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**FACULTY OF GEOGRAPHY**

**DEPARTMENT FOR REGIONAL GEOGRAPHY**

**PhD Thesis**

# TRASCĂU MOUNTAINS – GEOECOLOGICAL STUDY

**Abstract**

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**Cluj-Napoca**
**2011**

## SUMMARY

***Key words:*** Trascău Mountains, carst relief, isolated calcareous massifs, landscape ecology, geoecology, geosystem, geofacet, geotope, biostasic, rhexystasic and parastazic systems.

# INTRODUCTION

The present work is the fruit of the doctoral research works carried out under the attentive guidance of Professor Pompei Cocean, Ph.D., and it goes along the line of the geoecological research set off by P. Tudoran [1973, 1983] further on continued by M. Buza [1979, 2000], M. Oncu [2000], Hajnal Kovacs [2000], and N. Baciu [2006].

The doctoral thesis „**Trascău Mountains – geoecological study**" wishes to be, alongside a thorough description of the multitude of elements composing the natural environment (abiotic and biotic), completed by the ones associated to the anthropic component, as well as a detailed radiography of the territorial complexity of the Trascău Mountains through the outlining of the uniqueness and specificity of the analysed region and of the relations of interconditioning and interdependence of the composing elements and the integrating parts of the units and subunits of the geographical landscape.

Hence, the paper is structured in four chapters, the first one treating the theoretical and methodological aspects that were the basis of the geoecological analysis of the Trascău Mountains since the apparition of the "landscape science" and of the notion of "natural territorial complex" and to the definition provided by C. Troll [1939] for geoecology as *"science of the entire complex of inter-relations between the living communities and their natural environment"*. Still in the first part, there are presented the stages in which geoecology turns into a science, as well as its subject – the geosystem. To the same extent, the methods and principles of research that were used in the geoecological analysis of the Trascău Mountains will be treated and described such as an enumeration of the main contributions to the presentation of the region, from the geological and geomorphologic research works on the landscape to the vegetation studies on various subunits of the analyzed territory.

The second part of the paper is destined to the integrate analysis of the natural components (relief, soils, climate, hydrography, biogeographic component) taking into account the role of these elements in the outlining of the uniqueness and specificity of the analysed region.

Chapter three is represented by the analysis of the anthropic factor, stating from the historical aspects on regional population and continuing with the analysis of the numerical evolution of the population, of the habitat component and also the accentuation of the role that the anthropic factor has as a modelling agent of the geographic landscape of the analyzed unit.

The last chapter is reserved to the presentation and description of the dynamic and structural particularities of the current geosystems, with the underlining of their state on the one hand (biostasy, rhexystasy, parastasy) and, on the other, of their extension and distribution in the relief unit that is studied.

# CHAPER I
# THEORETICAL AND METHODOLOGICAL CONSIDERATIONS

## I.1. THEORETICAL ASPECTS

The basis of the spatial analysis of a territory is considered the geographical landscape, so that in the first part of the paper there will be presented the stages of the apparition of landscape analysis as premises for the development of the geoecological research, from the first perceptions on the landscape and to the apparition of the "geography of the landschaft", as well as the definition of the new directions in "landscape science" research. Within the latter, along the past century there has been a gradual separation of the modalities to approach and analyze the landscape: on one side there is its research from the vegetation perspective (later on this direction gave birth to the landscape ecology and then geoecology of C.Troll) and on the other side, its cultural approach. "*Landscape ecology has first developed as a biogeographic science, as a bridge between geography and ecology. Landscape ecology is related to geography through the emphasis it places on the spatial models and the interactions human-nature, while the study of the landscape functions and the relations organism – environment belongs to the field of ecology*" [N. Vourela, 2003].

Geoecology is per se, as part of the geographic sciences, a distinct discipline that has appeared relatively recently on the stage of spatial research, constituting into a field of complex analysis and incorporating both descriptive aspects related to the geography of an area and the aspects of interactions, interdependence, complementarity, and causality of all the elements identified within it, being defined as "*science of the entire complex of inter-relations between the living communities and their natural environment*" [C. Troll, 1938].

Considering the territorial complexity of a region as a system, as a "unitary whole" that can be decomposed into sub-systems and, in which all the composing elements can be considered a different system, but at a distinct level of analysis, we admit that as a starting point in the geoecological research we used the notion of geosystem introduced by V.B. Soceava in 1963 [according to I. Mac, 1990], as well as its subunits, geofacies and geotope.

Based on the geomorphological stair of J. Tricart and A. Cailleux, Brunet elaborated a regionation principle of the geographical space where the zone, the domain and the region represent upper fields, whereas the geosystem, geofacies and geotope are the lower organization levels. The zone is a first rank spatial unit, with relative homogeneity subsequently to the existing discontinuities among its components; these discontinuities are responsible for the existence of certain interregional units that are less homogenous, represented by domaines (the alpine domain). The region represents itself a unit inferior to the other two, being characterized by a large spatial complexity (for example the Apuseni Mountains are distinguished from other mountainous groups as they represent a larger degree of landscape fragmentation, distinct geological complexity and a particular climatic component (a bland moister climate) that favours the existence of deciduous forests even at higher altitudes).

Alongside being taxonomic elements inferior to others, the geosystem, geofacies and geotope are exactly the components of the geographic space that allow their more detailed

analysis. Thus, the geosystem corresponds to a well individualized territorial complex (in our case The Trascău Mountains), emphasizing its ensemble dynamics, the geofacies insists on the physiognomy (geofacies of the deciduous forest with *Fagus sylvatica*), while the geotope is the last level of the spatial analysis. If the geosystem considers the geographical complex and its dynamics occupying areas of tenths to hundreds of sqkm, the geofacies will reflect the features of the local ensemble and will correspond to a homogenous sector characterized by a proper physiognomy the spatial extension of which will be more reduced (from tenths to a few sqkm) whereas the geotope will represent the lowest level of analysis and the extent of which will only be of several sqm; therefore, the homogeneity degree of each taxonomic unit is the greater the scale of analysis is more reduced.

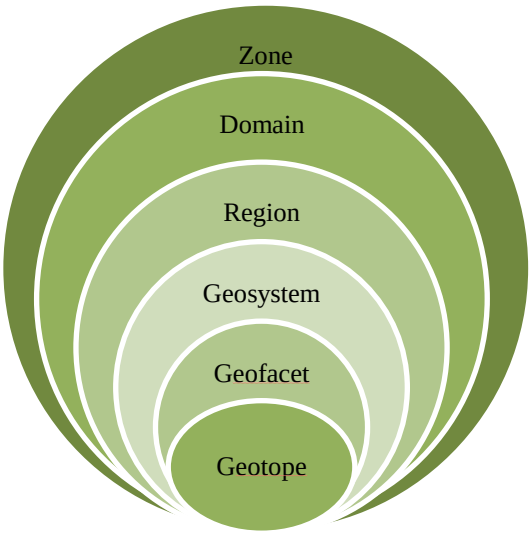


**Fig. 1.** Regionalisation of the geographical space.

In order to try to establish the spatial limits up to which the dynamic of a system is dictated s*trictly by natural causes and in order to explain the anthropic intervention as well the geosystem dynamics,* we will turn to the idea of biorhexistasy of E. Erhart [cf P. Tudoran, 1983] that considers the evolution in relation to the climax state. Hence, according to this theory, the geosystems can be grouped into the following systemic ensembles:

**a) Geosystems in biostasy**, where the ecological potential is relatively stable and in balance with the biological exploitation. Their structure has been slightly modified by the anthropic activities without suffering an irreversibly regressing dynamics. The small degree of anthropic intervention does not affect the system state as it can easily return to its initial state. The evolution of these systems is dictated by the biogeochemical processes and agents (competition among vegetal species, pedogenesis, etc.). In this type of dynamic geosystems are included the ensembles with a high degree of ecological support stability (and a very weak manifestation of the geomorphological processes).

**b) Geosystems in rhexistasy**, these are the systems where the balance between elements is seriously disturbed, as a result of the essential changes undergone by the ecological potential, either natural causes or anthropic. The evolution of these systems is regressive and at times irreversible to the initial state.

Furthermore, with a view to quantifying the anthropic impact on the natural systems, P. Tudoran [1973] introduces the notion of parastasy to explain the level of anthropic intervention. According to him, **the parastasic geosystems** are the systems with major disequilibrium between the ecological potential and biological exploitation, the high degree of natural component modification determined by significant anthropic activities preventing the return, even in a longer period of time, to a similar or close state to the one of climax. Thus, the existing elements are not

pursuant to the reality subsequently to a constant anthropic intervention, the return to the balanced state of the natural components requiring a long process, even under the conditions of a ceased anthropic presence and activity. Within such a system, we can talk about a lack of the natural elements or their rare presence. Nonetheless, we need to mention they can be represented by a few abiotic components (such as the lithological substratum or the edafic cover).

## I.2. THE METHODOLOGICAL FRAMEWORK

In the geoecological analysis of the Trascău Mountains, the study methodology used is on one side the regional one, given the appearance of geoecology as a geographical discipline, and the ecological one on the other side, applicable to the research in environmental geography that supports the orientation towards a "human ecology" through the interdependence relations between human and environment and even more the orientation towards determinism of the links between the biotic and abiotic component.

H. Leser [cf M. Buza, 2000] states that there are no specific geoecological methods, but methods of all the close sciences can be applied everywhere as long as they have a real spirit and lead to problem solving. M. Buza [2000] states that "there are specific methodics if, through methodics one understands the structural intertwining of a great number of methods of work that can be well applied separately in different disciplines".

The interdisciplinary character of geoecology makes it use both research methods specific to geography and others borrowed from sciences so that the existence of a geoecological methodics has more starting points, more precisely: a series of disciplines with distinct research tasks cooperate in the geoecological research; diverse research fields use a complex of methods that are related from an interdisciplinary point of view and the fact it is a unique research objects – the geographical landscape – which, due to its complex character and as a unique research subject, cannot be solved suing the methodic of only one discipline but requiring individual working modes from various research fields.

## I.3. PREVIOUS RESEARCHES OF THE TRASCĂU MOUNTAINS

Along the 20$^{th}$ century and even before, numerous scientists from different fields of knowledge have been amazed by the spectacularity and variety of the morphological aspects but also of the historical ones displayed in the Apuseni Mountains and implicitly in the Trascău Mountains. They were determined to study them and the results of all these scientific works were reflected by the large number of scientific papers and articles appeared in various domains (history, ethnology, geography, geology, etc.).

Therefore, the works appeared were extremely varied both as approach and regarding the object of the analysis. The geologists and geographers were among the first scientists who observed and researched the Trascău Mountains. This was due to the great lithological, mineralogical and stratigraphic variety present all across their territory and also to the result of

the spectacular endogenous and exogenous forms of the Trascău Mountains. The most important work from a geological point of view and a synthesis of all the previous works is **"Evoluția geologică a Munților Metaliferi (The Geological Evolution of the Metalliferous Mountains)"** [V. Ianovici and collab., 1969] where M. Bleahu treats the subdivisions of the Metalliferous Mountains, achieving the first real delimitation of the Trascău Mountains.

Important contributions to the karstology of the Apuseni Mountains have been made by a large number of scientists, geologists and geographers together as a result of the diversity of the existing endokarstic and exokarstic forms [Em. de Martonne, 1992; R. Ficheux, 1971; I. Popescu-Argeşel, 1977, P. Cocean, 1980, 1984, 1988, 1990, 1995, 2000]. Concerning the karst of the Apuseni Mountains, we mention the works of P. Cocean **„Chei şi defilee în Munți Apuseni (Gorges and Defiless in the Apuseni Mountains)"** [1988] or **„Munții Apuseni. Procese şi forme carstice (The Apuseni Mountains.Karstic processes and forms)"** [2000], as they are among the most complex in this field. They present, from the perspective of the formation, all the gorges and defiles sectors in the Apuseni Mountains, as well as the genetic processes that led to their apparition, providing at the same time information on the distribution of the karst in the Apuseni Mountains.

A first complex study on the Trascău Mountains has been elaborated by I. Popescu-Argeşel [1977], his work **„Munții Trascăului, studiu geomorfologic (The Trascău Mountains, a geomorphological study)"** constituting a general paper in which are approached the aspects related to the geological evolution of the relief unit and implicitly its formation.

Among the first research works on the flora of the Apuseni Mountains we must mention the studies of E. I. Nyárády [1937, 1939] on the vascular flora of the Turda Gorges, those of E. Pop on the endemisms of the Apuseni Mountains and the works of I. Hodişan, Şt. Şuteu şi I. Gergely referring to the floral elements in the various subunits of the Trascău Mountains.

For the geoecological research works in the Romanian geography we have to mention the fact that the relatively small number of these studies in our country is compensated by their outstanding scientific value, P. Tudoran [1983] and M. Buza [1979; 2000] being among the first to conduct geoecological research works on the various mountainous groups; in the same manner, the geoecological research have had as subjects other relief units, M. Oncu [2002] publishing a geoecological study on the Mureş Corridor, more precisely the sector between Deva and Zam, whereas N. Baciu [2006] published a geoecological study on the Transylvanian Plain.

# CHAPTER II
# COMPONENT ELEMENTS OF THE NATURAL FRAMEWORK

## I.1. GEOGRAPHIC LOCATION AND LIMITS

The Trascău Mountains are situated in the south-eastern part of the Apuseni Mountains, dominating the Mureş valley, downstream of the confluence with the Arieş River, and they are a first rank unit both from the perspective of the relief (mainly developed on limes) and of the geographical space organization. They are composed of a particular petrographic mosaic,

ranging from narrow crystalline patches to crystalline limes, coralligerous limes and dolomites, to rocks of the Cretaceous flysch or miocene deposits, all of them reflected in the remarkable landscape diversity identified all over their territory. The touristic attraction of this area is given by the variety of the karstic relief, alongside the plethora of endo- and exokarstic forms developed, as well as the fauna and special flora containing many endemic species and a diversity of protected areas, as they can be found on such a narrow area in very few places of the Romanian Carpathians.

Regarding the limits of the analzyed unit, we mention that if the northern, eastern and southern limits are relatively well individualized; the western limit is more difficult to eastblish as a result of some petrographical differences. [I. Popescu-Argeşel, 1977]. The norhern limit is given by the Iara and Hăşdate Depressions, the eastern limit is represented by the Aiudului Hills from the Alba-Iulia – Turda Corridor while the southern limit is spreading along the Țelna and Zlatna localities and is given by the valley of the Ampoi River (by the Zlatna and Meteş depressionary basins). As mentioned, the western limit imposes several difficulties as a result of some peterographical differences; from the valley of the Ampoi River up to the valley of the Arieş River, the Trascău Mounatins are in a direct or indirect contact with the Auriferi Mountains and northern from the Arieş River, with the Muntele Mare Mountains.

Administratively, the Trascău Mountains are allocated to the counties of Cluj (only their northern part, including the Turda Gorges and the Tureni Gorges, and a small part of the Arieş River valley) and Alba, representing at the same time the mountain unit with the vastest surface on the territory of Alba County. The length of the calcareous ridge is of approximately 75 km from the north to the Ampoi valley which represents, as mentioned above, the southern limit of the analyzed region. The relief unit, through its morphometry is included in the category of the lower mountains having in the same time a reduced altimetry in comparison to the rest of the mountain units of the Apuseni Mountains.

Its highest altitudes are recoreded in the southern part of the unit, surfaces of more than 1,200 m being registered in the Dâmbău and Corabia massifs, then in the Ciumerna massif and the Secu and Bedeleu massifs. To the north, the heights are even more reduced and in the central part, the only massif that exceeds 1,200 is the Pleaşa Râmeţului. A hypsometric analysis of the Trascău Mountains reveals an expansion of the 1,000 and 1,200 m surfaces comparative to those of 1,200 m.

The density of the fragmentation is considerably reduced in the area of the Jurassic limestones in the west of the unit, increasing gradually to the east and north. The greatest density of the fragmentation is given by the flyschoid formations due to their great friability partially imposed by the lithological variety of the region.

The fragmentation of the relief of the Trascău Mountains in directly involved in the development of the biological exploitation where it influences the microclimatic conditions of the region through modifications triggered on the humidity regime and the evaporation and evapotranspiration.

Depending on the direction in which they deploy, the relief fragmentation influences the repartition of the herbal and woody associations, the southern, south-eastern and eastern

directions favoring the development of thermophile formations whereas the northern and north-western directions develop the umbrofile formations.

Referring to the role of the morphometric and morphographic elements in the geoecological analyses, we must note that they can offer information regarding the diffusion of the soil cover or even the spatial distribution of various phytotaxons. Hence, the degree of slope declivity and the exposure of the versants are among the elements of the relief that have a major role in the support of the ecological potential and implicitly in the biological exploitation as they can be constituted in the limitative or favoring factors in their development.

Through their characteristics, they influence directly the values of the various climatic and hydric parameters of the region (the values of the temperatures and the level of the relative humidity, the degree of insulation, etc.), whereas their indirect action is translated into the influence they have on the diffusion of the plant and animal species (on the shadowed versants there will be shadow loving plants whereas the ones with a higher insulation will display heliophile plants).

The exposition of the versants constitutes into a major factor with implications in the geographical landscape of the Trascău Mountains to the extent it produces differentiation in the solar radiation that translates into qualitative and quantitative toning of the vegetal cover. At the same time, the versant exposure influences the regime of the river course, on those with southern orientation there is a more accelerated melting of the snow that once in the river bed will contribute to increasing the course values.

## II.2. THE RELIEF OF THE TRASCĂU MOUNTAINS

In the geoecological study of the Trascău Mountains the analysis of the relief was done considering the support role it has in the development of the ecological potential and the biological exploitation, respectively the influence of the relief in the repartition of the edafic cover that has a role in the existence and development of the vegetal cover and implicitly in the distribution of the faunistic component of the analyzed unit. Thus, among the most pregnant forms which confer uniqueness and specificity to the studied region are the exokarstic formations and, in addition, the more than 25 gorge sectors and numerous isolated calcareous massifs that, through their slopes and the verticality of their walls, imprint a non-uniform distribution of the vegetal cover and thus also a distinct physiognomy to the analyzed landscape.

As such, the role of the relief in the development of the ecological potential and biological exploitation, but also in the anthropic use is a direct one through the degree of declivity of the slopes and the exposure of the versants influencing the spatial repartition of the various phytotaxons and of the anthropic factor distribution, the latter being the one whose actions are translated into the state and quality of the geographical landscape components of the analyzed region.

**The karstic relief**

The landscape of the Trascău Mountains is greatly composed of karstic forms, from the seldom apparitions of the calcareous klippes to the landscape dominance of the isolated massifs and the presence of certain exokarstic and endokarstic formations of great spectacularity and touristic attraction. The exokarst of the Trascău Mountains is represented by limestone pavements, kettles, sinks, and gorges, while the endokarstic formations are represented by the cavernicolous environments consisting in the 321 caves of the massif [cf P. Cocean, 2000] but also in the sinkholes (among the most important being the ones of Piatra Cetii and the one of Vânătara).

The gorge sectors on the territory of the Trascău Mountains are developed altitudinally in a rather large ecart, from over 800-900 m to approximately 500 m, as a result of the gradual sinking of the calcareous band with the advancement to the north (reaching approximately 550 in the area of the Tureni Gorges). Geoecologically, at the level of the analyzed unit, the gorge sectors are presented unitarily, in the sense that their walls are populated with chasmophytic species adapted to the saxicole environments characteristic to these types of formations. Consequently, for the most part, the gorges on the territory of the Trascău Mountains present similarities both in the repartition of the vegetal cover and in the distribution of the edafic cover, the latter being represented by the areas with accentuated declivity of the walls on skeletal soils, and the ones with moderate declivity or reduced slopes, from rendzinic soils to lithosoils, capable in certain cases to sustain even the development of a forest vegetation.

Among the most spectacular and renowned gorge sectors on the territory of the Trascău Mountains we enumerate the Turda Gorges, the Mănăstirii Gorges, the Râmeț Gorges, the Cetii Gorges, Tecşeşti Gorges, Întregalde Gorges, the notoriety being given by the spectacle offered to the sight by the multitude of denticulate saddles, towers, poles or larger surfaces of detritus and other abiotic and biotic elements (numerous rare species, some endemic for this part of the Apusenis), but also the anthropic ones (in the Mănăstirii Gorges is located one of the most known places of cult and nucleus of orthodoxy – the Râmeț Monastery). In this context, we mention the existence in the areal of the Turda Gorges of *Allium obliqum, A. flavum* or of certain endemisms such as *Aster alpinus* but also of other species whose presence has remained as a result of the microclimate conditions chillier on the northern exposure versants, species such as: *Ranunculus illyricum, Vitis sylvestris, Festuca vallesiaca* or *Dianthus spiculifolius*, etc., whereas the Râmeț Gorges are known partly because of its natural portal and partly subsequently because of the signaling in their perimeter of the mountain-eagle (*Acvila chryasetos*) or of the *Leontopodium alpinum*. To the same extent, the Întreglade Gorges have become known still due to the signaling, at the beginning of the last century, of the edelweiss (*Leontopodium alpinum var. intregaldense*), considered to be vegetating at one of the lowest altitudes in Romania.

Keeping the analysis of the formations characteristic to the karstic relief, we have to state the presence of the calcareous massifs, the exokarstic manifestation of great spectacularity all over Trascău Mountains. Obviously, their presence and spatial dispersion does not shadow the grandiloquence of the spectacle offered by the multitude of gorges and defiles but rather complements the state of mind of those who, one way or another, have crossed, admired and analyzed the landscape so masterly put at everyone's disposal. From among all these, the

geographical landscape of the Trascău Mountains detaches the Colții Trascăului (Trascăului Fangs) massif with the Piatra Secuiului peak, the Data and Rachiş massifs located south of the Colții Trascăului in the area of Vălişoarei Gorges. The massifs Piatra Cetii or Piatra Craivii that situated in the south-eastern part of the analyzed unit also present themselves as a first rank geographical landscape in this side of the Trascău Mountains, dominating the surrounding areas through the slopes of their bald walls, thus detaching themselves from the monotony of the contiguous relief. On the bald cliffs of these calcareous massifs, the species represented are mostly identical to the ones in the adjacent gorges sectors, associations of chasmophytic species, with variable distribution and diversified floristic components.

**The relief developed on ophiolites**

The ophiolites of the Trascău Mountains are less spread compared to the calcareous rocks, but with greater development than the crystalline schist, appearing under the form of more or less vast strips particularly in the northern part of the unit. In the central and south-eastern part of the Trascău Mountains, the ophiolites appear as narrow strips or isolated patches while in the southern part they are disseminated in the flysch mass.

The morphology of the ophiolites is characterized by the presence of a varied microrelief, with complex forms, pyramidal aspects, poles, towers and the color of which (dark, black) confers a ruiniform aspect. The ophiolitic microrelief is present in the basinet downstream of the Turda Gorges, in the Colții Trascăului massif, in the Tarcău and Colții Caprii peaks, in the small isolated massifs disseminated in the flysch mass, the defiles sectors dug in the ophiolites while loyally preserving the characteristics of a defile.

The most important defile sectors in the Trascău Mountains are met along the Arieş, Hăşdate, Tureni, Pietroasei, Rachiş, Râmeț, Galda, Bucerdea, Țelna, Ighiu, Ampoița, Ampoi, and Feneş valleys. All across the Trascău Mountains, the relief forms developed on ophiolites present singular features that give birth to a varied landscape both regarding the disaggregation forms and their aspect which is mostly ruiniform. The diversity of the forms on which the defiles sectors carved in ophiolites offer result from the processes of differential rock erosion under the modeling factors but also from their physical disaggregation processes. Therefore, the vegetal formations are weakly represented in these defiles sectors, the degree of slope declivity, the denudational processes, physical alteration of the rock, as well as the anthropic intervention (under its different manifestation forms) presenting themselves cumulative factors in the aesthetics of the landscape of these areas.

There are however situations in which the report of the lithology with the vegetal component is in a balanced state, in the sense that on the slopes with a moderate declivity and versant exposure adequate for the development of the vegetal cover there are both herbal and woody associations, rich in species and that coexist in an almost perfect natural symbiosis. The passage from a lithologic facies to another is observable only through the chromatic nuances of the various formations present, the vegetation being mostly similar as we have mentioned above. Additionally, there are cases in which we encounter a gradual passage from the vegetal associations pertaining to the shadowy valleys to the mezoxerophile chasmophytic associations adapted to rocky habitats.

**The relief developed on crystalline schists**

In the Trascău Mountains the crystalline schists appear in the north-western part, on both banks of the Arieş River, as islands, being in fact a continuation of the ones from the Muntele Mare Mountain and progressively sinking until complete disappearance as we continue south-eastward. The relief developed on crystalline rocks is a heavy one, with forms that imprint on the landscape massive aspects, with narrow valleys, convex versants, and abrupt falls near the thalwegs. In most cases, the biological exploitation is represented by the beech forests that also have other species and which cover almost completely the versants, but also displaying certain pine plantations, instituted as antierosional measures during the past decades.

**The relief developed on conglomeratic rocks, sandstones, clays and marls**

In most cases, the conglomeratic facies are intercalated by other types of formations; this restrains only to a certain extent the development of a relief characteristic to this type of rock. The conglomerates of the Trascău Mountains are situated on the southern part, more and more to the Ampoi valley, the relief being characterized by rounded interfluves, frequently limited by abrupt that are easy to identify as a result of the sudden change of the versants' features (on conglomerates there is a series of slope abrupt, lithologic shoulders, etc.). The relief grafted on clay and marls is present in association with formations of conglomerates and slates and is located in the lower Feneş strata (schistic clay), as well as in the upper ones (still clay facies) best represented in the Meteş strata (as striated clay marls). In the Râmeț and Brădești strata we can find horizons of marl schists and sabulous clays).

The soils that develop on these kinds of rocks are soils rich in nutritious bases and elements, such as eutricambosoils but also the soils poor in nutritious elements such as the acid brown ones (districambosoils) or the brown soils with iron (prepodzolic soils).

In the dominance area of these substratum types, on the moderate declivity slopes, there appear the deciduous forests (beech, durmast, birch or elm), with small coniferous intercalations, mainly pine and fir, whereas in the lower areas they have been almost completely removed to make space for the cereal cultures thus considerably diminishing the floristic diversity.

## II.3. THE DEPRESSIONARY AREAS

Similarly to the rest of the relief units on the territory of our country, the Trascău Mountains are composed of various depressionary units, with multiple functions and diverse features. Most of the depressionary areas in the Trascău Mountains are at the margins of the relief unit, which distinguishes them even more from the rest of the neighboring units. Depending on their location, the depressionary areas are either intra-mountainous or contact depressions.

The intra-mountainous depressionary units in the Trascău Mountains are generally small sized, the only detaching one being the Trascău depression. Alongside, other less vast

ones, yet similarly important regarding the anthropic component and the multiple functions, are the Poiana Aiudului and Vălişoara depressions.

The contact depressions comprise both the depressionary areas situated in the western part of the Trascău Mountains and the ones in the south. Given their location in the Apuseni Mountains as intra-mountainous depressions and as a result of the fact they margin in fact the relief unit we analyze, we will consider them contact depressionary areas. Among these, only a few come in direct contact with the Trascău Mountains; they are: Sălciua depression, Poşaga depression, Lunca depression and Ocoliş depression in the western and central-western part of the mountainous unit; Zlatna and Ampoi – Ampoița depressions in the south, as contact areas with other mountainous units; Iara, Hăşdate, Turzii, Pietroasa, and Podeni depressions situated at the contact of the Trascău Mountains with the Transylvanian Plateau.

Regarding the biotic component of this depressionary areas, we must note the almost complete absence of the forests in the proper area of the depressions, the presence of forest vegetation of the western versants, as well as the existence grasslands, orchards and vineyards in the areas of confluence where settlement systems have been developed, belonging to the Meteş and Ighiu communes.

## II.4. SOIL, SYNTHESIS OF THE INTERACTION BETWEEN THE ELEMENTS OF THE GEOGRAPHICAL LANDSCAPE

Integrate part of this geocomplex, the soil presents itself as a natural organism, an environment for plants and various living species, which, through its characteristics and organo-mineral composition, supported by the bio-physical features, is capable to sustain and maintain the biotic activity. It is a complex organism, with a well individualized position within the natural systemic components; it acts at the same time as an "intermediary" of the relations and interactions between the components of the geographic environment, also constituting into a fundamental support in the development and course of the processes among the geospheres. To the same extent, it can be considered a good indicator of the environment quality as it is among the natural components most sensitive to the actions of external factors.

Geoecologically, the soil represents an accumulator, a complex environment of substances and energy, organisms and microorganisms, features and processes [M. Oncu, 1999]. Through its functions and characteristics, the edafic cover, either organic or mineral, is constantly subjected to the combined action of the external factors (erosion, anthropic activity, geological phenomena) and the internal ones (physic-chemical and biological modifications).

The edafic cover of the Trascău Mountains is characterized by a large variety of the types present, closely linked to the genetic conditions and the relief particularities; their zonal character being determined by the altitude and the bioclimatic conditions present. As mentioned above, the diffusion of the soil types is strictly correlated with the type of rock on

which they have developed, with a high degree of slope declivity, climatic factors, in the chine areas and on the more abrupt versants we can find skeletal soils, whereas on the moderate forest-covered slopes there are the brown forest soils in different varieties and in the depressionary areas, the alluvial soils.

At the level of the analyzed relief unit and as a result of the low altitudes (under 1,500 m), in the soil cover, the predominant are districambosoils often associated with the lithosoils on the abrupt versants. The areas with occurrence of limes present a pedological cover composed of rendzines, rendzinic lithosoils, typical and fertile eutricambosoils.

At the lower altitudes or in the depressionary areas, the edafic cover is represented by the luvosoils, preluvosoils and eutricambosoils, the luvosoils being the most affected by the stagnogleisation processes.

In the valley sectors where the rivers have carved in more solid rocks and the versants are more abrupt, the soil cover is constituted of lithosoils and eutricambosoils in the circumstances of the presence of acid parental rocks.

In the depressionary regions, as well as on the river terraces on the couloirs to the valley, the soil cover is mainly formed of soils belonging to luvosoils and cambisoil classes. In the Zlatna depression, the edafic cover is represented by the typical luvosoils that are strongly debasified, associated with the alosoils and districambosoils upon contact with the mountainous area, then by eroded eutricambosoils and erodosoils in the deluvial sectors resulted from carbonatic rocks.

In the river alluvial plains there are distric, eutric and calcareous aluvosoils, often displaying gleic properties.

## II.5. CLIMATE, ELEMENT OF FAVORABILITY IN THE DEVELOPMENT OF THE ECOLOGICAL POTENTIAL

### The air temperature

The distribution in surface of the thermal values in the Trascău Mountains reflects the topographic conditions, so that the average annual temperatures register a gradual decrease from the eastern part of the unit to the western one but also from the depressionary towards the mountainous areas, as the altitude grows. Generally, the climate of the Trascău Mountains, just as the entire group of the Apuseni Mountains is a moderate temperate continental one, with a ranging based on the relief altitude, determined by the geographical position of the massif and by the structure of the active surface.

At the level of the analyzed unit, the average annual temperatures have positive values, situated between 5.5 and 6.7°C towards the western part of the unit, whereas the eastern part presents higher values, between 8.5 and 9.8°C. The average annual temperature, calculated in the interval 1982-2001, for all the four stations, represents the "normal" or "relative zero" compared to which we can appreciate the sense and value of the divergences that occur form one year to another [P. Tudoran, 1983]. Thus, these divergences are generally small, the thermal differences between the warmest years and the coldest ones varying from 2.5 to 3°C.

**Monthly average values of the temperatures (°C) for the interval between 1983 – 2001**

Table 1

| Station | Months | | | | | | | | | | | | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | I | II | III | IV | V | VI | VII | VIII | IX | X | XI | XII | |
| Turda | -2.6 | -1.1 | 3.9 | 10.2 | 14.8 | 17.7 | 19.9 | 19.8 | 15 | 9.6 | 3.2 | -1.9 | 9.3 |
| Alba-Iulia | -1.7 | 0.2 | 4.9 | 11.3 | 15.5 | 18.1 | 20.7 | 20.6 | 15.8 | 10.2 | 3.6 | -1.0 | 9.8 |
| Băişoara | -3.1 | -3.7 | -0.9 | 4.4 | 9.0 | 11.9 | 14.3 | 14.3 | 9.9 | 6.4 | 0.6 | -2.5 | 5 |
| Roşia Montană | -4.3 | -3.6 | -0.3 | 5 | 10 | 12.7 | 15.1 | 15.3 | 10.7 | 6.7 | 1.1 | -2.1 | 5.5 |

**Source:* www.ncdc.noaa.gov; National Administration of Meteorology.

From the analysis of the seasonal thermal values, we can conclude that thermally, the Trascău Mountains are characterized by an attenuated continentalism with relatively bland winters and moderate summers, the average multiannual amplitude being relatively uniform in the Alba-Iulia – Turda Corridor (24.8-25.1°C) and more decreased towards the western part of the unit (21.8°C).

**Values of the seoasonal average temperatures (°C) for the interval between 1983 – 2001**

Table 2

| Station | Seasons | | | |
|---|---|---|---|---|
| | Spring | Summer | Autumn | Winter |
| Turda | 9.7 | 19.2 | 9.3 | -1.9 |
| Alba-Iulia | 10.6 | 19.5 | 9.9 | -0.9 |
| Băişoara | 4.2 | 13.6 | 5.7 | -3.1 |
| Roşia Montană | 4.9 | 14.4 | 6.2 | -3.3 |

**Source:* www.ncdc.noaa.gov; National Administration of Meteorology.

Ecologically important for the course of the vegetal cycle of certain plants is the average of the monthly minimums, for the analyzed relief unit the values are positive only in the second trimester of the year, respectively April through October.

For the agrarian and sylvan practice, a special emphasis is placed on the frost regime, respectively on the knowing of the average and extreme data of the first and last frost. For the western part of the Trascău Mountains the date of the first frost usually appears in the second half of October and for the eastern part it is registered only in the last days of October and the first half of November. In this regard, we must specify that there were situations in which, in the last warmer years the date of the first frost occurred only in December – in 2000, in Turda, the temperature of -0.1°C was reached only on December 4.

**The average and the extreme date of the first and the last frost 1983 – 2001**

Table 3

| Station | Average date | | Extreme date | | | |
|---|---|---|---|---|---|---|
| | First frost | Last frost | First frost | | Last frost | |
| | | | Earliest | Latest | Earliest | Latest |
| Turda | 11 Nov. | 09 Mar. | 27 Oct. | 04 Dec. | 16 Feb. | 26 Mar. |

| | | | | | | |
|---|---|---|---|---|---|---|
| Alba-Iulia | 08 Oct. | 17 Mar. | 17 Oct. | 11 Dec. | 26 Feb. | 04 Apr. |
| Băişoara | 24 Oct. | 12 Apr. | 30 Sept. | 22 Nov. | 15 Mar. | 08 May |

**Source:* www.ncdc.noaa.gov

For plant development also important is the transition through the 5°C threshold as this value represents "*the biological zero*" i.e. the temperature at which a certain species starts its vegetation cycle. Hence, knowing these threshold values is useful particularly for the agrarian practice, but also for the sylvan or pomiculture, even more so as the days with temperatures over 5°C coincide with the spring seeding.

To the same extent, knowing the thermal threshold of 10°C is important for the agriculture calendar as this threshold value is absolute zero for certain culture plants with higher thermal requirements, plants such as corn, vine but also some vegetables (tomatoes, peppers, cucumbers) and fruit (peaches, nuts, etc.).

The 20°C threshold temperatures interval characterizes the summer season and is significant for the knowing of the phenological phases of different plants, a great variety of thermophile species (apricot tree, vine, peach tree, etc.) demanding higher temperatures for the fruit maturation.

The plant phenophases are produced under the direct influence of the climatic conditions in the vegetation period and the passage of the temperature values through certain thresholds (mainly the 10°C one) constitutes the beginning and the ending of the vegetation season [Maria Pătroescu, 1996].

**Phenophases of a complete vegetative cycle in relation with the average temperature that characterizes them [cf Alina Satmari]**

Table 4

| **< 0**°C | **0 – 5**°C | **5 – 10**°C | **10 – 15**°C | **15 – 20**°C | **>20**°C | **20 - 15**°C | **15 – 10**°C | **<10**°C |
|---|---|---|---|---|---|---|---|---|
| | Budding | Leafing | Blossoming | Fructification | Ripening | Seed dissemination | Partial loss of the foliage | Total loss of the foliage |
| **Vegetative phenophases** | | | | | **Generative phenophases** | | | |

**Climatic particularities (topoclimates)**

The diversity of the relief form on the territory of the Trascău Mountains to which are added the elements pertaining to the anthropic activity determine a non-uniform repartition of the solar radiation and precipitation quantity, which is translated into the existence of certain climatic particularities developed differently within the analyzed unit.

Based on the analyzed data referring to the thermal regime of the Trascău Mountains but also considering aspects related to the quantity of registered precipitations and the field observations regarding the vegetation types installed in diverse physic-geographical conditions, we identified a series of climatic particularities – topoclimates proper to the Trascău Mountains, characterized by thermal values and precipitations different from one another. Thus, we

identified the topoclimate of the high plateaus, the topoclimate of the sunny abrupt, the topoclimate of the versants covered with forest vegetation, the topoclimate of the secondary meadows, the topoclimate of the valleys and defiles, the topoclimate of the depressionary areas, and a topoclimate of the underground environments.

## II. 6. THE HYDROGRAPHICAL NETWORK

The hydrography of the Trascău Mountains is very diverse, with a large number of tributaries that belong to the hydrographical networks of the Arieş, Aiud, Geoagiu and Ampoi Rivers, all of which are direct or indirect tributaries of the Mureş River, through its middle flow. The majority of rivers developed within the analyzed unit are represented by small sized rivers which include them in the category of short and very short water courses. The only ones with a considerable length are the Arieş and Ampoi Rivers, both direct tributaries of the Mureş River, destined to border the unit, one towards the north-western part and the other in the south.

The hydrographical basins of several important rivers such as Aiud, Geoagiu, Galda and Ampoi Rivers along with some of their tributaries have their origin outside the calcareous ridge of the Trascau Massif, respectively in the Metaliferi Mountains and only some of the tributaries spring from the Trascău Mountains: the Rachiş and Neau rivers of the Aiud hydrographical basin, the Cetea and Cricău rivers from the Galda hydrographical basin and the Ighiu and Țelna rivers from the Ampoi hydrographical basin.

In regards to the general flow direction of the rivers, we have to mention that it is influenced by main receiver: eastern flow direction for the tributaries of the Mureş River, northern direction for those of the Arieş River and southern flow direction for some of the tributaries of the Ampoi River. Also, depending on the morphology of the relief, the hydrographical network of the Trascău Mountains encounters some differences in the direction of flow, maybe the most eloquent example being the hydrographical basin of the Ampoi River, where the Ciumerna plateau operates as a dispersion point almost towards every cardinal point for the water courses, from this area springing the Ampoița, Ighiu, Țelna, Bucerdea, Craiva and Cricău rivers – all of which are the tributaries of the upper course of the Galda River.

The average density of the hydrographical network in the calcareous area is under the direct influence of the azonality factor, varying from 0,2 – 0,9 km/sq km, the most representative surfaces being the Ciumerna plateau, the Râmeț – Ponor plateau and the Bedeleu plateau, while in the proximity of the klippes, the values of the density are under 0,2 km/sq km. On the other hand, the existence of some carstic springs located in the marginal sector of the limestone determines a slight increase in the values of the density of the hydrographical network up to 1,2 2,1 km/sq km (such is the case of the Cheia depressionary basin, of the marginal area of the Ciumerna plateau and of the Rimetea – Colțeşti area).

Regarding the ground waters we mention that they are deposited either in porous strata, either in carstic or in fissured rocks. Those from the porous strata are encountered in the alluvial gravel and sands from the meadows and terraces representing in the same time the most important underground resources of the region and are present in the meadows of the main

tributaries of the Mures River, especially in the confluence area. In the same time, there are ground waters that are deposited in gravel, sands or clays, as is the case of those from the Trascău Piedmont [T. Morariu, Octavia, Bogdan, A. Maier, 1980].

The surface waters of the Trascău Mountains developed mainly on a west-eastern flow direction is tributary to the Mures River, the most important dominant hydrographical system of the eastern border of the Apuseni Mountains. The sequence from north to south of the main rivers is given by the Arieş, Aiud, Geoagiu, Galda and Ampoi Rivers, between them being intercalated other, smaller ones in terms of size, discharge or drainage.

Regarding the lacustrine system of the Trascău Mountains we mention the presence of only one important lake – namely the Ighiu Lake, the other lakes identified within the analyzed region being represented by semi-permanent lacustrine systems, meaning that they can posses water accumulations only after some abundant rain falls; in the same time and in many cases during summer, these small lakes can almost entirely ran dry.

## II. 7. THE BIOGEOGRAPHICAL COMPONENT

Located at the eastern border of the Apuseni Mountains at the contact with the Transylvanian Plain, the Trascău Mountains benefit of a distinct climate which allows the development of a almost unique biota, with the presence of numerous continental and especially alpine species, the biogeographically interference area in which this region is located being therefore favorable for the existence of a wide range of species, many of which endemic or even rare for the Romanian flora.

**Elements of fauna**

As a correlative hierarchy of the animal kingdom, the lower areas are populated with species of invertebrates and vertebrates common for the Romanian territory, while the higher areas posses a distinct faunistic component, with a wide variety of species of birds, mammals and invertebrates, whose scarcity within the analyzed area, within the Apuseni mountains and even within the national territory is registered by special conservation measures implemented as a part of the Natura 2000 network in Romania.

Within the depressionary areas and meadows dominant are the common mammals, the most encountered being the fox, the hare, the hog; in the same time, the insects are very well represented, while the most gentle and notable of all – the butterflies are the group most widely studied. Also, the forests are populated with mammals' characteristic for the nemoral region, such as the deer, the wild boar or the badger.

At the opposite side, there are the mountain ridges, the peeled cliffs and the steep slopes which represent the habitat of some distinguished species of mammals, birds or insects. Among birds we mention the presence of mountain-eagle (*Acvila chrysaetos*), of the stone-merl (*Monticola saxitalis*), or of the stone butterfly (*Tichodroma muraria*). The insects are also well represented within the analyzed unit, only in the surroundings of the Rimetea locality being approximated the existence of over 15 thousand species of insects [L. Rákosy, 2006].

In the same time, the lepidopetrs of the Trascău Mountains present a great diversity of species, some of them with a quite limited distribution, a situation which makes their presence to be considered a rarity within the analyzed unit; from springtime until late autumn, a multitude of butterflies brightly colored enchants the sights of all of those who bait or visit these places. Among them we mention the presence of the *Polyommatus icarion, Satyrus briseis, Melanargia galathea, Amathes phegea, Zygaena carniolica, Argynnis (Fabriciana) addipe, A. paphia, and Iphidicles podalirius.* Also, in the area of the Turenilor Gorge which represents in the same time the only location from the territory of the Cluj County where this species is recorded, we mention the presence of the *Zerinthia ploxena* species and in the area of the Râmețului Gorge of the *Parnassius apollo* species.

**Floristic particularities of the Trascău Mountains**

The vegetation of the Trascău Mountains possesses great phytocenotic diversity as a result of the differences in altitude, of the exposure of the versants, or of the type of soil covers of the region. At the lower parts of the mountains, especially on the southern slopes, the durmast or oak forests are present, interrupted by hayfields or agricultural surfaces; towards the upper part, the northern slopes are covered with pure beech or mixed with hornbeam or ash trees forests, while the deforested areas are covered with secondary grasslands.

The forests – the most complex ecosystem, are unevenly spread throughout the unit; on more extended surfaces are located in the southern part of the analyzed area, on the slopes, while in the rest of the region, the surfaces were deforested in order to assure new ones destined for the utilization as hayfields or grasslands. The beech forests spread throughout the unit are found in different vegetation units, with segmentation of the occupied surfaces as a result of the morphology of the relief, of the characteristics of the soils as well as a result of the climatic features of the region.

Apart from these vegetal associations, we mention the presence, on different surfaces in terms of exposure and declivity of slopes, of the coniferous forests, which are in fact the result of some antierosional measures implemented in the past decades within the analyzed region. The largest part of these plantations is located in the proximity of the settlements where the soil erosion is more pronounced. In the same time, and as a distinct feature of the analyzed unit, we mention the presence of the larch (*Larix decidua*) forest, a glacial well preserved relict, located in the proximity of Vidolm locality, on the Arieş River valley.

Within the analyzed unit and in most of the cases, the surfaces occupied by forests are discontinuous, interrupted by areas with secondary vegetation resulted after the deforestation of the surfaces occupied initially by forests. The spreading of the herbaceous vegetation is made following the altitude, in many cases these associations accompanying the forest vegetation, meaning that to each woody area corresponds a different type of vegetation. As such, if the level of the durmast forests is between 300 and 600 m in altitude, in the case of more sunnier slopes reaching 700 m than, the herbaceous vegetation will comprise xerophytes or meso-xerophyte species, with the dominance of the *Agrostis capillaris* (*A. tenuis*) species. In the same time, the grasslands vegetation developed in the level of the durmast forests mixed with beech, corresponds

to secondary grasslands with *Agrostis capillaris* and *Festuca valesiaca, F. rupicola* or *F. pseudovina* species developed on the sunny slopes with southern, eastern and western exposure.

In regards to the analysis of the floristic particularities of the region we must also mention the presence of the vegetation characteristic for the calciferous massifs which comprises a series of xerophyte or mezophyte species as well as woody species. The saxicole vegetation is dominated by the *Sesleria rigida, Avenastrum decorum, Poa nemoralis, Festuca glauca* etc. species while the vegetation characteristic for the rock debris is made out of some pioneer associations dominated by the *Dryopteris robertiana, Galium erectum, Teucrium montanum, T. chamaedrys* or *Thymus comosus* species [Şt. Csürös, I. Pop, 1965].

**Protected areas and nature conservation**

In regards to the system of protected areas within the Trascău Mountains, we mention their affiliation to the European environmental protection network Natura 2000, the exploitation of these surfaces being therefore under the incidence of the European and Romanian legislation in the field. On a European level, the Natura 2000 network was designated to assure favorable conditions of development and protection for the species vulnerable or affected by the anthropic intervention.

In regards to the conservation and nature protection measures we mention that, within the framework of the Natura 2000 program and in order to identify the species that require special conservation, the Sites of Community Interest (SCI) and the Special Protected Areas (SPA) were instituted, within these areas a large number floristic and faunistic elements being under special protection measures, species which as a result of their vulnerability were included in the European list of endangered species.

As a consequence of the conservation measures within the Trascău Mountains a large number of protected sites are present, SCI and SPA, which from an administrative point of view belong to the Cluj (the north-eastern extremity of the region and a segment of the Arieş defile) and Alba Counties, over 85% of the surface of the analyzed region being occupied by protected areas of national or local interest.

**The Natura 2000 sites within Trascău Mountains**

Table 14

| Crt. no | Natura 2000 code site | Name of the site | Surface (ha) | Biogeographical region | | Administrative region | |
|---|---|---|---|---|---|---|---|
| | | | | Alpine | Continental | Cluj | Alba |
| 1 | ROSCI0034 | Turenilor Gorge | 105 | | x | 100% | |
| 2 | ROSCI0035 | Turzii Gorge | 324 | x | x | 100% | |
| 3 | ROSCI0253 | Trascău Mountains | 50,102 | x | x | 4% | 96% |
| 4 | ROSPA0087 | Trascău Mountains | 58,783 | x | x | 13,3% | 86,7% |

**Source:* Romanian Ministry of Environment and Forests.

## CHAPTER III
# THE ANTHROPIC COMPONENT OF THE TRASCĂU MOUNTAIS GEOSYSTEM

By means of its definition, the geoecological analysis presumes the research of all the aspects and elements that constitutes the distinctiveness of a region, either of the biotic ones developed on the basis of some abiotic elements, either of the anthropic components which completes the multitude of processes, phenomena and interactions developed within a certain territory.

### The numerical evolution of the population

Nowadays, the population from the Trascău Mountains belongs from an administrative and territorial point of view to two counties; the north and north-eastern extremity of the analyzed unit is spread within Cluj County, while the rest of the region is developed within the Alba County.

Throughout the last century, the numerical evolution of the population encountered important fluctuations dictated by the economical and social events that occurred in the life of the local communities. If the first part of the last century was characterized by an increasing evolution in the total number of the population, in the second half, the general tendency is the continuing decrease of the number of inhabitants, a tendency which subscribes to the national trend recorded throughout the last two decades.

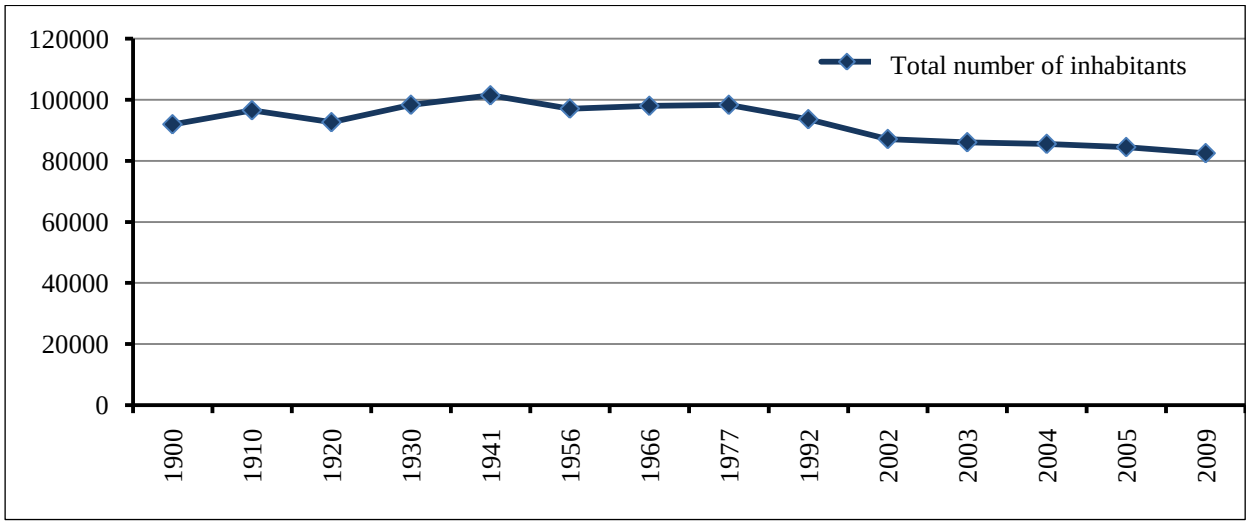


**Fig. 2.** Numerical evolution of the population between 1900 and 2009.

### Population density

The general density of a population within a territory is given by its spatial distribution in regards to the occupied surface, whereas the values of the population density are directly influenced by the number of that population. As a result, in the areas where the total number of the population possesses reduced values, the values of the population density will also record more reduced values.

The calculation of the population density for the Trascău Mountains, for the year 2009 allowed the assortment of all 21 administrative territorial units into 5 different categories, the obtained values being quite different from one to another, ranging from near 7.53 inhabitants/100 sq km (as is the case of the Râmeț commune), to 50.92 inhabitants/100 sq km (the case of the Ighiu commune) or even 123.66 inhabitants/100 sq km (the case of the Săndulești commune).

In order to make an assessment of the human impact within the analyzed unit, we have appealed to the analysis of the parameter physiological density, which reflects the state of the anthropic stress on the environment, and is reflected by the total number of inhabitants which corresponds to a hectare of agricultural land. For the year 2009 we have obtained different values of this coefficient, a situation which facilitated the assortment of the administrative units into several categories. The values range from under 0.20 inhabitants/ha of agricultural land to more than 1.89 inhabitants/ha of agricultural land. The obtained results show that the administrative units which recorded the lowest values are similar to those where the total number of the population is reduced or where a decreasing tendency is recorded. In this case as well the Râmeț and Întregalde communes recorded the lowest values, while the Aiud administrative territorial unit has recorded the highest value (3.68 inhabitants per hectare of agricultural surface).

Per the entire analyzed region, the values of the parameter physiological density is 0.74 inhabitants/ha.

**System of settlements**

In regards to the system of settlements we have to mention that the main element responsible for the development of the dwellings is the relief which, by means of its morphology determined and influenced the appraisal of the inhabited nucleus. The current configuration of the villages from the Trascău Mountains is the result of the adaptation of the anthropic element to the condition of the relief and in a much reduced manner, the result of the modifications of the relief as a consequence of the anthropic changes of the natural environment.

**Settlements density**

The current development and settlements density is the combined result of a multitude of natural elements, dictated by human subjectivity, the selection of a place of establishment for a household being influenced in the same time by the requirements for food and shelter of the human communities. As such, the population has established households in the areas most favorable and where the access to resources is more facile (in this regards, the depressionary areas, the meadows and the lower parts of the hilly areas were preferred), while the higher areas and as a consequence of the increased degree of inaccessibility were initially used only from an economical perspective and only later on, for the construction of dwellings.

The configuration of the system of settlements within the Trascău Mountains presents a concentration of the heart of the dwellings in the depressionary areas from the inner and outer parts of the analyzed unit, a contiguity of the household towards the center of the settlement and a dispersion of the dwellings in the central parts of the region, where as an

adaptation to the morphology, the households are more scattered on the slopes, distanced from one another.

In regards to the density of the settlements, we must mention that there is a moderate distribution within the entire analyzed unit, a concentration of the villages in the lower areas, along the water courses or in the depressionary areas being however observed, while the higher areas, the hills and plateaus posses more scattered and isolated settlements. The values of the density of settlements are also varied per each analyzed territorial unit, ranging from 3.91 villages/100 sq km (the case of the Ighiu commune), to more than 7.48 villages/100 sq km (as is the case of the Zlatna administrative unit) or 9.59 villages/100 sq km. The highest values of the settlements density are recorded by the Galda de Jos (10.78 villages/100 sq km), Întregalde (10.78 villages/100 sq km) and Râmeț communes (16.46 villages/100 sq km).

**Typology of settlements**

The analysis of the demographic typology of the rural settlements reveals that 67% of the analyzed villages posses fewer than 1000 inhabitants, a value which includes them in the category of small and medium sized settlements. This situation is explained, on one hand as a consequence of the aging process which plays an important role in the values of the birth rate (there are some villages where the entire population is represented by 5 or 6 persons, most of them being 65 or more years old) and on the other hand as the result of the adaptation to the morphology of the relief, the villages located at higher altitudes possessing fewer inhabitants as opposed to those located in the depressionary or lower areas.

In terms of the morpho-structural typology of the villages, we must mention that in most of the cases the hydrographic network was the one that influenced the spreading of the settlements, many of them (over 95%) being located in the nearness of some water sources. As an adaptation to the relief, the morphology and structure of the settlements are diverse, within the analyzed region, scattered, dotted about or congregate type of villages being identified.

Also, in relation to the heart of the settlement, there are the linear or tentacular villages. In terms of texture, the villages from the Trascău Mountains posses a linear (by its self or in combinations) or irregular textures. An analysis regarding the distribution of the settlements within the Trascău Mountains reveals that the existing villages can be divided into two categories, namely into bordering villages (which are represented by the settlements located at the periphery of the analyzed region) and into internal ones (which are located towards the inner parts of the territory, or in the depressionary areas – the case of the Rimetea and Colțeşti villages, or on the plateaus – such is the case of the Râmeț village).

**The classification of the villages according to their demographic capacity, in 2002**

Table 18

| Type of village | Demographic capacity | Number of villages | % | Number of inhabitants | % | Number of inhabitants / village |
|---|---|---|---|---|---|---|
| Small sized | Under 100 inhabitants | 28 | 37 | 1 390 | 5 | 37,57 |
| | Between 100 and 500 inhabitants | 30 | 40 | 7 366 | 30 | 184,15 |
| Medium sized | Between 501 and 1000 inhabitants | 11 | 14 | 7 939 | 32 | 567,07 |
| | Between 1001 and 1500 inhabitants | 7 | 9 | 8 192 | 33 | 910,22 |
| **Total** | | **76** | **100** | **24 887** | **100** | **327,46** |

**The characteristics of the relief and the anthropic land use**

Within the analyzed unit, the flat or moderate surfaces permitted the installation of the human communities, a situated which resulted in a modification of the modalities of land use, in many cases the natural vegetation being replaced by an anthropic-related one that could better serve, qualitatively and quantitatively to consumption.

It is well known that the depressionary areas, the larger valleys and the areas that could offer a better natural protection were preferred to the detriment of the more opened spaces and where the access is facile. The same situation was encountered within the analyzed region as well, where, the depressionary areas, besides their semi-enclosed character and as a result of a much milder climate were preferred for the installment of the human settlements, the versants of the surrounding hills being therefore modified in order to serve for the development of the agricultural activities. Maybe the most edifying example of agro-terraces are the ones from the Trascău Depression, where, as a result of the increasing demand for more extended agricultural surfaces, the population enhanced on the steep slopes of the Piatra Secuiului massif, a system of agricultural terraces that were used for the cultivation of barley and even for the development of orchards [L. Rákosy, 2006].

As mentioned, the depressionary areas are occupied with cultivated surfaces while the higher areas used as hayfields or grasslands are the surfaces that were previously occupied by forest vegetation. We sustain this fact by mentioning that, even though nowadays these surfaces are used as hayfields or grasslands, the soil cover is the one characteristic for the wooded areas (the distribution of the brown soils is quite extended proving the previous existence on large surfaces of the deciduous forests).

Besides these deforested surfaces which are used as grasslands or hayfields, within the peripheral areas of the Trascău Mountains as a result of a much milder relief with moderate slopes, the surfaces cultivated with maize, wheat, barley or rye are well represented. In the same time, towards the eastern extremity of the region, near the Mureş River Couloir and as a result of more increased temperatures, on the sunnier slopes the vineyards are well individualized, a situation which influenced the development of the vine preparation and production activities and implicitly the specialization of the population in these types of activities.

As a consequence and depending on the particularities of the relief, dominant within the analyzed region are the different types of land use: the depressionary areas are used for the cultivation of crops, the higher areas and the plateaus are used as hayfields or grasslands, the moderate slopes that posses a milder climate are covered with vineyards or orchards. In the perimeters near the households, the ecological potential is profoundly modified, in many cases the relief being completely „anthropized" while the hydrographical network is in many cases modified (apart from the drainage and improvement of the water beds, in many cases, along the water courses the colorful reminders of the anthropic activities are present: different plastic objects and wrappings, tires, or any other household objects).

## CHAPTER IV
# DYNAMIC AND STRUCTURAL PARTICULARITIES OF THE CURRENT GEOSYSTEMS

The inter-conditionings and occurrence of the different components of the geographical landscape, as well as the association modalities among them contribute to the diversity of the landscape of the analyzed unit, a situation which permitted the identification and description of several sub-units – geofacets, with distinct qualitative and quantitative features, as part of a higher integration unit – the geosystem.

The identification and description of these sub-divisions of the geographical landscape of the Trascău Mountains was made taking into account aspects regarding the uniformity and the functionality of the systems, as well as ecological, dynamic and physiological criteria to which we added the method of overlapped thematic maps. In the same time, in the individualization of these sub-units we have taken into account other aspects such as the physical and geographical features of the analyzed unit, the lithology, and the edaphic and climatic characteristics of the region as well as the state of the landscape component as a result of the anthropic intervention.

The main taxonomical principle used in the classification of the geosystems is the one adopted by G. Bertrand [1968], who, borrowing H. Erhart's idea of rhexistasy [1967], adapted it to the ecological and dynamic requirements of the natural systems, assorting the systemic components in accordance with their state of climax, to which, we have considered useful, the utilization of P. Tudoran's concept of parastazy [1982] in order to define those system that are strongly artificial as a result of high degree of anthropic intervention.

As such, based on our own field observation to which we have added the analysis of the existing cartographical materials (Romanian soil map 1: 200 000, Turda sheet, topographical map 1: 100 000, the land use cover provided by Corine Land Cover 2006 as well as the satellite images offered by Google Earth) as well as the meteorological data provided by the National Administration of Meteorology, in the current paper we have indentified and described a total number of 21 geofacets as part of four types of geosystems: of the geosystem of the deciduous forests, of the geosystem of the coniferous forests, of the agrarian geosystem and of the anthropic geosystem.

## IV.1. THE GEOSYSTEM OF THE DECIDUOUS FORESTS

It corresponds to the areas comprised between 600 and 1300 meters, as well as to the peripheral ones from the border with the Metaliferi Mounatins, along the Aries River Valley. This geosystem is developed on relatively plan surfaces, on mild crests and plateaus, but also on the versants with moderate or increased declivity, on different type of soil cover, with diverse physical and chemical properties. It is characterized by a climate with average annual temperatures ranging from 4 to 9°C, with the average temperature of January ranging from -4, to -6°C, and that of July comprised between 17.5 and 22°C. Within this geosystem, the values of the amount of rainfall are influenced by the western circulation of the atmospheric masses, by the foehnisation phenomena as well as by the disposal of the relief, which determines different values in the quantity of precipitations (between 700 and 1 000 m in the piedmontan area and between 800 and 1 200 in the mountain area).

In the given air temperature and rainfall conditions, the dominant vegetation, the forestry one encountered favorable conditions of installment and development, as a result the largest surfaces or occupied by pure beech forest or in combination with other species, followed by durmast, hornbeam forests, with variable distribution and coverage.

The soil cover is mostly represented by districabosoils, eutricambosoils, but also by rendzines or preluvosoils.

Depending oh the type of vegetation and on the state of equilibrium between components, we have indentified and described 10 types of geofactes, as sub-units of the geofacets in biostazy and rhexistazy.

**Geofacets in biostazy**

In this category are included those subunits of the landscape that are found in a relative stable equilibrium, close to the state of climax and where the anthropic intervention can create, for a short moment, a regressive but not irreversible dynamic, the system being therefore capable to return to the initial state in a very short period of time. Within this category and taking into account the physiognomy of the subunits as well as the dominant components, three categories of landscapes were identified: a landscape of the broadleaf forests, a landscape of the calciferous crests and cliffs and an aquatic rheophile and lacustrine landscape.

### The landscape of the broadleaf forests and of the associated vegetation

**1.** The geofacet of the forests with *Fagus sylavtica*

Represents the most extended geofacet of the analyzed units, dominates its western part and is spread from 700 to 1 200 m altitude. It is characterized by annual average temperatures of 7.5 - 4°C and amount of precipitation of 800 – 1 200 mm, having in a same time a fragmentary distribution as a result of the historical deforestations made in order to obtain new surfaces usable as grasslands or hayfields, or for the development of crops. This geofacet occupies large surfaces in the south-western part of the unit, on moderate or slightly declivitous versants where a continuous and relatively profound layer of acidic brown soil cover or eu-mesobasic soil is present.

Along with the beech, in the composition of this geofacet, other species are present but in more reduced percentage, species such as the mountain maple (*Acer pseudoplatanus),* the mountain elm (*Ulmus glabra)* and scarcely fir (*Abies alba*) or spruce (*Picea abies.)* The shrubbery stratum is edified by the sporadic presence of species such as the *Daphne mezereum, Sambucus nigra, S. racemosa, Corylus avellana,* while the herbaceous strata is unequally developed and is represented by species characteristic for the mull flora, with the presence of the Carpathian species such as *Symphytum cordatum, Dentaria galdulosa* or *Pulmonaria rubra*.

**2.** The geofacet of the forests with *Fagus sylvatica* and *Carpinus betulus*

Is developed on moderate or declivitous slopes, as well as on steeper shadier versants and along the valleys, between 300 and 800 meters altitude in conditions of air temperature and precipitation similar to the previous geofacet, mostly on eutricambosoils, but it can also be found on luvosoils.

Within this geofacet the dominant species is the beech followed by the hornbeam and in more reduced percentage, the durmast (*Quercus petraea*), the cherry (*Cerasus avium*), the mountain maple (*Acer pseudoplatanus*), the mountain elm (*Ulmus glabra*), the ash tree (*Fraxinus ornus*), as well as the linden tree (*Tilia cordata*) or the poplar (*Populus alba*). The shrubs are unevenly spread within this geofacet and are represented by *Corylus avellana, Cornus sanguinea, Sambucus nigra* etc., while the herbaceous strata contains species characteristic for the mull flora (*Galium odoratum, Dentaria bulbifera* etc.).

**3.** The geofacet of the forests with *Quercus petraea* and *Fagus sylvatica*

Is developed between 300 and 700 meters altitude, on sunny slopes and on the higher parts of the hilly areas, and where the soil cover is mostly represented by dictricambosoils, with the mentioning that could be also found of luvosoils. Within this geofacet the dominant species is the durmast, with some beech (*Fagus sylvatica*) and rarely hornbeam (*Carpinus betulus*) or cherry tree (*Cerasus avium*). In many cases this geofacet is found in the nearness of the durmast forests, where represents in fact the transition towards the beech forests.

**4.** The geofacet of the forests with *Quercus petraea*

Occupies mostly the eastern and south-eastern part of the analyzed unit, between 200 and 700 meters altitude, were the thermal regime ranges from 10.5 to 7.5°C and the amount of precipitations is between 650 and 800 mm, and with a soil cover represented mostly by eutricambosoils. It is also found on the eastern versants of the Bedeleu massif, on a calcareous substratum, on triasic ophiolites and conglomerates, on mild or more declivitous slopes with different exposures (eastern, western or southern).

Among the species that contribute to the individualization of this geofacet we mention the presence, but in a much reduced percentage and depending on the exposure, of the ash tree (*Fraxinus ornus*), as well as of the linden tree (*Tilia cordata*) or of the hornbeam (*Carpinus betulus*). Also, within this geofacet another thermophile species can be present, namely the *Quercus pubescens* species. In the same time, within this geofacet, the herbaceous stratum is represented by a great variety of species, the most commonly found being *Carex montana, Silene*

*nutans, Potentilla alba, Cytisus nigricans, Iris pseudocyperus, Poa nemoralis, Brachypodium sylvaticum* ş.a

**5.** The geofacet of the forests with *Quercus petraea, Fagus sylvatica* and *Carpinus betulus*

It is located on the slight and moderate slopes, with different exposures, on the ridges and plateaus, as well as on more shaded surfaces at lower altitudes. It's developed on a soil cover represented mostly by eutricambosoils with marl, calcareous sandstones substratum, but also on preluvosoils from the eastern part of the analyzed unit.

In the formation of this geofacet, towards the upper part is found the durmast mixed with beech and cherry, mountain maple or linden tree, while towards the lower parts, the hornbeam or the field maple can be present (*Acer campestre*).

**6.** The geofacet of the *Corylus avellana* shrubs

Is developed on the rocky versants, with south-eastern exposure where a calcareous substratum is present, and where the soil cover is represented by eutricambooils, districambosoils and even rendzines. Along with the hazel nut tree other species such as *Crataegus monogyna, Rosa canina* or *Prunus spinosa* can be encountered, while the herbaceous stratum is represented by sylvan species such as *Poa nemoralis, Urtica dioica* as well as by different species of fern, in the areas where the humidity is more pronounced.

Due to the fact that the hazel nut tree is generally spread throughout the majority of the broadleaf forests, its presence on compact surfaces is the result of the gradual deforestations of the beech and durmast forests made in order to assure new surfaces for the development of grasslands or hayfields. On more compact areas are located at the upper part of the calciferous massifs in the Turzii Gorge or Piatra Cetii, but also in the nearness of the Rachiş village, at the Piatra Lungă location.

## The landscape of the calciferous crests and cliffs

**7.** The geofacet of the calciferous crests and cliffs

The diversity of the geographical landscape of the Trascău Mountains is given not only by the physiognomy of the vegetation but also by the modalities of land use and by the multitude of exokarstic forms spread throughout the territory, the vertical walls of the gorges and the isolated calciferous massifs representing in the same time, first rank elements in the outlining of the region's distinctive features.

The majority of these exokarstic forms are characterized by very pronounced verticality of the cliffs, in many cases with the total lack of the edaphic component which influences the distribution of the vegetation and gives a certain physiognomy to these areas, as opposed to the neighboring surfaces.

As such, and according to their physiognomy and degree of biological exploitation several categories of geotopes were identified, namely the saxicole geotope with mesophyle vegetation, the saxicole geotope with xerophyle vegetation, the geotope of the crests and abrupt

walls, the geotope of the stable detritus with herbaceous vegetation and the geotope of mobile and semi-mobile detritus without vegetation.

*The saxicole geotopes with mesophyle vegetation* are found between (600) 800 and 1200 m, on northern and north-eastern versants towards the upper part of the gorges and calcareous massifs, on moderate slopes and where as a result of the calcareous substratum on which is developed, the soil cover is represented mainly by rendzines and pseudo-rendzines.

*The saxicole geotopes with xerophyle vegetation* are similar in terms of altitude and soil cover to the previous ones, except for the fact that, it is developed on southern, south-eastern and eastern versants from the upper part of the gorges and isolated massifs of the analyzed area. Characteristic for these subunits are not only the plant species with more increased thermal requirements such as *Allium flavum, Allisum murale, Avenastrum decorum, Crataegus monogyna, Galium erectum, Geranium pratense, Jurinea mollis, Teucrium montanum, Vinca herbacea* or some rare species such as *Iris aphila, Fritilaria montana, Delphinium fissum* etc. as well as by different animal species, and especially reptiles.

*The geotope of the crests and abrupt walls without vegetation* is characterized by a pronounced verticality of its walls and where, as a result, the soil covers are entirely absent, a situation which influences the biological exploitation. In the given conditions, the vegetation is poorly represented by a few casmophytic species, as a consequence of their reduced requirement for soil cover.

*The geotopes of the stable detritus with herbaceous vegetation* are scarcely represented in the areas with moderate declivity of the slopes and are formed by a series of diverse stone blocks which resulted from the disaggregation of the rock under weathering processes. As a result of some moderate slopes, the soil cover can be poorly developed while the herbaceous vegetation is represented in many cases by *Poa nemoralis.*

*The geotopes of mobile and semi-mobile detritus without vegetation* are the result of the continuous disaggregation of the rock and are represented by different blocks, where as a consequence of declivity of versants, the vegetation did not encounter favorable conditions of installment and development.

## The aquatic reophyle and lacustrine landscape

Is in fact represented by the rivers and lakes (natural and artificial ones as well) located within the analyzed area. Even thought the similarities between the two types of subunits are more than obvious and mostly dictated by their dynamics, and as a result of their chemical properties, we have considered as adequate, their assortment in the same category.

**8.** The aquatic reophyle geofacet

Corresponds to the hydrographical network of the analyzed area and is represented by the rivers that border the limit, as well as by those that cross it. Within this geofacet we can sustain the idea that the comprising elements are found in a state of equilibrium and that the probable disturbances can be easily surmounted by its components. In this regard, we mention that, within these subunits, a great diversity and abundance of species can be encountered among

which the trout (*Salmo trutta fario*) and other species of fish, batrachians, insects and reptiles characteristic for the aquatic ecosystems.

This geofacet is characterized by a permanent flow, with variations in the water discharge influenced by the thermal regime and by the amount of rainfall. The probable disturbances can occur as a result of the anthropic intervention, mainly represented by damming or improvement measures of the water beds as well as by other, more negative measures such as the installment of gravel plants.

**9.** The lacustrine geofacet

Correspond to those subunits of the landscape represented by the natural as well as by the anthropic lakes and is characterized by a state of equilibrium between components. Within this geofacet we have included the only natural lake of the Trascău Mountains – Lake Ighiu as well as the stock ponds situated in the hydrographical basin of the Tur River, in the perimeter of the Turenilor Gorge.

If the entire surface of lake Ighiu is 5.26 ha and a total volume of 0.225 mil cubic meters, the stock ponds from the Turenilor Gorge are much smaller, with a total surface of no more that 4 sq m and a volume of only a few cubic meters.

**The geofacets in rhexistasy**

Correspond to those systems that are found in a state of semi-equilibrium between the components or where the equilibrium is disturbed as a result of some essential changes suffered by the ecological potential, either from natural or anthropic causes. The evolution of these systems is regressive and in many cases irreversible to the initial state.

**10.** The geofacet of the forests with *Alnus glutinosa, Fraxinus excelsior* and *Ulmus glabra*

Is developed in the meadows of the peripheral and internal rivers of the analyzed unit, at altitudes ranging from 200 to 700 m, with average annual temperatures of 10-7.5°C, precipitations 600-900 mm and relatively high values of the humidity rate as a result of the constant hydric input from the rivers. The substratum in represented mainly by gravel rocks and sands deposited on alluvial or eu-mesobasic soils.

This geofacet is characterized by the presence of the nemoral European species such as the black alder (*Alnus glutinosa*) mixed with ash tree or elm, with the mention that other species can be present such as the black and white poplar tree (*Populus nigra, P. alba*) or the willow (*Salix fragilis, S. alba*).

## IV.2. THE GEOSYSTEM OF THE CONIFEROUS FORESTS

Is represented by the surfaces occupied by the coniferous forests (especially fir, spruce and larch) developed between 800 and 1300 meters, on moderate or steeper slopes located in the proximity of the localities as well as towards the upper part of the gorges and isolated massifs,

on steep northern slopes, but t it can also be found on western or even eastern and southern versants. Within this geofacet, the soil cover is mainly represented by rendzines and litosoils developed on a calcareous substratum, as well as by districambosoils and eutricambosoils.

**The geofacets in biostasy**

**11.** The geofacet of the *Larix decidua* forest

Is represented by the larch forest developed in the nearness of the Vidolm village from the Aries River Valley representing in the same time an exception for the nemoral region, as a consequence of the fact that, this species usually develops at high altitudes, between 1350 and 1850 meters, respectively towards the upper limits of the boreal belt, while at Vidolm the larch forest is located at approximately 800 m on litosoils and on a substratum consisting in calciferous conglomerates. Within this geofacet, along the dominant species – the larch, other rare plant species such as *Sorbus dacica*, *Goodyera repens*, *Rubus saxatilis*, *Pleurospermum austriacum* etc. are present [according to Şt. Csürös, I. Pop, 1965].

For the analyzed unit, the presence of the larch within the belt of the beech tree is considered a heritage, the larch forest from Vidolm representing therefore a glacial relict with a status of protected area.

**12.** The geofacet of the forests with *Pinus sylvestris* and *Larix decidua*

Is spread on diverse surfaces and different exposure of the versants, mainly on calcareous rocks where the soil cover is represented by litosoils. The arborescent stratum is edified by the presence of the fir and larch, the last one having only a dispersed distribution in comparison with the previous one, while within the herbaceous stratum the *Poa nemoralis* species is dominant. This geofacet is developed in the Întregalde Gorge but it is also found in the proximity of settlements, especially there, where antierosional measures were implemented.

**The geofacets in rhexistasy**

**13.** The geofacet of the forests with *Pinus sylvestris* and *Pinus nigra*

These subunits of the geographical space of the analyzed unit are the result of some improvement measures effectuated in order to reduce the impact of soil erosion processes. As a consequence, these surfaces are located mainly in the proximity of settlements, on different versants and exposure of slopes. Within this geofacet, the soil cover is represented by brown eu-mesobasic and acid soils as well as by alluvial soils from the depressionary areas.

Even though the initial vegetation has disappeared and the physiognomy and structure of the fir plantations is quite different from that of the broadleaf forests, as a result of their state of equilibrium between components we have considered adequate their inclusion in the geofacet in rhexistasy due to the fact that, there is the possibility of returning to the initial state, but with the creation of a different physiognomy of the landscape.

These subunits of the geographical landscape are located in the proximity of the settlements, where in order to stabilize the soil cover as a result of the previous deforestations the

plantation of new species that will slacken and reduce the activation of the landslides was implemented. Within these subunits, along the dominant species which is the forest fir, individuals of *Pinus nigra* can also be identified. These geofacets are located as mentioned, in the proximity of settlements, near Buru, on the western versant of the Trascău River Valley, in the nearness of the Izvoarele village as well as on the northern versant of the Galda River Valley, near Galda de Sus village.

## IV.3. THE AGRARIAN GEOSYSTEM

This subunit is represented by the surfaces used for the cultivation of crops as well as by those occupied by orchards and vineyards and by those used as grasslands or hayfields. It possesses a diverse distribution within the analyzed region, being located within the internal and peripheral depressionary areas as well as on the moderate slopes and at the lower parts of the steeper versants or towards the upper parts of the calcareous plateaus or in the meadows of the main rivers developed within the analyzed area.

Within this geosystem, the subunits of the geographical landscape are included in the category of the geofacets in rhexistasy as a result of the state of semi-equilibrium between components due to a moderate anthropic impact.

**The geofacets in rhexistasy**

**14.** The geofacet of the grasslands with *Agrostis capillaris (A. tenuis)* and *Festuca rubra*

It is represented by the surfaces initially occupied by beech and durmast forests which have been cleared up in order to obtain new agricultural surfaces. Is developed on shadier versants on brown acidic, brown eu-mesobasic soils as well as on regosoils; regarding the climatic conditions of this geofacet, we mention that posseses the same climatic characteristics as the beech forests.

These secondary grasslands are installed after the clearing of the beech forests and the dominant species are *Agrostis capillaris* and *Festuca rubra*, followed by other gramineous plants such as *Cynosurus cristatus, Dactilis glomerata, Poa pratensis, Lolium perenne, Trisetum flavescens* etc.

Due to their floristic composition, are among the most productive type of grasslands, with a pastoral value 50-60 calculated according to the frequency of the species and with an estimated annual productivity of 2.2-2.5 t/year/ha [Resmeriță, 1970, according Gh. Coldea, 1992].

In the same time, within these subunits and as a result of the abusive and irrational grazing as well as a consequence of the soil erosion, the *Botriochloa ischaemum* species can also be present.

**15.** The geofacet of the grassland with *Festuca valesiaca, F. rupicola* and *Agrostis capillaris* species

Usually accompanies the geofacet of the durmast and hornbeam forests and is developed on southern, south-eastern and south-western slopes, on moderate versants with xerophyle characteristics.

This geofacet is edified by the presence of *Festuca valesiaca, F. rupicola* and *Agrostis capillaris* species, this type of grasslands possessing moderate or increased productivity depending on the dominance of the gramineous or leguminous species. In the same time, the *Botriochloa ischaemum* species can be present, this last one having no nutritional value.

**16.** The geofacet of the cultivated surfaces

Is spread throughout the analyzed area, from the internal depressionary basins to the peripheral ones from the northern, north-western and southern extremities of the region, mostly on flat or relatively flat surfaces; it can also be developed on slightly moderate slopes in the proximity of the settlements on brown acidic, brown eu-mesobasic or alluvial soils.

In many cases, within this geofacet an alternance of the cultivated species can be observed, from the dominance of the surfaces cultivated with maize, to those with wheat or barley, a situation which reflects mostly the population's requirements and needs. In the same time, in the areas where the insolation is more pronounced and the temperatures posses' higher values, the presence of surfaces cultivated with potato can be observed.

**17.** The geofacet of the orcahrds and vineyards

It is developed on relatively flat or moderate surfaces, at the lower parts of the hilly areas, being identified in the nearness of settlements. These subunits are developed on brown eu-mesobasic and brown acidic soils, as well as on alluvial soils from the eastern bordure of the analyzed unit. On more extended surfaces are identified in the vicinity of the Rimetea and Colțești villages on moderate slopes with southern, south-western and south-eastern exposures, as well as on slightly steeper versants with an increased degree of insolation (within the territories of the Cricău, Galda de Jos or Ighiu communes).

Regarding the cultivated species, we mention the dominance of the apple and plum tree, with an almost equal distribution of the occupied surfaces, while the vineyards are found on relatively flat surfaces or at the upper part of the lower hills, occupying more reduced surfaces in the nearness of the Cricău, Craiva, Ighiu, Ighiel, Bucerdea Vinoasă villages (within the last one a large number of vine cellars being identified, a fact which proves the engagement of the local population in vine preparation and production activities).

## IV. 4. THE ANTHROPIC GEOSYSTEM

The anthropic geosystem is represented by the entire complex of elements of the geographical landscape which resulted on one hand after the development of the system of settlements and of the communication infrastructure (roads or railroads), and on the other hand

as a consequence of the anthropic land use and exploitation measures (the development of quarries for the excavation of lime, sand etc.).

This geosystem comprises those elements of the geographical landscape that were strongly affected by the human intervention being therefore included in the category of geofacets in parastasy, with the equilibrium between components intensely disturbed and with a distinct physiognomy as opposed to the rest of the units and subunits of the geographical landscape.

**The geofacets in parastasy**

Correspond to those subunits of the geographical landscape that are completely antrhopized, and where even if the human impact is to immediately cease, the components could not return to the initial state of equilibrium, in a long period of time.

The parastasic geosystems are represented by those subunits where, besides the long term anthropic intervention, other elements allochthonous to the geographical landscape are identified, elements such as the system of settlements, elements related to the communication infrastructure and others. As such, within this geosystem four types of geofacets were identified, their delimitation taking into account not only their physiognomy but also the degree of involvement and affectedness of the elements of landscape within the analyzed region.

The historical evolution of the human communities within the territory of the Trascău Mountains materialized by the appraisal of a large number of settlements, some of them located in the depressionary basins or at the lower parts of the hilly areas, while others developed in more isolated, less accessible parts. As a consequence, within the geosystems in parastasy, besides the geofacets of the quarries and communication axes, we have identified two types of geofacets of the human settlements: one corresponding to the viable rural settlements and another represented by the critical rural ones.

**18.** The geofacet of the viable rural settlements

It corresponds to the economically[1] developed villages, with a relative young population and positive values of the birth rate as well as with an increased number of inhabitants. In many cases, these viable rural settlements are represented by the centers of commune, where besides the developed transport and communication infrastructure, the urbansitic and technical facilities are present, mainly represented by adequate medical services or any other sanitarian or cultural facilities (such as dispensaries, small dental clinics, libraries, kindergartens, schools etc.).

In many cases, their situation on county rank communication axes influences their social and economical development, on one hand by means of assuring a continuous touristic flow as a result of some extraordinary attributes of the landscape, a situation which has direct consequences in the development of the industry-related services, and on the other hand by means of assuring the proper conditions for the development of the profit providing activities (in many cases the opening of some local stores for the commercialization of alimentary and non-alimentary products is influenced by the existence of adequate roadways that can provide the

[1] Even if this aspect is important for the existance of the human communities, in the classification of the geofacets its role is only subdisiary, the agruments used in the classification taking into account the geodemography of these settlements especially in the situation when, in recent years significant decreases in the total number of inhabitants were recorded.

liaison with the provisioning centers from the urban areas). In the existing conditions, the younger population isn't forced to leave towards other urban centers, thus remaining within the villages and contributing to the assurance of the future existence of these settlements.

The geofacet of the viable rural settlements is represented by the localities developed at the eastern, southern and in a reduced percentage, by those from the north-western borders of the analyzed unit, as well as by several settlements located in the inner parts of the region. The most representative settlements for this geofacet are the Rimetea and Colțești villages (located within the Trascău Depression), several villages which from a territorial and administrative point of view belong to the Livezile, Cricău, Ighiu, Meteș communes – from the eastern part of the unit, or to Sălciua and Poșaga communes and, in a much reduced percentage to Ocoliș commune – towards the western part of the Trascău Mountains.

**19.** The geofacet of the critical rural settlements

In the classification of these geofacet we have taken into account aspects regarding not only the demography of these settlements but also their localization within the analyzed unit. In recent years, within these settlements a continuing decrease in the number of inhabitants was recorded, and according to the last census in 2002, there were villages that possessed no more than 50 inhabitants (there also were villages that possessed only 5 or 6 inhabitants), the majority over 65 years old. This situation combined with the emigration of the young population (in the villages where younger population still exists) towards larger urban areas determines the continuous decrease of the population and implicitly, low vitality rates of these settlements, a situation which can put in uncertainty their future existence.

The rural settlements that are included in this category are those situated in the higher, more isolated parts of the analyzed unit, as opposed to those from lower, more accessible areas. Also, the access to these villages is more difficult as a result of the inadequate road infrastructure, many of the roads towards these settlements being impracticable during wintertime or after some heavy rainfall.

The geofacet of the critical rural settlements is represented by the villages that belong to Râmeț, Întregalde, Galda de Jos (the Răicani, Zăgriș, Lupșeni villages) communes, as well as by the Rachiș (which belongs from an administrative and territorial point of view to the Miraslău commune), Vâltori or Runc villages (belonging to the town of Zlatna).

**20.** The geofacet of the quarries and surface exploitations

It is edified by the presence of some gyps quarries or by several surface exploitation areas that are located in the vicinity of settlements within the analyzed region.

In this manner, we have identified in the proximity of the Turenilor Gorge, respectively at the entrance from the Tureni village and at the exit towards the Copaceni village, as well as near the Poiana Aiudului village, several strongly anthropized surfaces, where the entire complex of elements are in a total discordance with the reality as a result of the fact that, from these areas, the inhabitants from the neighboring villages extracted the raw material and especially the rock blocks in order to use it for the construction of their dwellings. As a consequence, nowadays, the

ecological potential within these areas is strongly affected and, in many cases, the soil cover is entirely absent, which resulted in the total or partially absence of the biological exploitation.

In the same time but with a more extended spatial distribution, we mention the presence of the gyp's quarries from Sănduleşti and Cheia, where the physiognomy of the landscape is completely different, and these areas being therefore strongly artificial. As a result, the ecological potential is profoundly affected and suffering significant modifications with no possibility of return to an initial or similar to the initial state of equilibrium, the deep excavations strongly affecting the state of the natural components.

**21.** The geofacet of the communication axes

Represent important elements of the geographical landscape of the Trascău Mountains, with major impact on the ecological potential and with consequences in the direction of evolution of the human communities. This geofacet is represented not only by the communication axes that limit the region, but also by the ones developed parallel to the hydrographical network thus assuring the relation between the inner villages with the peripheral ones. Along these communication axes, the installed vegetation is in many cases similar, and is represented mainly by herbaceous plants and scarcely by arborescent ones.

Within the Trascău Mountains, the communication systems represent axes of ingression and transmission of energetic fluxes, important for the delineation of settlements.

## CONCLUSIONS

The qualitative and quantitative analysis of the comprising elements of the geographical landscape of the Trascău Mountains correlated with the diverse lithology and multitude of processes and phenomena characteristic for the analyzed unit, reveals the fundamental features of the region, materialized in the complexity of the identified elements.

As such, the lithology imposes distinct shapes of the relief similar to the edaphic and climatic component which dictates the evolution and spatial distribution of the plant and animal communities. The main characteristics of the relief represented by the multitude of endo- and exokartic forms as well as by the relief developed on ophiolites, conglomeratic rocks, clays or marls, constitute for the analyzed unit, support for the development of the ecological potential and implicitly of the biological exploitation, seen and analyzed in strict correlation with the anthropic land use.

As such, the geocomplex of the Trascău Mountains has suffered, throughout the time, significant changes of all its components, changes that were dictated on one hand by the population's require for the establishment and development of new settlements, and on the other hand, as it's constant requirement for new surfaces as a direct consequence of the economical demands.

The development and stratification of the vegetation was influenced by the anthropic element, especially by means of the extraction of timber and overgrazing. As such, the surfaces that suffered the most dramatic impacts were the forested ones, in many parts throughout the

analyzed units, these surfaces being entirely deforested in order to obtain new ones destined for the utilization in agricultural purposes (arable surfaces, grasslands or hayfields). As a result, within the Trascău Mountains, the anthropic element was the one who dictated the evolution in the state of components meaning that, its activities had direct repercussions on all the natural, biotic or abiotic components.

Even so, the analysis of the elements of the landscape by means of their state and quality permitted the identification of a large number of geofacets in biostasy as opposed to those in rhexistasy or parastasy. We cannot consider this fact only the result of the "anthropic non-interference" especially in the cases where, the isolated calcareous massifs and in many cases the steep slopes of the versants played a favorable role in the development of the spontaneous vegetation to the detriment of the facilitation and installment of the human settlements. Within the subunits of the geographical landscape represented by the calciferous crests and cliffs, the inferior taxonomical categories – the geotopes posses a larger number of endemic species as opposed to the rest of the subunits, mainly because are characterized by a reduced accessibility and high degree of isolation of the gorges and isolated calcareous massifs.

Therefore, we sustain the idea that the biostasy, respectively the state of natural equilibrium between the components of the geographical landscape is due firstly to the restrictiveness of the relief towards the development of the anthropic-related elements, and only partially due to the decreased level of human intervention. On the other hand, in the areas were the slopes possessed a more reduced declivity and the installment and development of settlements or of communication infrastructure was facilitated by the morphology of the relief, is more than obvious the dominance of the geofacets in rhexistasy or of those in parastasy.

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