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### CUPRINS – CONTENT – SOMMAIRE – INHALT

B.M. DOLGONOSOV, Knowledge Production, Hyperbolic Growth and Phase Transitions in Biosystems * <i>Producția cunoașterii, creșterea hiperbolică și tranzițiile de fază în biosisteme</i> .....	5
FLAVIA - LUANA MĂGUȚ, S. ZAHARIA, I. A. IRIMUȘ, Applied Legislative Methodology in the Analysis of Landslide Hazard. Case Study from Maramureș County * <i>Metodologia legislativă aplicată în analiza hazardelor privind alunecările de teren. Studiu de caz din județul Maramureș</i> .....	37
I. DANCI, I.H. PAVEL, A. FRANTIUC, S. DEAC, Delimitation of Risk Generating Geomorphologic Processes in Cluj Metropolitan Area * <i>Delimitarea proceselor generatoare de risc geomorfologic în Zona Metropolitană Cluj</i> .....	51
MONICA MOLDOVAN, IONELA GEORGIANA GAVRILĂ, Glimee Deep-Seated Landslides from Tăureni (Transylvania Plain) * <i>Glimeele de la Tăureni (Câmpia Transilvaniei)</i> .....	63
IRINA BLAGA, C. BLAGA, The Precipitation and Temperature Evolution in Cluj County, in June 2010 * <i>Evoluția precipitațiilor și temperaturilor în județul Cluj în iunie 2010</i> .....	71
J. SZILÁGYI, I.A. IRIMUȘ, The Deficit of Humidity and the Associated Risks in the Reghin Hills * <i>Deficitul de umiditate și riscurile asociate în Dealurile Reghinului</i> .....	81

GABRIELA-ALINA MUREȘAN, GABRIELA TIMIȘ, Borșa-Vișeu Mining Area. Effects of the Policy of Disadvantaged Areas * <i>Consecințele aplicării politicii zonelor defavorizate în zona minieră Borșa-Vișeu</i> .....	91
I. H. PAVEL, I. DANCI, Numerical Evolution of Amlaș Land Population * <i>Evoluția numerică a populației Țării Amlașului</i> .....	103
RAMONA FLAVIA RAȚIU, An Evaluation of the Characteristics and Future Development of the Settlements in the Someșană Plain (Northern Transylvanian Plain) * <i>O evaluare a caracteristicilor și a dezvoltării viitoare a așezărilor din Câmpia Someșană (nordul Câmpiei Transilvaniei)</i> .....	111
RODICA PETREA, MARIANA PRAȘCA, LUMINIȚA FILIMON, The Morphologic Component as a Development Premise for Small Towns. Case Study: Town of Vașcău (Bihar County, Romania) * <i>Componenta morfologică ca premisă a dezvoltării orașelor mici. Studiu de caz: orașul Vașcău (județul Bihor, România)</i> .....	123
GR. P. POP, The Industry of Someșul Mic Corridor * <i>Industria din Culoarul Someșului Mic</i> .....	133
FL. FODOREAN, Roads, Fortresses, Settlements and Landscape. The Archaeological Patrimony and the Twenty First Century * <i>Șosele, cetăți, așezări și peisaj. Patrimoniul arheologic și secolul 21</i> .....	145
E. NAGY, The Situation of the Workforce Market in the Southern Part of the Romanian-Hungarian Border * <i>Situația pieței forței de muncă în partea de sud a graniței româno-maghiare</i> .....	153
D. IRIMIA, BIANCA TOMA, The Identification of the Geomorphosites in Buzău Subcarpathians. Tourism Capitalization Options * <i>Identificarea geomorfositurilor din Subcarpații Buzăului. Opțiuni pentru valorificarea turistică</i> .....	161
G.B. TOFAN, The Drăgoiasa-Tulgheș Depressionary Alignment. The Tourism Potential, Arrangement and Capitalization * <i>Ulucul depresionar Drăgoiasa-Tulgheș. Potențial turistic, amenajare și valorificare turistică</i> .....	171
ARABELA MUSCALAGIU, Urban Cultural Tourism – Priorities of Sustainable Development in the Transylvanian Depression * <i>Turismul cultural urban – priorități privind dezvoltarea durabilă în Depresiunea Transilvaniei</i> .....	185
M. HOTEA, Open Access Events and Tourism Impact on Economy. Case Study: “Hora de la Prislop”, Borșa – Maramureș * <i>Evenimentele cu participare liberă și impactul turismului asupra economiei. Studiu de caz: “Hora de la Prislop”, Borșa – Maramureș</i> .....	195
ANA-MARIA CORPADE, C. CORPADE, D. PETREA, CLAUDIA-THORA IONESCU, C. MOLDOVAN, Focus Points for a Sustainable Mobility in Cluj-Napoca Metropolitan Area * <i>Puncte cheie pentru o mobilitate sustenabilă în aria Metropolitană Cluj-Napoca</i> .....	203
AL. PĂCURAR, Geographical Valences of the Notes Belonging to the Benedictine Monk Raymund Netzhammer, in the Work “From Romania: Incursions through this Country and its History” * <i>Valențe geografice în lucrarea călugărului benedictin Raymund Netzhammer: Din România. Incursiuni prin această țară și istoria ei</i> .....	211

NICOLETA MARIA ERCHEDI, Accessing Financing Programmes in Moşilor Land * <i>Programe de accesare financiară în Țara Moşilor</i> .....	223
I. MAC, Operational Geography – Gnoseological, Epistemological, Constituent and Applicative Reflections * <i>Geografie operațională – reflecții gnoseologice, epistemologice, constitutive și aplicative</i> .....	229

### Notes and Book Reviews – Note și recenzii

Camelia-Ina Gavra, Landscape, Cultural Landscape, Delimitation of Cultural Landscapes * <i>Peisaj, peisaj cultural, delimitarea peisajelor culturale</i> .....	233
Ana-Neli Ianăș, <i>Țara Almăjului. Studiu de Geografie Regională [Almăjului Land. Study of Regional Geography]</i> , Presa Universitară Clujeană, 2011, 441 p. (GR. P. POP).....	237
Heiko Schmid, <i>Economy of Fascination. Dubai and Las Vegas as Themed Urban Landscapes</i> , Berlin, Stuttgart, Gebrüder Borntraeger, 2009, 272 p. (A. LAKATOS).....	240
Wolfgang Frey, <i>Freiburg green City, Wege zu einer nachhaltigen Stadtentwicklung, Approaches to Sustainable Urban Development</i> , Freiburg-Basel-Wien, Verlag Herder GmbH, 2011, format 18 x 23 cm, 208 p. (A. LAKATOS).....	241
Greceanu, Olga, <i>Testimony in Word and Image. Vocabulary of Faith and Spiritual Life</i> , 2011, vol. 1 (A-E) – 419 p., vol. 2 (F-M) – 428 p., vol. 3 (N-Z) – 424 p., big format, with numerous drawings, maps and plans, The Bible and Orthodox Mission Institute, Bucharest (AL. PĂCURAR).....	243
Mihai Dim. Sturdza, coordinator and coauthor, <i>Boyar Families from Moldavia and the Romanian Country. Historical, Genealogical and Biographical Encyclopaedia</i> , vol. II, Simetria Publishing House, Bucharest, 2011, 724 p., A4 format (AL. PĂCURAR).....	246





## KNOWLEDGE PRODUCTION, HYPERBOLIC GROWTH AND PHASE TRANSITIONS IN BIOSYSTEMS

B. M. DOLGONOSOV<sup>1</sup>

**ABSTRACT.** – **Knowledge Production, Hyperbolic Growth and Phase Transitions in Biosystems.** The evolution of a global biological community such as the humanity or Earth's biota is shown to be directly connected with the production and accumulation<sup>1</sup> of valuable information (knowledge) needed for survival. Different ways of knowledge production based on the genetic, neuronal, and external memory types are considered. Common features of these memory types are indicated. It is proved that the growth of community population obeys a hyperbolic law. This law is verified using empirical data on the growth of taxonomic diversity of Earth's biota during the Phanerozoic, growth of human population during the late stage of anthropogenesis, and growth of the facilities of external memory for the last hundred years of the current informational epoch. We also assessed the moments of changing one dominant memory type into another during the evolution. It is shown that each transition leads to the emergence of a new dominant taxon with development rate three orders of magnitude faster than that before the transition.

*Keywords:* evolution, information, biota, humanity, hyperbolic growth.

### 1. INTRODUCTION

Complex systems, which we will consider here, are usually indicated by a large number of elements tightly organized among themselves. According to P. Teilhard de Chardin (1959) complexity depends “not only on the number and diversity of the elements included in each case, but at least as much on the number and correlative variety of the links formed between these elements”. Evolutionary systems increase their complexity over time, so we should expect more complex objects to appear later in the evolutionary process (C. Bennett, 1990). R. Kurzweil (2005) outlined six epochs of complexity with domination of (1) physics and chemistry; (2) biology; (3) brains; (4) technology; (5) the merger of biology and technology; and (6) the whole universe. E. Steinhart (2008) showed in detail how Teilhard's vision of complexity harmonizes with the R. Kurzweil classification. Here we will consider from the informational viewpoint three of the epochs-based on biology, brains, and technology-placing the emphasis on knowledge production in biosystems (with technological components when necessary) and on different memory types, which are dominant in these epochs, as well as analyze transitions between them. We will try, as far as possible, to elucidate mechanisms of processes in memory and to make quantitative assessments of memory sizes and transition points.

An evolutionary biological community accumulates various information in common memory and uses it, via feedbacks, for solving tasks of survival. A system having memory and capable to solve tasks can generally be regarded as an intelligent one and therefore it can be

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called *civilization* meaning it in a broad sense. In the global scale, we can point two examples of such systems; these are: the human world system and the Earth's biota. It is of importance to clear how the accumulation of information influences the expansion of civilization. The hyperbolic growth is a manifestation of positive feedbacks in the interaction of system parts. For humanity these feedbacks are organized in the following loop: "...technological growth – growth of the upper limit of Earth's carrying capacity – demographic growth – more people, more potential inventors..." (A.V. Markov and A.V. Korotayev, 2009) and then the loop is closed returning to the same positions, but on a higher quantitative level.

In the case of biota, its diversity grows according to the following feedbacks: "more taxa – higher alpha-diversity... – communities become more complex and stable – extinction rate falls and/or emergence rate increases..." (A.V. Markov and A.V. Korotayev, 2009) and then the loop is closed.

The identity of growth law for human civilization and biota suggests an idea of the action in both cases of some universal mechanisms, bringing these distinctive systems to the same blow-up regime of growth. Indeed, in the above-mentioned loop for humanity the technological growth due to knowledge accumulation is the main driving factor as was shown by B.M. Dolgonosov and V. I. Naidenov (2006) and B.M. Dolgonosov (2009, 2010a, b). In the loop of biota, the decrease in extinction rate is evidence of the improvement of taxa fitness to ambient conditions and hence of rise in the amount of valuable information accumulated in genomes.

Thus, there are grounds to assume that similar informational mechanisms can regulate both human population and taxonomic diversity in biota. These mechanisms have recently been analyzed by B.M. Dolgonosov (2010a). Here we continue this analysis with the purpose to disclose mechanisms of informational processes and to consider key theoretical propositions in more detail.

The work is arranged as follows. In the beginning we discuss the question what is civilization from the informational standpoint and to what extent this understanding of civilization corresponds to the conventional notion of it. Further, we briefly consider the arrangement of memory as a basic attribute of civilization, characterize memory types and their function, and extract common features of memory. Special attention pays to the problem of information compression and to the interrelation between the total amount of information in memory and the amount of knowledge that represents small but vitally important part of information. We find a relationship between total memory size and population size, as well as dependence of knowledge production rate on population size. These dependencies allow us to deduce a law of population growth. Then, we touch the problem of biodiversity, determine a modified Shannon's entropy taking into account memory sizes of taxa, discuss the evolutionary essence of such factors as taxa memory sizes and knowledge production rates, which are macroscopic factors of the natural selection. Finally, we consider the transitions with changing dominant memory type as well as estimate the layout of transition points and the corresponding memory sizes.

The facts that compelled us to pay attention to this problem lie, it would seem, far from the informational issues; these are the data on human population growth for the last two thousands of years. H. Foerster et al. (1960) revealed that the population growth dynamics are described by a hyperbolic time-dependence of  $N \sim (t_1 - t)^{-\alpha}$  with an exponent  $\alpha = 0.99$  (where  $N$  is the population size, and  $t_1$  is a singularity moment). Later, this law was slightly modified by S. Hoerner (1975), who put the exponent equal to unity, and this modification was then assumed as a basis in the subsequent works of different authors.

It has turned out that a similar hyperbolic law is also typical for the growth of biodiversity determining by the number of families and genera (A.V. Markov and A.V. Korotayev, 2007, 2008, 2009). These works analyzed the number of taxa in the marine and continental biota during the Phanerozoic lasted 542 millions of years.

The hyperbolic growth is a manifestation of positive feedbacks in the interaction of system parts. For humanity these feedbacks are organized in the following loop: “technological growth – growth of the upper limit of Earth’s carrying capacity – demographic growth – more people, more potential inventors...” (A.V. Markov and A.V. Korotayev, 2009) and then the loop is closed returning to the same positions, but on a higher quantitative level.

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## 2. INFORMATIONAL TRAITS OF CIVILIZATION

In the philosophical literature the term *civilization* has different interpretations (e.g. A. Schweitzer, 1923; E. Benveniste, 1971; R. G. Collingwood, 1992). One of them describes the subject and, abstracting from details, it can concisely be formulated as follows: *civilization is a self-developing social system*.

Another interpretation gives a characteristic of such a social system, specifying the direction of its development, namely: *civilization is characterized by growing the socio-cultural level moving it away from the barbarian state*. It makes, in essence, more precise definition of the word *self-developing*, present in the first interpretation.

Depending on the scale of processes, we can consider the world civilization, involving the entire humanity, and local civilizations of different scales, which differ by territorial and socio-cultural features such as religion, language, phenotype, etc.

The development of civilization is associated with the accumulation of knowledge on the nature and society, with creation of new technologies, and with development of ethics and culture. As was noted by N. N. Moiseev (1998), “the collective intelligence ... plays a role similar to the role that human mind plays in organism, that is, assists in the development of society and in the overcoming of permanently increasing challenges”.

At the same time,” the culture and technological grounds of living – these are still not a civilization. These are only constituents of civilization. As a basis of civilization identity I would rather mark out the identity of spiritual worlds. I think that it is the identity that gives rise to the unity of action” (N. N. Moiseev 1998).

This statement has something in common with the views of A. Schweitzer, who noted that there are two opinions concerning the nature of civilization: one considers civilization as a purely material entity, and another joins together the material and the ethical origins. A. Schweitzer (1923) has defined civilization (in the sense of the direction of development) as follows: “It is the sum total of all progress made by man in every sphere of action and from every point of view in so far as the progress helps towards the spiritual perfecting of individuals as the progress of all progress”.

Meanwhile, both the material and the ethical can be consolidated in **the concept of knowledge**. This consolidation is quite natural because knowledge can involve the essentials of material objects and processes that are necessary *for adaptation to the surrounding world*, as well as the ethical norms helping in the spiritual perfecting of humans that is of importance *for self-organization of society*. These two essences of civilization are strongly correlated, so a disbalance between them inevitably retards the progress compelling to develop the retarding essence and thereby restoring equilibrium (apparently, seldom short-term breakthroughs in the sphere of spiritual alternate with long-term periods of lagging in this sphere and dominating of the material origin). The presence of this correlation between different constituents of knowledge allows us to adopt *the total amount of knowledge (material and ethical) as an indicator of the developmental level of civilization*.

Thus, *from the informational viewpoint, civilization represents a multicomponent system having memory and producing knowledge necessary for survival*. This definition of civilization does not contradict the conventional notion, although broadens this concept on systems of not only humanitarian nature but also on the biota, because the presence of memory and a processor (or rather a multiprocessor consisting of many processors allocated over the whole memory) closely connected with memory, is typical both for humans and for other biological species. There is no contradiction here with the modern understanding of biota and its evolution, because: “the Earth’s life evolves not like a set of uncoordinated objects (organisms, species, or populations) each of which is anxious for their own survival and must rely upon itself only. The life develops like a single whole. ‘Modular assembly’, information exchange, cooperation, and symbiosis – here is the basement for the development of life from very first its steps on the Earth” (A. V. Markov, 2010).

The above-introduced concept of civilization is a special case of informational systems. Generally, an informational system is defined as a system “which is capable to (i) perceive, (ii) store, and (iii) generate macroinformation” (D. S. Chernavsky, 2004).

The peculiarity of civilization is that it is obliged to produce *vital information* in order to provide its own existence, while macroinformation has a more general sense and is not necessarily directed to the solution of life-support tasks.

In the concept of civilization there are two key notions; these are: **memory** and **knowledge**. We understand knowledge as conditional information generated in the course of analysis of the perceived unconditional information received as signals from the world. The conditional information is valuable (useful, vital) information, which is extracted from the perceived information. Methods of extraction (or data processing methods) also represent an important part of knowledge, and the process of extraction represents the knowledge production of which we have mentioned in the definition. This understanding of knowledge has common features with the scientific (and maybe artistic) method of cognition of the world: “scientific work in the field of natural sciences includes two necessary elements: perception of unconditional information from the nature and generation of conditional (theoretical) information” (D. S. Chernavsky, 2004).

In respect of memory it is known that there are three types of it: genetic, neuronal, and external. The first two types are internal for biological subjects constituting civilization. Another matter is the external memory – its carriers are objects external for subjects of civilization. Developed external memory is an exclusive attribute of the modern human civilization, where this type is realized as different external information carriers: physical specimens, books, different magnetic and optical carriers, etc. Genetic memory dominates in biota, providing accumulation of valuable information and its inheritance. Thus, biota demonstrates the above formulated features of civilization, which can be named the biological one. Human civilization grown from the biological one uses advantages of the neuronal memory which has perhaps reached, on a definite stage of anthropogenesis, the size of genetic memory and then surpassed it providing an accelerated development of the human phyletic branch. The further development of humanity results in the enhancement of external memory, which (as we show below) has recently become dominant due to the fast improvement of computer carriers.

Undoubtedly, the domination of one or another type of memory must influence the type of civilization and the rate of its development. So it is important to analyze the arrangement and mechanisms of working different types of memory.

### 3. AN OVERVIEW OF MEMORY TYPES

The assignment of memory of any type is to reflect structures and processes in the world onto internal patterns of memory. For this purpose memory must have a set of elements and facilities for establishing links between them as well as, in addition, the rate of pattern formation must be sufficient for adaptation. If memory contains  $N$  elements and each element has  $n$  states, then the total number of memory states will be equal to  $n^N$  and the maximum memory capacity will be  $N \log_2 n$  bits. Thus, at a fixed  $n$ , memory size is completely determined by the number of elements  $N$ . Earlier B.M. Dolgonosov and V.I. Naidenov (2006) and B.M. Dolgonosov (2009, 2010b) have estimated the amount of valuable information accumulated in memory. Below, we give an estimate of the base memory size by the number of elements, but without taking into account both various structures and the hierarchical operational superstructure

that significantly increase memory size (it is yet impossible to estimate this contribution). We outline the memory functioning and mark out some universal mechanisms of information processing, intrinsic to various memory types.

### 3. 1. Genetic memory mechanisms

Elementary units of this memory type are base pairs in genome. Eukaryotes have additional mechanisms of encoding information based on complex hierarchical structures in which along with DNA there take part RNA, proteins, and different chemical groups modifying nucleotides and aminoacids. It has not yet clear how to assess memory size of such a complex organized system. This inclines us to use a simplified way taking into account only genomic nucleotides. But even in this case, the assessment of memory size is not so simple because of a rich structure arranged on a set of nucleotides. The structure includes numerous links between local formations whose combinations allow encoding valuable information on the structure and function of organism. Indeed, the exon-intron structure of genes enables to combine separate elements in gene formation (by means of duplication, transposition, and shuffling). As a result there appear new genes that encode different proteins using different combinations of exons and introns of the same gene. It was shown that there is a correspondence between gene exons and domains of proteins encoded by these genes. Although introns do not encode proteins, they are not a quite inert material because they include large amount of various regulatory elements affecting gene expression.

The formation of gene ensembles governed by single genes – transcription activators – plays an important role (R. Tupler et al., 2001; A.V. Spirov et al., 2002). This way allows generating large assortment of proteins on relatively small gene numbers. At the same time, less than 1.5 % of human chromosomal DNA take part in encoding proteins. In addition to protein-encoding genes, there are genes whose end product is RNA. Families of genes, formed through duplication, diverge in time. Some of them accumulating mutations are converted to pseudogenes, which are incapable to encode proteins and RNA. Pseudogenes are formed also due to splicing and reverse transcription.

Regulatory functions are performed by means of gene networks responsible, in particular, for phenotypical traits of organism. A gene network is a group of coordinatively functioning genes consisting of (a) a central regulator of the protein or nucleic origin; (b) a group of genes (cassette) containing, in their regulatory regions, sites of binding the central regulator that provides the coordination of expression of cassette genes; and (c) signal transmission pathways from the world through a receptor to the central regulator. The presence of multiple binding sites provides high combinatorial capacity of code (hence, large memory size) that enables genetic programs to significantly build up their complexity without essential growth of genome sizes. An additional possibility for memory size growth is provided by an increase in the number of hierarchical regulatory levels of gene networks when passing from prokaryotes (with two levels: transcription and translation) to eukaryotes (with six additional levels) (N. A. Kolchanov et al., 2002a, b). The presence of such diverse structures and ways of encoding information means that not only base pairs contribute to the memory, but also many structures of different hierarchical levels.

It can be expected that organism complexity is directly correlated with the amount of valuable information accumulated in genome. If so, we can order groups of organisms by their non-redundant genome sizes. It is difficult to directly determine these sizes; therefore A.V.

Markov and A.V. Korotayev (2009) proposed to consider this problem in a comparative aspect for specifically selected groups of organisms using the following rules: each group is *monophyletically complete*, i.e. originates from the same ancestor and involves all descendants of this ancestor; the groups are ordered chronologically – by their emergence moments; an earlier group includes the later one; in each group the species with minimum genome size is found.

This minimum genome size is regarded as an estimate of the size of non-redundant genome for a given group. The above-listed rules allowed the authors of the cited work to construct the following chain of embedded taxa: all living > eukaryotes > animals > chordates > vertebrates > tetrapods > amniotes > mammals > primates, and to indicate, in each taxon, the species with minimum genome size. Juxtaposing the minimum genome size with the taxon emergence moment, we can trace the growth of minimum genome during the evolution of Earth's biota (Fig. 1). It turns out that during the long period from the beginnings of life on the Earth to the emergence of mammals in the late Trias (about 220 millions of years ago) the minimum genome grows according to the hyperbolic law  $Y = C(t_1 - t)^{-\alpha}$  with parameters  $C = 2.03 \times 10^9$ ,  $\alpha = 2.55$ ,  $t_1 = 0$  (determination coefficient  $R^2 = 0.965$ ), where  $Y$  is the minimum genome size (millions of base pairs);  $t$  is time (millions of years ago). The singularity moment  $t_1$  was fixed at zero that means it falls into our time. Even if it is not so, the parameters change a little. For example, at the displacement of  $t_1$  on  $\pm 50$  millions of years the exponent  $\alpha$  shifts on  $\pm 0.17$  relative to the above value, the constant  $C$  gets values of  $7.84 \times 10^9$  and  $0.47 \times 10^9$  respectively, but  $R^2$  changes insignificantly, in the 4th decimal digit. Note that the above-mentioned authors found distinct values:  $C = 0.16 \times 10^9$ ,  $\alpha = 2$ , and  $t_1 = 85$  with a minor value of  $R^2 = 0.959$  (A.V. Markov and A.V. Korotayev, 2009).

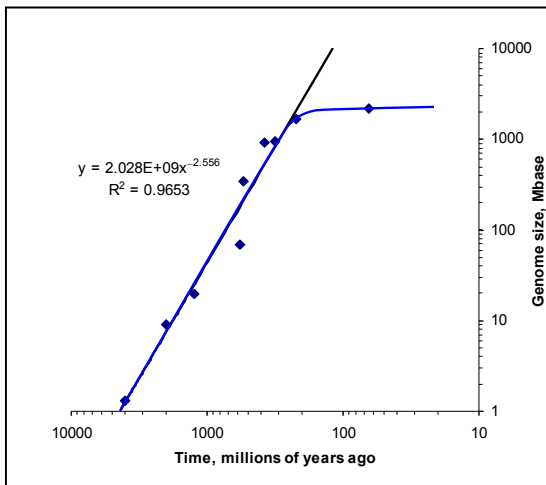
As seen from Fig. 1, with the emergence of mammals the further growth of genomes becomes inefficient and is frozen at a level of ~2 billions of base pairs (underline that this is an estimate for minimum genomes), and the subsequent growth of genetic memory is provided with a more efficient collection of “combinatorial mechanisms of the regulation of transcription and exon-intron structure, mechanisms of alternative splicing, and epigenetic mechanisms, hereby creating the grounds for an exclusively efficient way of encoding vast diversity of variants of the same protein... This is an evolutionary adaptation of wide ability, allowing eukaryotes practically unlimitedly to build up the complexity of genetic programs of individual gene expression without an appreciable increase in genome sizes” (N.A. Kolchanov and V.V. Suslov, 2006).

So, in spite of the freeze of genome growth, a rise in memory size goes on along with increasing complexity of organisms but already using other mechanisms. This can be depicted by extrapolating the observed trend to the region of genome size stagnation (Fig. 1). This extrapolation shows to what extent genome must increase in its size to provide the appropriate growth of memory. As was noted by N.A. Kolchanov et al. (2002a, b), the additional encoding mechanisms developed in eukaryotes allow the memory to increase its capacity to the level that would require the increase of genome size to  $10^{10} - 10^{11}$  base pairs that corresponds to a 10–100-fold increase.

In human genome there are about 5 % of encoding and regulatory genes (this is the non-redundant DNA), and of this quantity it turns out to be sufficient to build organism, or more exactly to set a spectrum of possible pathways of its building, but what a pathway will be realized, it depends on specific environmental conditions that affect the organism (A.V. Markov, 2010).



More than 95 % of genome have no direct relation to genes and encode neither proteins nor RNA (C. Adami et al., 2000; E. S. Lander et al., 2001; A. M. Lesk, 2002; L. D. Stein, 2004; A. A. Sharov, 2006). This is the so called “junk DNA”, which cannot nevertheless be regarded as genetically inert because it contains mobile genetic elements, in particular, transposons promoting different innovations in genome. Due to their relocations, they can modify available genes, produce new genes, and cause mutations including significant chromosomal reconstructions. Not less than 80 % of mutations and reconstructions of DNA are the result of their activity (M.G. Kidwell, 2005). It is possible that non-coding sequences, prevailing in eukaryotic genomes, nevertheless encode something not requiring the conventional triplet code. Otherwise, they would degenerate into random sequences, which are eliminated by the selection as it occurs for prokaryotes (I. B. Rogozin et al., 2002). Summarizing, we may conclude that the “junk DNA” supports necessary diversity in the variability of genome, and the natural selection culls out harmful mutations. This accelerates the production of vital information providing adaptation to the environment variability. Thus, “junk DNA” may be interpreted as auxiliary (partially processed) information, which can, in good opportunity, be needed for producing vital information.



**Fig. 1.** Minimum genome size growth during the evolution of life. Markers indicate taxa minimum genomes sizes versus taxa emergence moments (data source: Markov and Korotayev, 2009).

Because of such a complex genome structure, the direct estimation of genome memory is difficult; it is possible only to count the number of elements in the total genetic memory of humanity.

Taking into account a human genome size of 3200–3300 Mbase and the current human population slightly less than 6.9 billions (see data of the US Bureau of the Census,

<http://www.census.gov/ipc/www/idb/worldpopinfo.php>), we find the number of elements,  $2 \times 10^{19}$  base pairs, in the total genetic memory of humanity. Memory size in bits can be determined from this value by multiplication by  $\log_2 n = 2$  (since there are four types of nucleotides,  $n = 4$ ) that gives  $4 \times 10^{19}$  bits.

From all the information stored in genome the part of vital information (encoding and regulating) depends on genome size. For example, unlike the human genome with a 5 % non-redundant part, relatively small genomes of prokaryotes of sizes within the range  $10^{-1} - 10^1$  Mbase (although sometimes there are bigger genomes – see:

<http://www.ncbi.nlm.nih.gov/genomes/lproks.cgi?view=1>) have the non-redundant part up to half of the genome (sometimes to 80 %), and the rest is related to the “junk” part.

Thus, in spite of the different value of information in genome, we can state that *genome contains extremely compressed information compared to the information that is required to describe the organism built by this genome*. Such a compression has required billions of years of

the evolution of life (from auto-catalytic cycles to the RNA world and then to the world of DNA–RNA–protein) (S. Kauffman, 1990), when a reliable way of encoding information was found, and on this basis viable codes were selected from a variety of generated codes.

A mathematical analogy of this process, although having a much less degree of compression, is the construction of **an axiomatic theory** in which a branched network of theorems is deduced from a small set of axioms. If the theory is considered as a whole, the amount of information (text) will be impressive enough. But if we retain only the formulations of already proved theorems (that are much shorter than proofs) but remove the proofs themselves, then significant compression of information can be achieved. In the vein of this analogy, *genome can be regarded as a set of formulations of the theorems proved during the evolution. In essence, their proving is constructing viable organisms on the basis of the genome* – an exclusively complex process, the description of which on the molecular level would form a text of vast size. But if theorems are formulated with mistakes (or genome contains fatal errors), these theorems cannot be proved (accordingly, organisms built by this genome are nonviable). From the said it follows that genome contains the information compressed over all the preceding evolution of life.

### 3. 2. Neuronal memory mechanisms

Main operational elements of this memory type are neurons. They are interconnected with axons, forming synaptic membranes at the places of contacts. A neuron can be in the active or passive state that depends on properties of synaptic membranes, varied under the action of mediators. Neurons are combined in ensembles (neuronal networks), basic types of which are genetically programmed but admit intravital modifications with the formation of new contacts between neurons. The information received from the world is saved in the form of neuronal ensembles (N. M. Grzywacz and P. Y. Burgi, 1998; H. A. Lechner et al., 1999). The addressing to information stored in memory provokes activation of separate neurons or neuronal ensembles.

Neuronal memory stores information of different degree of transformation, namely, sensory information and three types of processed information: primary, secondary, and tertiary. Sensory information occupies maximum memory volume. The transfer of information from the sensory level downward the hierarchy occurs mainly in two ways: semantic (by extracting abstract knowledge) and episodic (by storing sensations, emotions, associations, etc.) (J. R. Anderson, 1976).

The capacity of sensory memory is essentially larger than the primary one. A part of information from primary memory is substituted with newly received information, and another part transfers to the secondary memory, for example, via rehearsal. Secondary memory has larger capacity and duration of storage than the primary one. Unlike the primary memory, the secondary one is organized on the basis of the semantic value of information. Information from the primary memory is extracted with high speed, and from the secondary one, slower because of the necessity of retrieving different variants. Finally, the tertiary memory is characterized by firm fixation of the past experience and is extracted with high speed.

Brain represents a mosaic set of interacting neuronal elements – micro- and macrocolumns, which create associations and chains, permanently adapting their boundaries according to received signals. The signals are transformed and encoded into different sets of primary afferent fibers. Activities in these sets excite processes in different cortical regions. These spatially separated regions are connected by a widely branched distributional system. Neurons in separate

nodes of this system are not projected into a kind of general convergent target in which a certain integrated thought (image, reflection) could be concentrated. This thought exists as a dynamic activity of the distributional system (V. B. Mountcastle, 1998). Thus, memory is an integrated property of brain activity that shows itself in interactions of different brain structures. Memory patterns have no definite location, but can be read from neurons of different brain structures. The topography of the functional subsystem responsible for reproduction of images changes from time to time (the so called phenomenon of walking active mnestic centers).

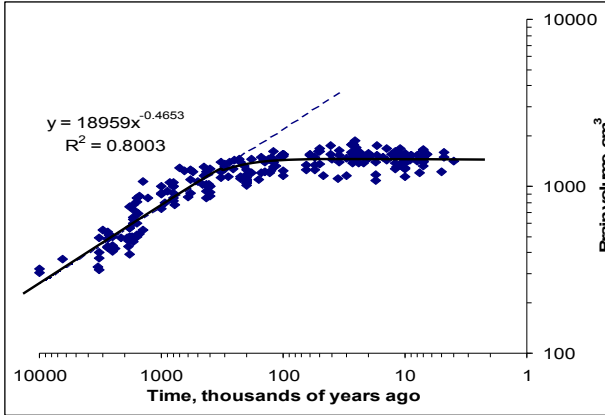
Thus, *in the neuronal memory (just like in the genetic one) there is differently processed information. The processing goes on permanently, accompanying with the transfer of processed and compressed information from the sensory memory to other forms of memory and providing thereby extraction and accumulation of valuable information.*

The transfer from the sensory memory towards the tertiary one is accompanied with compression of information. Using the prior analogy with an axiomatic theory (see subsection 3.1), it can be noted that only formulations of proved theorems finally remain in memory, i.e. manifold verified data, rules, images, notions – everything that forms a pattern of the world, whereas proofs themselves (including logical pathways brought to these representations) are often removed (forgotten) as useless because all these statements are already confirmed by personal life experience.

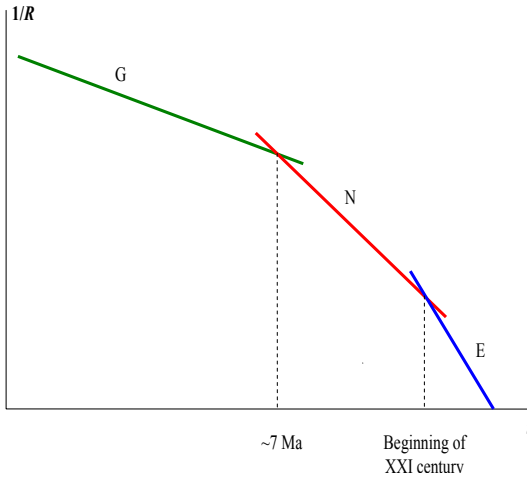
The amount of stored information depends on the number of neurons as well as on the abundance of links between them that can be formed as necessary. This circumstance complicates the calculation of the actual brain memory size varying during a life span. However, we can assess the number of neurons, which compose the basic memory size. It is known (F. Bloom et al., 1988; H. Haken, 1996; A. Ndabahaliye, 2002) that human brain consists of  $\sim 10^{10} - 10^{11}$  neurons. This is an estimate by orders of magnitude, and in such a case the middle of the range should be found as the logarithmic mean; now it is equal to  $3 \times 10^{10}$  neurons. Hence, bearing in mind the present human population we find an average estimate of the neuronal memory of humanity of  $2 \times 10^{20}$  neurons (or bits if adopting that a neuron is able, by forming its own circuit, to encode one bit of information). Thus, at present the neuronal memory is 5 times more than the genetic one by the number of elements. As the accuracy of these estimates is not large, we may state only that the difference is half an order of magnitude.

Let us consider the question when the transition from the domination of genetic memory to that of neuronal one could happen. For this purpose we consider the growth of brain volume during anthropogenesis (Fig. 2) drawn from the paleo-anthropologic data collected by S.V. S. V. Drobyshevsky (2007). The growth mostly obeys a hyperbolic law of  $Y = C(t_1 - t)^{-\alpha}$  with parameters  $C = 1.90 \times 10^4$ ,  $\alpha = 0.465$ ,  $t_1 = 0$  ( $R^2 = 0.800$ ), where  $Y$  is the brain volume ( $\text{cm}^3$ ),  $t$  is time (thousands of years). The singularity moment  $t_1$  is fixed at zero, i.e. it is assumed that it falls into our time. About 250–300 thousands of years ago, brain growth starts to decelerate and then goes into a plateau. This deceleration is conditioned by biomechanical problems such as child-bearing, load on backbone, and shift of gravity center, appearing as a result of brain growth. Nevertheless, memory size continues to increase due to the development of the cortex responsible for the formation of a hierarchical superstructure that allows creating neuronal networks and gives additional resources for storing information and working with it. So the trend depicted in Fig. 2 can be prolonged in the region, where brain does not grow. The prolongation shows to what extent brain volume should rise to ensure this growth of memory.

Brain volume of modern humans varies in wide limits: 1000–2000 cm<sup>3</sup>, and in average is equal to 1350 cm<sup>3</sup>. Brain volume of the hominid *Sahelanthropus* lived about 7 millions of years ago is estimated as 350 cm<sup>3</sup> (at an unknown range of variation), i.e. roughly 4 times less as compared with the modern humans average value. It means that the relative growth of brain during anthropogenesis is approximately half an order of magnitude like in the comparison of genetic and neuronal memory (remember that there was a 5-fold growth there, but in this case



**Fig. 2.** Brain volume growth of fossil hominoids during anthropogenesis (data source: Drobyshevsky, 2007 (table 3).



**Fig. 3.** A schematic time-dependence of the reciprocal total size of genetic (G), neuronal (N), and external (E) memory according to the equation  $1/R = w(t_1 - t)$  with parameters presented in Table 1 for each memory type. The number of elements  $R$  in total memory size is estimated as  $\sim 10^{14}$  and  $\sim 10^{20}$  at the G–E and N–E transition moments, respectively.

the difference between 4 and 5 is insignificant because of large uncertainty in the data).

These estimates allow assuming that the transition took place likely about 7 millions of years ago. Because the genome size of  $\sim 10^9$  base pairs weakly changed since then and the species-ancestor population was  $\sim 10^5$  individuals, we can find an estimate of the total genetic memory of  $\sim 10^{14}$  base pairs. Hence, at the transition moment, the same number of elements (by an order of magnitude) was in the total neuronal memory (fig. 3).

The question rises, to what extent the approach based on the calculation of the number of memory elements is adequate. It would seem that this approach contradicts to the fact that brain of big mammals (e.g. elephants or whales) surpasses human brain and nevertheless populations of these species are not large compared to humans. To answer this question, we should account for two circumstances. The first is that we should consider the evolution of brain moving along a trajectory of development, i.e. along a phyletic branch, in our case, the phyletic branch of humans.

The second circumstance is associated with the fact that passing from the human phyletic branch to that for elephants or whales, we need to bear in mind

the significant difference in body masses as well as the fact that there is a definite correlation between the masses of body and brain. With growing body mass, the peripheral nervous system also grows (roughly proportionally to body surface), and its servicing requires increasing the number of brain neurons proportionally to the power  $\sim 2/3$  of body mass (E. Macphail, 1982).

That is why big brain still does not ensure fast growth of species population. It is important to underline that brain growth in the evolutionary process should be monitored along the phyletic branch of the species under study.

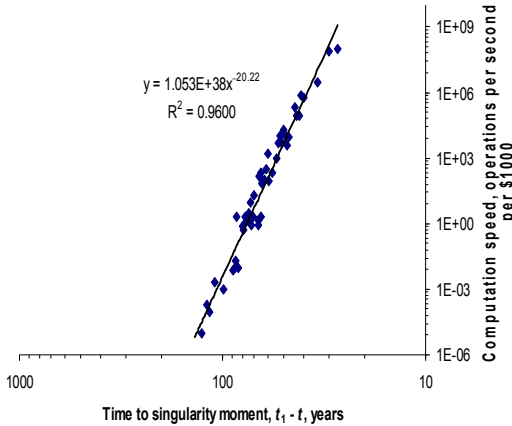
Returning to humans, note that anthropogenesis was accompanied with the development of neuronal processor that assists a deeper processing of received information. In its turn, the development of neuronal processor is connected with the enhancement of the means of social communications (E. Herrmann et al., 2007), which induce in due course the formation of the “cultural memory” and a developed language. During the evolution, appropriate morphological changes have occurred in brain, which are associated, in particular, with the development of cortex. In addition, it was needed to increase memory above the size that is necessary for servicing the peripheral nervous system to be able to allocate a more developed processor (rather a multiprocessor distributed over all the brain volume and operating in parallel) along with sensory information (as the initial material for its operation) and variously processed information. The progressive growth of neuronal memory has finally led to the situation when it surpassed genetic memory by the number of elements. To all appearance, just this has occurred in the anthropogenesis and ensured the accelerated growth of population. Thus, in this context the number of memory elements is of importance for accumulating knowledge and growing species population.

### **3. 3. External memory mechanisms**

This type of memory includes carriers of different types, but computer carriers such as magnetic and optical disks, flash memory, etc. predominate. Information on these carriers is organized by means of file systems. A file system is unnecessarily directly associated with its physical carrier; it can be virtual or networking and can operate with information allocated over different carriers, sometimes remote from each other on large distances. Every carrier is divided into clusters. A single file can be allocated over several clusters disposed in different places of the carrier. Clusters and files are arranged by drivers of operational system, which form a network governing multiple files. Information can be duplicated and rewritten in various places of the same carrier or on different carriers, changing the physical location of information. Judging by the above description of genetic and neuronal memory, something alike there is also in the external memory that hampers searching the places where needed information can be located (remind that such a fragmentation can be associated with duplication, transposition, and shuffling of exons and introns in genome; and with walking of mnemonic centers in brain).

Information can be characterized by its social significance and potential value. Significant information is duplicated many times, and in this connection we can introduce frequencies of occurrence of individual informational objects. However, the frequencies are not always directly connected with the potential value from the standpoint of community survival. Vital information is commonly scattered over different informational objects, so it is hard to extract it from the context and calculate its total amount. But even if it would be able to do this, simple summation of the sizes of extracted objects is all the same incorrect because the objects are non-equivalent. Thus, if to sum up the sizes, it is necessary to use weight coefficients

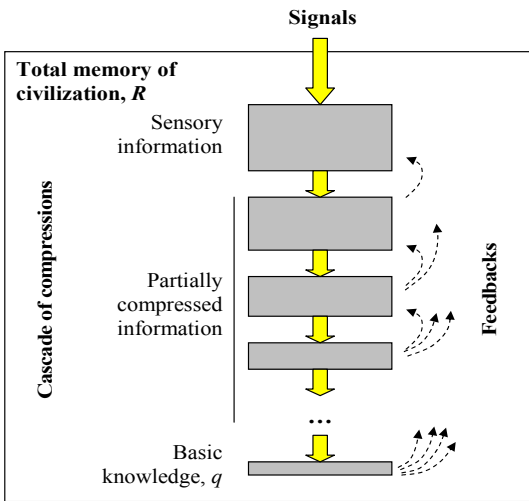
evaluating information in the objects. It is commonly considered that the value of information can be defined through the reduction of uncertainty after receiving this information (D. S. Chernavsky, 2004). However, this approach implies the presence of a paradigm helping the information to be interpreted. But if the information is not built in the existing paradigm, its value cannot be determined (and what is more, at this moment it is equal to zero); its value can be revealed only in the future, in favorable concurrence of life circumstances.



**Fig. 4.** Hyperbolic growth of computation speed (data source: R. Kurzweil, 2001). Singularity is achieved at the year  $t_1 = 2027$ .

There are also other difficulties in the accounting for the amount of valuable information, for example, connected with the use of different languages. First of all, the said concerns natural languages, which are poorly algorithmized. But even the application of solely algorithmic languages does not resolve the problem, since the description of the same informational object in different languages yields programs of different length, and to indicate the minimum length program is a problem algorithmically irresolvable (B. M. Kolmogorov, 1987, A. V. Melkikh, 2008).

The same difficulties are characteristic of the approach of C. Bennett (1990), in which complexity (that is evidently proportional to the amount of information) is estimated via logical depth defined as the “execution time required to generate the object in question by a near-incompressible universal computer program, i.e., one not itself computable as output of a significantly more concise program” (C. Bennett, 1990). That is why we have to deal with the total amount of information. As seen, the same situation takes place also for two other types of memory – genetic and neuronal.



**Fig. 5.** A conceptual scheme of information flows in civilization. Signals from the world undergoes the cascade of compressions, where the top level is occupied with sensory information; the intermediate levels, with partially compressed information; and the bottom level, with basic knowledge. Dashed arrows denote feedbacks that control upper levels of memory.

Facilities of external memory can be assessed by the computational power defined as the number of operations in unit time per unit cost of hardware.

Treatment of the data represented by R. Kurzweil (2001) shows that during

the whole XX century the computational power increased according to the hyperbolic law (Fig. 4)  $Y = C(t_1 - t)^{-\alpha}$  with parameters  $C = 1.05 \times 10^{38}$ ,  $\alpha = 20.2$ ,  $t_1 = 2027$  ( $R^2 = 0.960$ ), where  $Y$  is the computational power achieved to the moment and measured in the number of operations per second per 1000 constant dollars of the year 2000,  $t$  is time (year)

Along with the power, the growth of stored information proceeds. As shown below (see section 6), a power law relationship between computational power and information stored (looking like  $\dot{R} \sim R^2$ , where  $R$  is the total amount of external memory) takes place, so the accumulation of information also will go on according to a hyperbolic law. The singularity moment is fixed at the year 2027 that coincides with the singularity moment for human population (see below section 4).

According to the data of the researchers from the University of Berkeley, California (How much information, 2003), the humanity in 2002 produced 5 exabytes =  $5 \times 10^{18}$  bytes =  $0.4 \times 10^{20}$  bits of information, a prevailing part of which (92 %) was stored on magnetic carriers, mostly in hard disks (these 5 exabytes are less than one third of the new information that is communicated through electronic information flows – telephone, radio and TV, and the Internet – being circa 17.7 exabytes). Bearing in mind the information stored for all years till the moment, we can obtain an estimate of the current size of external memory:  $\sim 10^{21}$  bits. These findings most likely underestimate the real situation, because the production of carriers has grown rapidly for the last years and the capacity of some carriers has already reached several terabytes. Of course, a prevailing part of external memory is filled with repeatedly used information such as films, music, texts, pictures, etc., as well as sensory information of private character, e.g. photographs, video and audio tracks (we imply simple fixation of surrounding events). This information flow contains very little of unique, vital information. In any case, it is clear that at present the external memory has already surpassed markedly the neuronal one. The transition occurred quite recently, at the turn of XX–XXI centuries (Fig. 3) and brought to the important quantitative change: *if earlier the total memory size of civilization grew proportionally to its population (because memory was internal for subjects of civilization), then now the domination of external memory makes population growth non-obligatory for further increasing memory as this can be done due to external carriers.*

### 3. 4. Common features of memory

In spite of that various memory types are grounded on a distinct elemental base and use different mechanisms of storing and processing information, there are some common traits independent of specific realization. First of all, this is the fragmentation of valuable information over all volume of memory, ambiguity of the mapping of real objects and processes onto memory patterns, diverse ways of encoding information depending on language used and on life history. It is necessary to account for language redundancy, duplication of fragments, errors of coding, reserve of passive structures and so on. These factors are urgent for any memory type. So, the size of information stored cannot be estimated quite definitely and it is impossible to indicate the minimum memory size needed to store valuable information. But it is possible to compress the perceiving information step by step using two ways: first, revealing regularities in the data organization and, second, removing the information that seems to be insignificant. The purpose is to produce knowledge (vital information) that is performed through: extracting valuable information, compressing it as much as possible, and encoding it in memory. This can

be done by the construction of algorithms describing technologies, methods, theories, rules of behavior and so on. The compression is a process expensive by energy and time and therefore is performed only under vital necessity.

Since the value of information depends on circumstances, it is necessary to have a reserve of memory to store not only vital information needed at the moment but also the information that can be needed in the future. Bear in mind that the production of new valuable information is a long-term process that includes searching regularities in the data structure, ignoring insignificant details, and compressing information. So, during all this process there is a need to store in memory intermediate information, which is not still compressed enough, but further compression is unprofitable for the moment because of large expenditures of resources.

Thus, memory includes information on different stages of transformation, from the initial information (perceived signals) to vital information whose degree of compression is determined by the current state of the system of knowledge. The development of this system promotes further compression of information. A conceptual scheme of information flows in civilization is shown on Fig. 5. Here following S. N. Nielsen (2007) we can see three major types of information that play a part in determining the complexity level of the system, one belonging to the components (boxes), one stemming from the flows (area arrows) and one from the system controls through feedbacks (dashed arrows). The feedbacks represent the ascendancy in the system that is necessary for its self-organization.

It is known that: “systems with either vanishingly small ascendancy or insignificant reserves [of flexibility] are destined to perish before long. A system lacking ascendancy has neither the extent of activity nor the internal organization needed to survive. By contrast, systems that are so tightly constrained and honed to a particular environment appear ‘brittle’ in the sense of C.S. Holling (1986) or ‘senescent’ in the sense of S. N. Salthe (1993) and are prone to collapse in the face of even minor novel disturbances” (R. E. Ulanowicz et al., 2009).

### 3. 5. Fractal structure of knowledge

Memory of civilization grows along with knowledge amount. *Knowledge is not consolidated in memory, but, on the contrary, forms a set of rare, accidentally allocated, unconnected inclusions.* This statement is well exemplified by the allocation of exons in eukaryotic genome, which are randomly scattered and separated from each other with big introns. Another example is the brain zones responsible for various images that are randomly allocated in brain. Finally, the fact that files can be fragmented over many computer carriers and there is a small fraction of valuable information among them gives one more illustration of the above statement. The aforesaid concerns not only single memory carriers (single gene, brain, or computer), but, to a more considerable extent, to the whole memory of civilization, which is fragmentary by itself because consists of large number of carriers. As a result, randomness and fragmentariness in allocation of knowledge over all memory volume become more expressed. These features of memory allow representing knowledge in the form of fractal object consisting of unconnected parts (physically unconnected, but connected by networks). A mathematical analogue of such an object is known as **the Cantor dust** (e.g. B. B. Mandelbrot, 1982), whose fractal dimension is less than unity. From the above-mentioned it follows that the memory size  $q$  occupied with knowledge interrelates with the civilization total memory size  $R$  by a power law relationship  $q \sim R^\varepsilon$  typical for fractals, where  $\varepsilon$  is the fractal dimension, which for a disconnected object



(like the Cantor dust) is less than unity. Moreover, taking into account that knowledge occupies very small volume of memory (i.e.  $q \ll R$ ) as well as that a set of inclusions in memory is a quite sparse fractal object, it should be expected that its fractal dimension is very small:  $\varepsilon \ll 1$ .

Of the exponent  $\varepsilon$  we can judge by the following example from statistical physics. The complete microscopic description of a system of  $N$  particles requires knowing  $R = 6N$  values of particle coordinates and velocities. Passing to a macroscopic description, a small set of macrovariables like temperature, pressure, volume, number of particles and so on is needed, i.e.  $q$  encompasses 3–5 values, seldom more. At  $N \sim 10^{23}$  the transition from micro- to macrodescription is evidently accompanied with enormous compression of information with the exponent  $\varepsilon \approx \ln q / \ln R \sim 10^{-2}$  (supposing that a proportionality coefficient, not written out but implied in the formula  $q \sim R^\varepsilon$ , has a value of unity by an order of magnitude).

### 3. 6. Logarithmic compression of information

At the so small value of  $\varepsilon$ , the power law dependence  $q \sim R^\varepsilon$  is close to a logarithmic one in a wide range of variation of variables. Indeed, writing the stated dependence in the differential form  $dq \sim dR / R^{1-\varepsilon}$  and taking a limit  $\varepsilon \rightarrow 0$ , we get  $dq \sim dR / R$  and after integration  $q \sim \ln R$ . Hence, *the amount of vital information grows logarithmically with increasing the total memory size*. This evidences a very strong compression of the initial information. Probably, the so strong compression is characteristic also for the evolutionary process in which natural selection extracts from the large amount of perceived information only the vital one and encodes it.

Taking into account physical units of the quantities  $q$  and  $R$ , the obtained logarithmic law of compression information should be written in the form  $q = q_c \ln(R / R_0)$ , where  $q_c$  is a constant, specific for the memory type used, and  $R_0$  is the minimum memory size at  $q \rightarrow 0$ . Note that when domination of some memory type is the case, the amount of knowledge  $q$  can be measured in the  $q_c$  units, and  $R$ , in the  $R_0$  units (i.e. we put formally  $q_c = 1$  and  $R_0 = 1$ ), then the information compression law takes a simple form of:

$$q = \ln R.$$

It can be interpreted by the following way: at the knowledge level  $q$  civilization is capable to recognize information received from the world in the amount  $R = e^q$ , i.e. figuratively speaking, *the scope of civilization exponentially increases with knowledge*.

Information and knowledge are accumulated in memory and used for recognizing signals and choosing behavior. As shown above, the inequality  $R \gg q$  holds true; it implies that among all information accumulated in memory knowledge occupies only a small part, whereas the most part of memory is filled with unprocessed or partially processed (intermediate, raw) information, which has still being transformed into knowledge (Fig. 5). This statement concerns any type of memory provided that not a single memory carrier (for which significant deviations from this rule are possible) is considered but all the carriers constituting the civilization.

## 4. THE NATURE OF HYPERBOLIC GROWTH

### 4.1. Knowledge and the population size

All the long-term evolution preceded the information explosion of the last decades is characterized by the domination of the internal memory, whose size  $R$  is composed of the memory sizes of  $N$  separate subjects constituting the civilization; this yields the relationship  $R = mN$ . Let  $R_0$  be an initial memory size when the civilization was in an incipient state and had a population size of  $N_0$ . Then  $R_0 = mN_0$ ,  $m = R_0 / N_0$ , and  $R = R_0 N / N_0$ . Recalling that  $R = R_0 \exp(q / q_c)$ , we find  $N = N_0 \exp(q / q_c)$ . In the relative units (i.e. putting  $q_c = 1$  and  $R_0 = 1$ ) we can write:  $N = N_0 e^q$ .

It means that in the course of evolution not only the amount of recognized information, but also *the population size grows exponentially with accumulating knowledge*. This can also be interpreted in such a manner: a system with storing information includes positive feedbacks, which makes the system unstable. In other words, the emergence of new knowledge destabilizes the system and leads to significant changes in it. With respect to the genetic memory, this effect has recently been noted by A.V. Markov (2010): “small variations in regulatory genes can lead to large evolutionary transformations, including the emergence of new properties and functions, and to a general complexification of the living system”.

### 4.2. A mathematical mechanism of the loss of stability

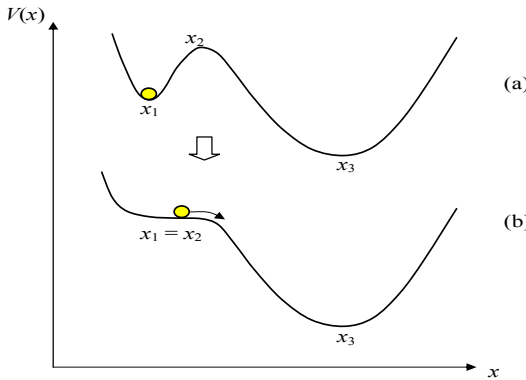
Let us consider a potential dynamic system with several stable states and with parameters drifting in time. The system is described by an equation  $\dot{x} = -V'(x)$ , where the over dot symbol denotes the time derivative, the prime denotes the argument derivative,  $x$  is a generalized coordinate (for example, population size),  $V(x)$  is a potential. Equilibrium points of the system are found from the equation  $V'(x) = 0$ . Let the system have two potential wells separated with a potential barrier. In this case, the potential has three equilibrium points  $x_1 < x_2 < x_3$ , two of which  $x_1$  and  $x_3$  are stable (they correspond to the two wells) and one  $x_2$  unstable (it corresponds to the barrier). From this it follows that  $V'(x) = k(x - x_1)(x - x_2)(x - x_3)$ , where  $k > 0$ .

Let the potential parameters change in time so that the potential well  $x_1$  disappears. At the moment of disappearance, the points  $x_1$  and  $x_2$  merge with one another:  $x_1 = x_2$  (Fig. 6), and the derivative of potential is transformed into  $V'(x) = k(x - x_1)^2(x - x_3)$ . Denoting the deviation from  $x_1$  as  $y = x - x_1$  and the distance between  $x_1$  and  $x_3$  as  $a = x_3 - x_1 > 0$ , we can rewrite the equation  $\dot{x} = -V'(x)$  in the form  $\dot{y} = ky^2(a - y)$ .

At sufficiently small deviations  $y \ll a$ , the latter equation can approximately be represented as  $\dot{y} \approx kay^2$ . This equation yields a hyperbolic growth of deviation. As approaching

to the point  $y = a$ , this law is violated. Thus, *from the mathematical viewpoint, the hyperbolic law arises from the loss of equilibrium and is accompanied with the movement of the system to another, remote equilibrium state.*

In respect to the growth of population, the first potential well lies at the point  $x_1 = 0$ , where the population is extinct (or, at least, presents in an incipient state), and the second



**Fig. 6.** Transformation of the system potential: (a) two potential wells  $x_1$  and  $x_3$  separated with a barrier  $x_2$ ; (b) the loss of stability at  $x_1 = x_2$  and the beginning of the transition to the stable state  $x_3$ .

potential well at  $x_3$  corresponds to a stable, non-zero population. The variable  $x$  is the population size  $N$ , the parameter  $a$  is the environmental carrying capacity, and  $ka$  is the coefficient of population growth  $w$  (see below). The convergence of the points  $x_1$  and  $x_2$  and the loss of stability of the zero potential well are caused by the appearance and development of memory and accumulation in it of valuable information, which allows the civilization to exit from the incipient state and to start building up its population size according to the hyperbolic law.

### 4. 3. Knowledge production and hyperbolic law

The total rate of knowledge production is determined as the sum of contributions of separate subjects of civilization, therefore as a whole this rate is proportional to population size:  $\dot{q} = wN$ , where:  $w$  is a coefficient of population growth (another name is a specific information processing rate; its physical sense is the mean rate of knowledge production per subject, i.e. per capita for humanity or per taxon for biota). This is followed by the equation of knowledge production  $\dot{q} = wN_0 e^q$ , which can be rewritten in the form without parameters:

$\ddot{q} = \dot{q}^2$ . The process has a singularity point, at which all the key quantities such as the amount of knowledge  $q$ , rate of knowledge production  $\dot{q}$ , and population size  $N$  tend to infinity. However, growth rate of these quantities is significantly different depending on the distance to singularity point. Far from it, growth is slow, almost imperceptible, but in its neighborhood the process enters into the blow-up regime resembling an explosion. It is accompanied with increasing the accumulation of knowledge that results in accelerating the growth of population. Indeed, from the equation of knowledge production and the relationship  $q = \ln(N/N_0)$  it is easy to derive an equation of population dynamics

$$\dot{N} = wN^2.$$

Solving it, we obtain the well-known hyperbolic law of population growth

$$N = N_0 / (1 - wN_0 t), \text{ or}$$

$$N = w^{-1}(t_1 - t)^{-1},$$

containing the singularity moment  $t_1 = 1/(wN_0)$ . It is seen that the higher the specific processing rate  $w$ , the faster the population grows and the earlier the singularity moment is achieved.

Thus, it appears that *the hyperbolic growth first discovered empirically for human population* (H. Foerster et al., 1960) (Fig. 7) *and recently for biodiversity* (A.V. Markov and A.V. Korotayev, 2009) (Fig. 8) *has purely the informational nature. In principle, it must hold true for civilizations of any origin, in which properties of subjects – memory size  $m$  and information processing rate  $w$  – are constant, and the accumulation of information goes through the internal memory channels.*

#### 4. 4. Drift of memory parameters

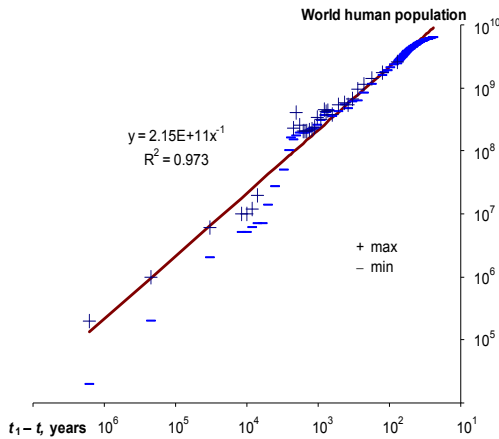
In reality, the memory parameters  $m$  and  $w$  change during the evolution. It is known that the last  $\sim 7$  millions of years of anthropogenesis the brain volume has nearly 4 times increased (S.V. Drobyshevsky, 2007). The information processing rate has most likely increased too that is resulted from a complication of the hierarchical neuronal network in brain. However, on the background of the immense human population growth of 5 orders of magnitude (from  $10^5$  to almost  $10^{10}$ ), just a several times variation in these parameters gives only small relative deviation from the ideal case supposing the  $m$  and  $w$  to be constant. The admissibility of this idealization is caused by the fact that population size in the preceding epochs is known only within an order of magnitude; so its variation due to the drift of the parameters  $m$  and  $w$  lying within this range of uncertainty is quite acceptable.

To estimate how the drift of memory parameters distorts population growth dynamics, we consider a simplified situation assuming that these parameters linearly grow in time:  $m = m_0(1 + kt/t_1)$ ,  $w = w_0(1 + kt/t_1)$  (note that in reality the behavior of  $m(t)$  is more complex – see: S.V. Drobyshevsky (2007), graph 83; however, the simple example under study is of importance for understanding how growth of  $m$  and  $w$  influences the population size). In this case the prior equation  $\dot{N} = wN^2$  is modified into the equation  $\dot{N} = wN^2 - (\dot{m}/m)N$ . As noted above, during anthropogenesis there has been a 4-fold increase in brain volume (and hence in memory  $m$ ) and most likely in the information processing rate  $w$  that corresponds to the coefficient  $k = 3$  in the above formulae. Calculations using the modified equation with the linear drift of memory parameters at  $k = 3$  demonstrate that population grows, as before, according to the hyperbolic law, but with a slightly shifted exponent value: instead of the prior  $-1$  now we get  $-0.98$ , i.e.  $N \sim (t_1 - t)^{-0.98}$ . Strictly speaking, this exponent value is approximate – it works within some intermediate time interval. But the fact is that the modified hyperbolic dependence is an approximation of the exact solution of the task having the form  $N = N_0 t_1^2 (t_1 + kt)^{-1} (t_1 - t)^{-1}$ .

As noted in Introduction, H. Foerster et al. (1960) treating empirical data on human population have obtained the exponent  $-0.99$ , but not exactly  $-1$ . It is clear now that one of the possible reasons of this deviation can be the drift of memory parameters. Since deviation from the case with constant memory parameters is small, this idealized case can be used for an approximate estimation.

#### 4. 5. Deviations from the hyperbolic growth

In respect of humanity, hyperbolic growth of population is caused by the domination of neuronal memory and the participation of the neuronal multiprocessor in knowledge production. H. Foerster et al. (1960) showed that the singularity moment  $t_1$  falls into the end of 2026 (i.e. approximately  $t_1 = 2027$ ) and found that the reciprocal knowledge production rate is  $w^{-1} = 200$  billions of persons $\times$ years. Calculations of A.V. Markov and A.V. Korotayev (2009) using an updated demographic series yields the refined value  $w^{-1} = 215$  billions of persons $\times$ years (fig. 7).



**Fig. 7.** Hyperbolic growth of world human population (data source: J. N. Biraben, 1979; S. Jones et al., 1994; see also data of the US Bureau of the Census: <http://www.census.gov/ipc/www/idb/worldpopinfo.php>). Singularity falls on the year  $t_1 = 2027$ .

It should be taken into account that hyperbolic growth of humanity describes the trend (long-term dynamics) of population smoothing short-term processes like cycles or fluctuations that result in deviations from the mean value. The mean value subsistence” (T. Malthus, 1826, part I.II.22). This thesis can be reformulated characterizes the stable population size that is ensured with the currently existing means of subsistence in accordance with the T. Malthus’ thesis: “Population is necessarily limited by the means of as follows: “the growth of human population at a given moment of time is restricted by the top of Earth’s carrying capacity being determined by the currently observed developmental level of vital technologies” (A. S. Malkov et al., 2007).

But the top of carrying capacity  $N(t)$  just describes the long-term population trend, slowly changing with technological development, where  $t$  is the long-term (historical) time. At a given level of technologies the current human population  $n(\tau)$  (where  $\tau$  is a short-term, or local time) can significantly oscillate, faster than the technological development rate. This can be exemplified by Malthusian cycles: *excess of resources – fast population growth – exhaustion of resources – fast population decline*, as well as by epidemics and natural disasters. Natural and social reasons can deviate the population size from the carrying capacity upward or downward. After

elimination of the reasons, the deviation relaxes to the level  $N(t)$  according to the Verhulst equation  $dn/d\tau = rn(1 - n/N(t))$ : here  $N(t)$  plays the role of the environmental carrying capacity, which slowly evolves with producing knowledge. *So, just the growth of  $N(t)$  in the historical time scale displays the informational essence of civilization.*

## 5. BIODIVERSITY MACRODYNAMICS

### 5. 1. Entropy of a biological community

A biological community represents a complex system in which every subject behaves occasionally, so the whole community can be regarded as a statistical ensemble. Separate taxa are subsystems of the ensemble. If the state of a taxon is considered to be adequately described by its abundance, we can easily find the number of ensemble states  $W = n!/(n_1!n_2!\dots n_N!)$ , where  $N$  is the number of taxa,  $n_i$  is the  $i$ th taxon abundance,  $n$  is the community abundance,  $n = n_1 + n_2 + \dots + n_N$ . Using Stirling's asymptotic formula for the factorials and finding the logarithm, we obtain an additive state function known as Shannon's entropy:

$$H = -\sum_{i=1}^N \frac{n_i}{n} \log_2 \frac{n_i}{n}.$$

This version of entropy can be called *populational entropy* emphasizing the fact that it is based on population abundances. Its maximum  $H_{\max} = \log_2 N$  is achieved at equal abundances of taxa  $n_i = \text{const}$ . It is seen that the entropy maximum depends only on the number of taxa  $N$ . Shannon's entropy can be regarded as a measure of nonequilibrium or, more exactly, the difference  $H_{\max} - H$  specifies the deviation of the community from its equilibrium state with maximum entropy. This measure of deviation has been used earlier by R. B. Evans et al. (1966) in the formulation of exergy and then developed by S. N. Nielsen (2007) in the semiotic analysis of ecosystems. On the other hand, in ecology the entropy is sometimes used as one of the measures of biodiversity along with the Kullback information measure, the exergy and others (S.E. Jørgensen and B. D. Fath, 2004; J. A. Camargo, 2008). N. Petrovskaya et al. (2006) applied these measures to a model community of three competitive species and showed that, in spite of the fact that all the species exhibit dynamically similar behavior, their contribution to the corresponding changes in the biodiversity measures is remarkably asymmetrical (emphasize that the matter concerns a nonequilibrium state).

Meanwhile, the above definition of entropy suffers from a grave shortcoming: *equilibrium abundances of taxa cannot in reality be equal to each other because of essential differences in their properties.* So, in calculations of the number of ensemble states we should be guided not by taxa abundances, but by a certain generalized characteristic, which in the equilibrium state tends to take the same value for every taxon. As further shown, the role of this characteristic is played by the taxon's memory size, which is of importance for the accumulation of valuable information necessary for survival. The question is how taxon's memory should be calculated: whether we need to take the total genome memory or only its non-redundant part.

To answer the question it is necessary to bear in mind that under constant ambient conditions the “junk” genome is not needed in principle (though then it would not be present in genome at all). But in reality the environment is subjected to significant changes, so there is a need to have an instrument providing variability of genome. This instrument is just located in the “junk” part in the form of mobile genetic elements. However, enlargement of this part of genome (for a reserve) is hampered by high energetic cost needed to replicate bigger DNA as well as to maintain and reproduce a variety of additional proteins resulting in growth of cell sizes. Therefore, there is a definite balance between the sizes of non-redundant and “junk” parts of genome, which depends, of course, on specific conditions of existence. In any case, it is clear that for its survival the taxon must have both parts of genome. It means that calculating the taxon memory size we should take into account the total genome memory. (Note that this conclusion has now seemed to be more reasonable than the prior suggestion to use only the non-redundant part of genome as containing the most valuable information – see: B.M. Dolgonosov, 2010b). At the same time, to order taxa by complexity and hence by the amount of stored *valuable* information we should use only the non-redundant part of genome that is what has been taken above – see subsection 3. 1.

As genome completely characterizes organism, it is naturally to think that the taxon state is described adequately by the mean genome size of organisms. Let  $\mu_i$  be the mean size of genome in the  $i$ th taxon. The taxon’s genetic memory is  $m_i = \mu_i n_i$ , and the total memory of all  $N$  taxa in the community is  $R = m_1 + m_2 + \dots + m_N$ . The number of different states of the community regarding as a statistical ensemble is now  $W = R!/(m_1!m_2!\dots m_N!)$ . Passing to the asymptotics and taking the logarithm, we get Shannon’s entropy in a new version:

$$H = -\sum_{i=1}^N \frac{m_i}{R} \log_2 \frac{m_i}{R},$$

which: can be named *memory entropy* contrary to the populational entropy written above. The above said about  $H_{\max} - H$  as applied to the populational entropy is completely transferred to the memory entropy.

## 5. 2. Equilibrium community

In an equilibrium state, the memory entropy achieves its maximum  $H_{\max} = \log_2 N$  the same as for the populational entropy, memory sizes of taxa equalize:

$$\mu_i n_i = m = \text{const},$$

and the community total memory becomes proportional to the taxa number  $R = mN$ . Thus, in a homeostatic state (i.e. close to equilibrium) the number  $N$  of viable taxa becomes again a key parameter of biodiversity, *but now this state is maintained not by equal abundances but by equal memory sizes of the coexisting taxa*. This conclusion is urgent for the biosphere, which usually stays in a homeostasis, except for seldom catastrophes disturbing it for a short while. Underline that *homeostasis does not mean lack of variability of ambient conditions, but only that this variability lies within definite limits, namely, does not result in fast and mass extinction of a great number of species*.

Note, by the way, that there is an interesting chemical analogy. A biological community resembles a **multiphase system** and there is the following correspondence between biological and chemical objects and quantities: taxa correspond to phases, the taxon memory  $m$  to the phase chemical potential, and the community total memory  $R$  to the thermodynamic potential of the system. It is known that in equilibrium chemical potentials of the coexisting phases equalize, and the same, as said above, occurs with the memory sizes of taxa.

The equalization of taxa memory sizes can also be explained as follows. The stability of a taxon correlates with its lifetime, which grows with accumulation of valuable information in memory because this increases the taxon's competitive ability. It means that memory size can be regarded as a macroscopic criterion of the natural selection. The taxa that lose competition for memory size to other members of community can go to extinction. As a result of this selection, memory sizes of the coexisting taxa tend to be equal. However, they cannot be exactly equal because of fast variations in ambient conditions, but equal only by orders of magnitude. *Such an equalization of memory sizes can be ensured not only by slow change in the genome size following the long-term trend in ambient conditions, but also by much a faster way – by the change in taxa abundances that compensates the underdevelopment of genome with higher abundance of the taxon.* After this equalization, the community total memory  $R$  will be proportional to the taxa number  $N$  in accordance with the above result  $R = mN$ .

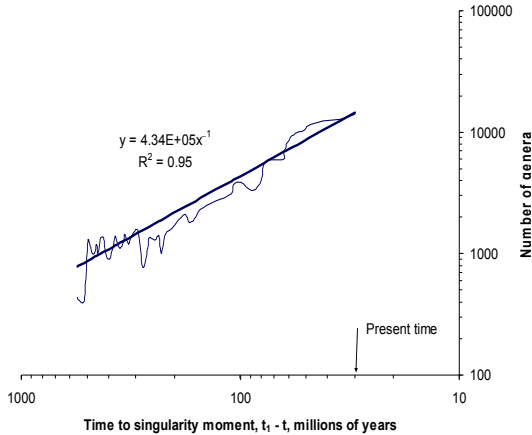
### 5. 3. Hyperbolic growth

The maintenance by a taxon of its memory size on the community mean level is a necessary condition for survival but not a sufficient one. Permanent variations of ambient conditions require of organisms to elaborate adaptive reactions and, consequently, to continuously produce knowledge in the coexisting taxa, otherwise the competition will be lost. Hence, *evolutionary processes will equalize (by orders of magnitude) not only memory sizes but also rates of knowledge production over all taxa.* The rate of knowledge production depends on both valuable information accumulated in genome and the store of mobile genetic elements promoting acceleration of the process. As a result of the equalization of rates in different taxa, the total production of knowledge by the whole community will be equal to  $\dot{q} = wN$ , where  $w$  is the mean rate of knowledge production per taxon. Recalling the logarithmic law of information compression in producing knowledge  $q = \ln R$  (compression occurs in encoding valuable information in genome), we obtain the same laws for knowledge production rate  $\dot{q} \sim e^q$ , the taxa number growth rate  $\dot{N} = wN^2$ , and the hyperbolic time-dependence of the taxa number  $N = w^{-1}(t_1 - t)^{-1}$  as in the case of humanity, but with distinct values of parameters. If taxa are genera (evolution of the genera number is shown on Fig. 8), then parameter values for the Phanerozoic biota are:  $w^{-1} = 4.34 \times 10^5$  taxa  $\times$  million years and  $t_1 = 30$  million years ( $R^2 = 0.95$ ). But if taxa are families then  $w^{-1} = 2.00 \times 10^5$  and  $t_1 = 70$  in the same units ( $R^2 = 0.96$ ) (these values have been found by A.V. Markov and A.V. Korotayev, 2009).

For species there are no reliable data. However, observing the trend in parameter values in the series of families–genera–species, we can roughly assess for species  $w^{-1} \sim 10^6$  taxa  $\times$  million years and the singularity moment  $t_1$  is disposed somewhere in the neighborhood



of our time plus/minus several thousands of years, *because the depletion of species composition of the Earth's biota under anthropogenic impact has become just during the last several thousands of years*. As thousands of years are not appreciable on the scales of tens of millions of years, we can adopt  $t_1 \approx 0$ .



**Fig. 8.** Hyperbolic growth of biodiversity (total number of genera of the continental and marine biota) during the Phanerozoic (data source: A. V. Markov and A. V. Korotayev, 2008). Singularity is achieved at the moment  $t_1 = 30$  millions of years.

The difference in singularity moments for the embedded taxa can be commented as follows. Considering the genera–family relation, we can notice that at the moment when the number of genera becomes infinite, the number of families remains finite. It means that at least one of the families becomes dominant tending to infinity. Similarly for the species–genera relation: at the moment of species singularity one of the genera becomes dominant also tending to infinity. It is clear that on the planet of a finite size the number of taxa cannot be infinite, but merely becomes large enough. It has not been clear yet whether this situation is possible from the biological viewpoint. At the same time, there is a suspicion that singularity must be achieved simultaneously for taxa of various levels, and the obtained discrepancy in singularity moments can be caused, for example, by high uncertainty in the original data.

Summarizing this section, we note the main conclusion: *there are two informational factors (macroparameters) that are subjected to the natural selection, these are: memory size  $m$  and knowledge production rate  $w$ . They equalize in the community providing the growth of the total memory size of civilization  $R$  and the total knowledge production rate  $\dot{q}$  according to a hyperbolic law.*

## 6. TRANSITIONS WITH CHANGE OF DOMINANT MEMORY TYPE

The hyperbolic growth of biodiversity had been lasting until a taxon appeared in the biosphere that could develop its neuronal memory (mainly due to developing social relations – see: E. Herrmann et al., 2009), became to actively use it for producing and storing knowledge, and, due to that, occupied monopolistic positions in the biosphere (of course, we mean humans).

The transition from the domination of genetic memory to that of neuronal memory in one of the taxa led to a qualitative change of the evolutionary process: to the beginning of hyperbolic growth of dominant taxon abundance and the cessation of hyperbolic growth of biodiversity (the latter is because *the dominant taxon monopolizes and destroys the biosphere*).

At present, we observe one more transition that is associated with the development of external memory. This type of memory has undergone several qualitative changes. It has been used in incipient forms since early stages of anthropogenesis (e.g. instruments of labor as examples for copying) and became to develop appreciably since the appearance of written language, especially since the beginning of book printing era. By the present century the amount of only printed material is estimated circa 200 petabytes =  $2 \times 10^{17}$  bytes =  $1.6 \times 10^{18}$  bits (How much information, 2003). The fastest growth of external memory occurred only in the last time. It began since the creation of computers and went on with improvement of their facilities (memory size and speed). By the beginning of XXI century the total external memory reached the level of neuronal memory of humanity and then surpassed it (Fig. 3). The development of this memory type will be resulted in consequences similar to those that were in the prior transition, namely, to the appearance of a dominant taxon no longer in biota but in the human world community. Apparently, it will be a pool of countries in which knowledge produces most intensively. However, this results not in growth of population in these countries (because knowledge growth essentially raises the living standard and dramatically increases its cost causing a reduction of birth rate), but in the elevation of its informational and economic power. In this process, the external memory size  $R$  increases exponentially with knowledge:  $R \sim e^q$  (this is a consequence of the logarithmic compression of information in producing knowledge), and the knowledge production rate grows proportionally to memory size:  $\dot{q} = wR \sim e^q$ , where  $w$  is the knowledge production rate per unit external memory size. Hence it appears that memory size obeys the equation  $\dot{R} = wR^2$  yielding a hyperbolic time-dependence  $R = w^{-1}(t_1 - t)^{-1}$ , where  $t_1 = (wR_0)^{-1}$  is the singularity moment,  $R_0$  is the initial size of external memory (at  $t = 0$ ).

To estimate the parameters, we take the year 2002 as initial, since for it there are data for the knowledge production rate  $v = \dot{R}$ . From the relationships  $v = wR_0^2$  and  $t_1 = (wR_0)^{-1}$ , we find  $w = v/R_0^2$  and  $t_1 = R_0/v$ . According to the above estimates, we have for the external memory with prevailing magnetic carriers:  $v \sim 10^{20}$  bits per year and  $R_0 \sim 10^{21}$  bits (see subsection 3.3). These values give  $w^{-1} \sim 10^{22}$  bits  $\times$  years and  $t_1 \sim 10^1$  years. Thus, the singularity moment in the development of external memory on magnetic carriers can be reached already during several decades. The type of carrier (magnetic) should be specified because, first, this type is basic now and, second, the appearance of a more improved carrier on an essentially different base (optics, graphene, or something other) will result in a significant increase in the information processing rate.

The calculated values of parameters are represented in Table 1 for various memory types. Emphasize that values of  $w$  are average for taxa of a corresponding level. For separate taxa this parameter will be scattered relative to the mean value. Note that the specific rates of knowledge production by the biota (per family) and by the humanity (per capita) coincide; however, a human (and a family in biota) produces knowledge twice faster than a genus and fivefold faster than a species (pay attention that Table 1 represents reciprocal values:  $w^{-1}$ ).

The above analysis shows that *the transition to a new memory type gives rise to a new civilization with a faster development rate. This civilization holds dominant positions till the next transition. With every new transition the time since one of them till the next becomes nearly*

three orders of magnitude shorter than the previous one. Indeed, the duration of biological evolution on the basis of genetic memory is measured by billions of years; the duration of anthropogenesis on the basis of neuronal memory, by millions of years; and the duration of informational epoch on the basis of external memory, by thousands of years (counting since the appearance of written language, though the domination of external memory has been reached quite recently).

By analogy with thermodynamics, biosystems with various dominant memory types can be regarded as phases, and the process of changing the dominant memory, as a phase transition. A thermodynamic phase consisting of particles is characterized in particular by chemical potential (defining as phase potential per particle) and a biological phase consisting of taxa, by memory size per taxon that can be named *biopotential*. The above-analyzed transitions in biosystems are not completed with establishing equilibrium between phases, since the development of the newly emerged phase goes on, its memory size grows, and biodiversity (the number of taxa) increases.

**Parameters of hyperbolic growth for various memory types**

**Table 1**

Memory type	Reciprocal specific knowledge production rate $W^{-1}$	Singularity moment $t_1$	References
Genetic memory in biota; taxa = families	$2.00 \times 10^{11}$ family $\times$ year	70 Myears forward since present time	Markov and Korotayev, 2009
Same; taxa = genera	$4.34 \times 10^{11}$ genus $\times$ year	30 Myears forward since present time	Ibid.
Same; taxa = species	$\sim 10^{12}$ species $\times$ year	Present time	Present work
Neuronal memory of humanity	$2.00 \times 10^{11}$ capita $\times$ year	Year 2027; exponent = $-0.99$	Foerster et al., 1960
	$2.15 \times 10^{11}$ capita $\times$ year	Year 2027; exponent = $-1$	Markov and Korotayev, 2009
External memory on magnetic carriers	$\sim 10^{22}$ bit $\times$ year	$\sim 10^1$ years forward since present time	Present work

In this sense the transitions considered are nonequilibrium phase transitions. A definite homeostasis (a kind of quasi-equilibrium) is possible when easily available resources have already been exhausted (due to the finiteness of biosphere), but possible only for a short while, until intrinsic changes in the system caused by accumulation of knowledge, development of new resources, and ripening of a new structure as a basis for a new memory type, eventually reveal themselves. And later on, a new memory type appears and a new phase transition occurs.

## 7. ADVANCE OF THE NEW CIVILIZATION

The rise of a new civilization in the depths of the old one is accompanied with competition for resources. If there is even a small advantage of the new civilization, it can reach dominant positions in due course. Suppose that the new civilization has a slightly larger memory or knowledge production rate and consider how this civilization rises. The autonomous development of each civilization proceeds in a hyperbolic regime. From the informational viewpoint, the interaction of both rival civilizations consists in that they try to impede knowledge production rate of each other.

Let  $\dot{q}_1$  and  $\dot{q}_2$  be the knowledge production rates in civilizations (or, in other words, the information flows circulating inside them). The second civilization influences the first one by the flow  $\dot{q}_2$ , and the first civilization tries to decrease this influence by means of its own flow  $\dot{q}_1$ . To completely get rid of negative influence of the rival, the first civilization must have its own flow much greater than the second one, so the external pressure on the first one becomes negligible at  $\dot{q}_1 \rightarrow \infty$ . Otherwise, if its own flow is small  $\dot{q}_1 \rightarrow 0$ , the pressure from the rival is completely determined by its flow  $\dot{q}_2$ . These limiting cases can be interpolated by the expression  $\dot{q}_2 / (1 + \gamma_1 \dot{q}_1)$  (multiplied by a constant coefficient) that describes the pressure of the second civilization on the first one. Thus, the competitive struggle on the field of information is described with the following equations:

$$\ddot{q}_1 = \dot{q}_1^2 - \beta_1 \dot{q}_2 / (1 + \gamma_1 \dot{q}_1), \quad \ddot{q}_2 = \dot{q}_2^2 - \beta_2 \dot{q}_1 / (1 + \gamma_2 \dot{q}_2),$$

where:  $\beta_1, \beta_2 \geq 0$  are influence coefficients (describing intensities of external pressure), and  $\gamma_1, \gamma_2 \geq 0$  are counteraction coefficients (intensities of counteraction against external pressure). The quantities  $q_i$  have been normalized in such a way that coefficients at  $\dot{q}_1^2$  and  $\dot{q}_2^2$  were equal to unity.

Let us consider the simplest case, when the external pressure does not meet with a rebuff on its action:  $\gamma_1, \gamma_2 = 0$ . Then the equations take the form:

$$\ddot{q}_1 = \dot{q}_1^2 - \beta_1 \dot{q}_2, \quad \ddot{q}_2 = \dot{q}_2^2 - \beta_2 \dot{q}_1.$$

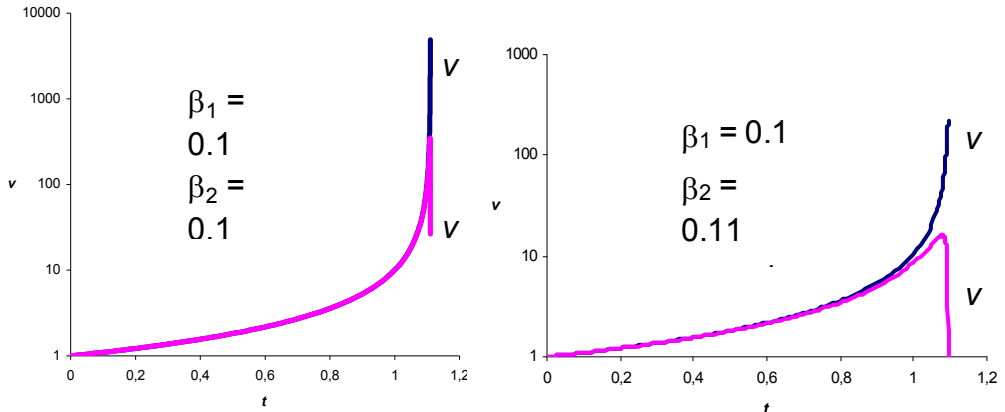
Introducing the knowledge production rate  $v = \dot{q}$ , we rewrite these equations in the form:

$$\dot{v}_1 = v_1^2 - \beta_1 v_2, \quad \dot{v}_2 = v_2^2 - \beta_2 v_1.$$

At  $v_1 = v_2 = 0$  we have an unstable equilibrium because any, even small informational disturbance (e.g. by receiving some information from the world) leads to a hyperbolic growth of civilizations. At  $\beta_1 = \beta_2 = 1$  the solution is  $v_1 = v_2 = 1$ , but it is structurally unstable, because a small change in the parameters  $\beta_i$  results in the violation of equilibrium. In the general case, the equations cannot be solved analytically; therefore we have found a numerical solution at initial conditions  $v_1(0) = v_{10}$ ,  $v_2(0) = v_{20}$  that determine knowledge production rates in civilizations at the beginning of the process.

The computation results are depicted on Fig. 9. The top chart demonstrates the development of civilization under equal influence coefficients  $\beta_1 = \beta_2$  but at slightly different initial flows  $v_{10}$  and  $v_{20}$  (the difference is only  $10^{-4}$ ). However, this difference appears to be sufficient to predetermine the fate of the less successful civilization (with less initial knowledge production rate). At a certain moment of time ( $t = 1.11$  in relative units) it does not stand up to the competition and rapidly decays, though till this moment both civilizations developed practically in equal measure. The civilization with a slightly higher initial knowledge production rate continues to grow not responding to the loss of the rival.

The bottom chart shows the development of civilizations under equal initial rates  $v_{10} = v_{20}$  but at slightly different influence coefficients. The civilization that acts more intensively on its rival survives and continues developing further, and the other civilization decays that happen at the moment  $t = 1.09$ .



**Fig. 9.** Knowledge production rate versus time in the system of two rival civilizations: (a) under equal influence coefficients  $\beta_1 = \beta_2$  and slightly different initial rates; and (b) under equal initial rates  $v_{10} = v_{20}$  and slightly different influence coefficients.

*Thus, a microscopic advantage of one of the rival civilizations is sufficient to win competition. This is only a question of time.*

In connection with the collapse that overtook the less successful civilization it is appropriate to refer to the conclusion of May (2005) and D. J. Fisk and J. Kerhervé (2006) that a large dynamic system with a complex set of interactions between elements does not necessarily maintain dynamic stability as it grows in size, moreover increased complexity might be the cause of the collapse of civilization that is in accordance with the qualitative argument of J. A. Tainter (1995). Long-term social sustainability depends on understanding and controlling complexity (J. A. Tainter, 2006) or, in other words, on the amount of knowledge stored.

The analysis carried out can be illustrated by mutual relations of humanity and global biota. The advantages of humanity in the knowledge production rate have resulted eventually in

the suppression of biota that opens ways to the monopolistic exploitation of natural resources accompanied with environmental pollution, destruction of biota, and disturbances in biotic mechanisms of climate control. Till the present time a part of disturbed terrestrial ecosystems reaches 60 % (World Resources Institute, 1988). In these conditions natural ecosystems are no longer able to restore themselves. So it is quite probable that the uncontrollable human impact on biota can result in a progressive deterioration of living conditions and a reduction in human population size. Different scenarios of this process have been considered earlier (B. M. Dolgonosov and V. I. Naidenov, 2006; B.M. Dolgonosov, 2009, 2010b) on the basis of the model developed there.

## 8. CONCLUSIONS

We have analyzed the connection between the dominant memory (genetic, neuronal, or external) and the type of civilization, supposing that a key trait of civilization is the production of knowledge needed for survival in the complex world. The analysis carried out demonstrated transitions between different types of civilization, which can be interpreted as nonequilibrium phase transitions. These transitions are developed in the following succession.

At the beginning of the formation of biota a reliable way of encoding and storing information on the basis of nucleotides appears. This way along with the natural selection allows finding and maintaining valuable codes. This induces growth of memory size that is necessary for accumulating vital information. The total memory size of biota grows according to a hyperbolic law, and the same law takes place for the growth of biodiversity (meaning the number of taxa) because taxa, as memory carriers, contribute to the total memory of biota. Further, as noted by A.V. Markov and A.V. Korotayev (2009), taxa gradually occupy ecological niches. However, because of the finiteness of the planet, easily accessible niches are eventually exhausted, so further appearance of new taxa becomes more and more energetically expensive. As a result, the growth of biodiversity slows down and deviates from the hyperbolic law that can be regarded as a transition growth regime toward the complete cessation of growth. According to the cited work, this new growth regime was observed at the end of the Cenozoic era, approximately from the beginning of anthropogenesis.

Long before the beginning of the transition, yet on the stage of hyperbolic growth, the biota finds a new way of encoding information on the basis of nerve cells. This originates a parallel development of a new memory – neuronal, which is used initially for regulation of physiological functions, and then more and more for processing sensory information. Further, a taxon appears with more developed neuronal memory both by its volume and by processing information rate (especially due to the development of cortex and, on this basis, “cultural memory”). In this process (we mean the anthropogenesis) the neuronal memory becomes eventually dominant. Its total size grows by a hyperbolic law just like the population of the taxon. The hyperbolic growth of population goes on until the finiteness of planetary resources becomes noticeable. Then, population growth rate starts reducing that is observed since the second half of XX century with further tendency to the cessation of growth or even to depopulation.

Meanwhile, the expanding humanity develops a new memory type on the basis of external carriers – cultural artifacts, physical specimens, images, texts, and finally computer carriers. In due course the external memory surpasses neuronal one by size and becomes dominant. Its total size also grows by a hyperbolic law. The external memory is replenished by almost all humans (though unique valuable information among all of the replenished is small),

but the store of knowledge is contributed mainly by developed countries. These are the countries that form a taxon (a pool of countries) in the world human community, which develops most rapidly and therefore represents the dominant taxon. Knowledge production demands large investments in science, education, high technologies, and altogether in economics and culture. Far from all countries have such means, and it is unlikely that the developed countries took on themselves a burden to finance these spheres of activities in alien countries especially with inefficient, corrupt regimes. It would seem that the Internet lifts these restrictions making it possible to use information in any place on the planet independently of that where the information has been produced. However, this fact too little helps in the development of their own infrastructure of knowledge production, economics, and culture. The current globalization does not predetermine equal levels of the development of countries participating in this process. Always there will be scientific and technological leaders and will be countries with less or even very low developmental level, which play an auxiliary role of suppliers, for example, of raw materials, consumer goods, and labor force. Since the growth of knowledge and economic power obeys the hyperbolic law, there will be no keeping up with leaders.

Thus, the appearance and development of every new type of memory leads to radical changes in the structure of old civilization and to the emergence from its depths of a new civilization developing more rapidly.

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## APPLIED LEGISLATIVE METHODOLOGY IN THE ANALYSIS OF LANDSLIDE HAZARD. CASE STUDY FROM MARAMUREȘ COUNTY

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**ABSTRACT.** – **Applied Legislative Methodology in the Analysis of Landslide Hazard. Case Study from Maramureș County.** Within the context of Romania's adhering process to the E.U., several legal instruments were created in order to reduce the impact of natural hazards. In the field of landslide risk, the Governmental Decision 447/2003 establishes "*The mapping methodology and the content of landslide and flood risk maps*", describing the criteria used to determine the sliding potential in a certain area. The case study applying the method described in this Governmental Decision focuses on the administrative unit of Groși, from Maramureș County, which is characterized by high values of annual precipitation and a lithology dominated by contractive clays and marl. With the help of the ArcGis 9.3 software a susceptibility coefficient was computed and reclassified into three categories: low, medium and high. The validation of the results was based on previously mapped landslides. Another analysis of landslide susceptibility was also performed using statistical methodology. Both the advantages and disadvantages which resulted from this comparative analysis are thoroughly presented and discussed. Nevertheless, the overall results point to a medium landslide susceptibility of most of the study area and high landslide susceptibility in the area affected by active and partially stabilized landslides. In order to evaluate the landslide hazard, the frequency and magnitude of the sliding processes was also estimated by heuristically establishing the return periods of rainfall-triggered landslides and the volume of material displaced during past events.

**Keywords:** *Maramureș, landslide hazard, legislative methodology, multivariate statistic analysis.*

### 1. INTRODUCTION

In the evolution of geographic systems, natural hazards are thresholds which can shift the whole system to a new state of equilibrium. When the human component is also involved, they can cause damage and casualties, which define a state of risk. Nevertheless, hazards are an association of causing factors, or legally binding circumstances, which determine a perfectly natural energy outburst (I. Mac, D. Petrea, 2002).

Knowing this association of factors, one can establish the spatial coordinates of almost any natural hazard. However, the etymology of the concept suggests there is a large amount of uncertainty related to the fulfilment of its potential. Therefore, defining the temporal coordinates of a hazard is done with greater difficulty, especially due to the lack of sufficient data. Considering these aspects, a hazard can be ideally characterized by the answers to the questions "what", "where", "when", "how strong" and "how often" (M. J. Crozier, T. Glade, 2005).

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The answer to the first question is represented in this study by landslides, a process which shapes the slope profile under the gravity impulse, on a sliding surface (V. Surdeanu, 1998), included in the larger category of mass movements.

The answer to the question “where” is given by two sets of results generated by applying the method approved by the Romanian legislation and the statistical multivariate method in a study area located near the Baia Mare municipality, in Maramureș County.

In order to complete the hazard analysis with the answer to the last questions, the probability of occurrence of a landslide with a particular magnitude must also be determined. In order to achieve this, the date of occurrence of past landslides, when known, was correlated with the climatic circumstances from the respective periods, in order to approximately determine the return periods and the magnitude of potential landslides, using the landslide triggering rainfall cyclicity.

Several GIS techniques were used in defining the data base, the mapping process and spatial analysis performed. These were completed with field observations and a rich experience of applying the legislative methodology in civil engineering projects, which helped adapting the models in order to represent reality as effectively as possible.

## **2. SUSCEPTIBILITY ANALYSIS AND GIS TECHNIQUES**

When considering landslides as natural hazards, spatial analysis is being often used in mapping susceptibility, a measure of an areas' predisposition to landslides, based on the presence of some known causing factors or on the history of events which affected a particular slope (M. J. Crozier, T. Glade, 2005). Using GIS techniques in combining these factors provides a higher accuracy and time economy, the effort and human resources needed being also considerably reduced (D. E. Alexander, 2008).

In addition to this, combining spatial data by means of GIS techniques allows the production of a multitude of models. However, choosing the most appropriate one cannot be accurately done without the experienced opinions of geomorphologists and geologists who know the real behaviour of the natural process. Therefore, the best results in hazard zonation are given by the combination of heuristic reasoning and computer-assisted models (C. J. van Westen et al., 2006). The two methods presented in the next section combine these two elements in different proportions and thus, the results vary accordingly.

### **2. 1. Legislative methodology**

*“The mapping methodology and the content of landslide and flood risk maps”*, established by the Governmental Decision 447/2003, acts in our country as the main legislative basis for the administrative actions of local and regional authorities. The landslide risk map, made accordingly to the instructions described in this decision, represents the legal act used by the county council to declare a landslide risk zone (G.D. 447/2003, chapter 1, art. 3 (2)), to establish the actions needed for risk prevention and mitigation, as well as to authorise the conditions for building in those specific areas (G.D. 447/2003, chapter 1, art. 4).

From the perspective of applied geomorphology, it is useful to know the variety of methods found in the scientific literature which are used for mapping landslide risk, but not sufficient, as only legislation can ensure the financial support needed by a practitioner in order to put into practice a prevention and mitigation project.

This is the reason why the first method used to establish the landslide susceptibility for the study area is represented by the method described in the Romanian legislation. The combination of factors considered for determining the sliding potential is achieved by means the following mathematical expression, originally found in the technical regulation GT-019-98 (“Ghid de redactare a hărților de risc la alunecare a versanților pentru asigurarea stabilității construcțiilor”, 1998).

$$K(m) = \sqrt{\frac{K(a) \times K(b)}{6} \times [K(c) + K(d) + K(e) + K(f) + K(g) + K(h)]}$$

in which:  $K(m)$  = average susceptibility coefficient;  $Ka$  = lithologic coefficient;  $Kb$  = geomorphologic coefficient;  $Kc$  = structural coefficient;  $Kd$  = hydrologic and climatic coefficient;  $Ke$  = hydrogeologic coefficient;  $Kf$  = seismic coefficient;  $Kg$  = forest coverage coefficient;  $Kh$  = anthropic coefficient.

For each of these eight factors their classes of susceptibility are determined heuristically by means of a general description, which allows the selection of a value between 0 and 1 for each factor. The susceptibility classes are defined as follows: zero (0), reduced (< 0.10), medium (0.10-0.30), medium-high (0.31-0.50), high (0.51-0.80) and very high (>0.80). Eventually they are reclassified in three classes: low (< 0.10), medium (0.10-0.50) and high (0.51-1) (G.D. 447/2003).

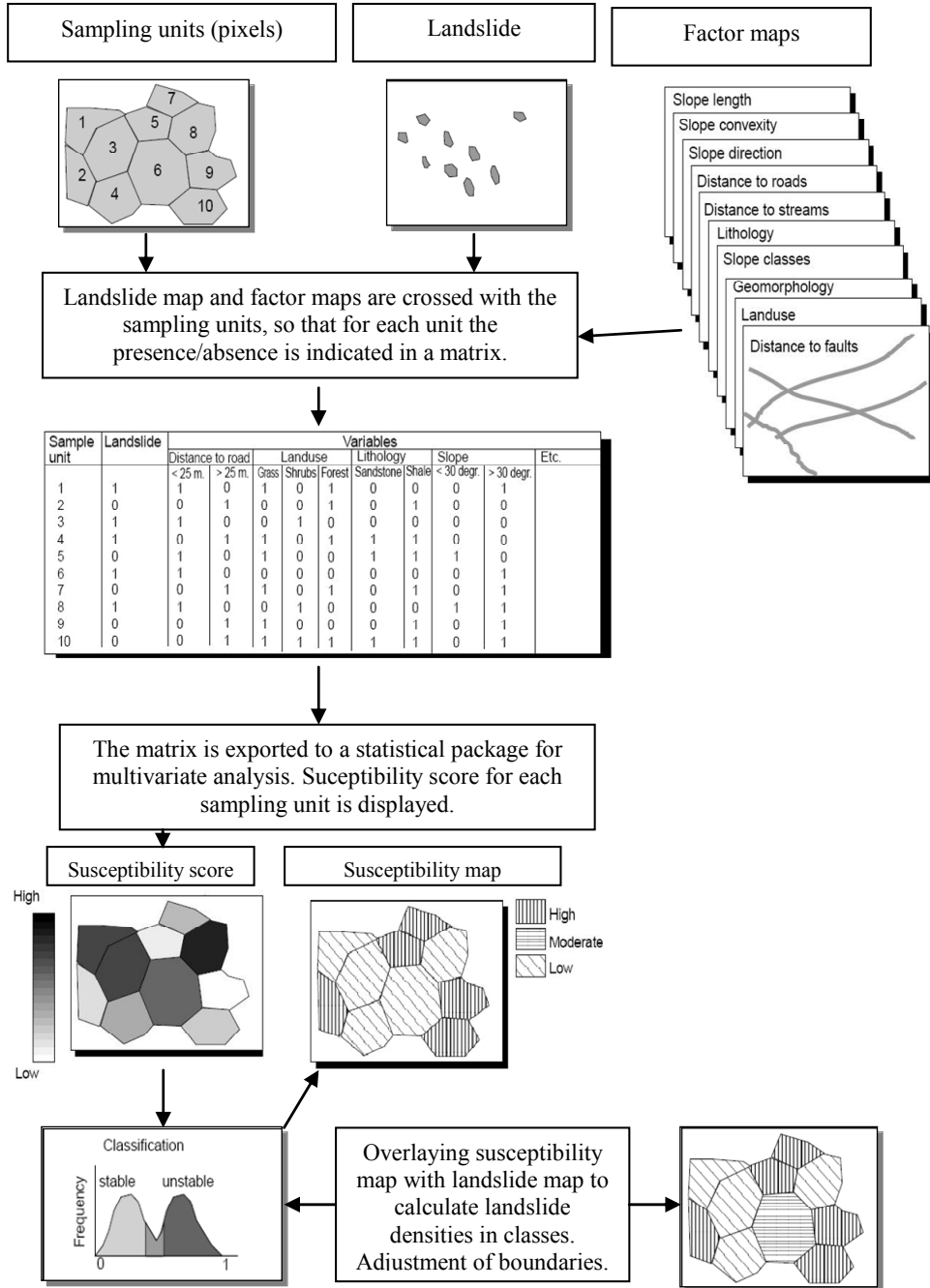
## 2. 2. Statistical analysis

Although in our country the legislative method is mostly a heuristic one, the most commonly used method for determining landslide susceptibility in recent studies, especially at a large and medium scale (<1:10.000 – 1:100.000) (T. Glade, M. J. Crozier, 2005), is statistical analysis (e.g. C. J. F. Chung, A. G. Fabbri, 2008, N. R. Regmi et al., 2010). Already in 2006, F. Guzzetti et al. counted, for the previous six years, over 40 such studies published in major international journals and their ever rising number is a proof of the method’s efficiency, when properly validated (C. J. F. Chung et al., 2003, F. Guzzetti et al., 2006).

Starting from the assumption that a certain combination of factors, which have previously caused a landslide, will similarly act in the future, this quantitative method establishes statistical relationships between the factors and the distribution of mapped landslides, seen as dependent variable. These relations are then applied to the whole study area in order to classify it according to the factors’ influence on landslide susceptibility (M. J. Crozier, T. Glade, 2005).

In order to include more than two factors which act as variables, as it is the case for landslide occurrence, the model usually used is that of multivariate analysis (Maria Rădoane et al., 1996), which is basically a set of techniques for data analysis. One of these techniques is represented by the linear probability model of the logit type, also called *logistic regression*, which uses one or more variables to determine a single, nominal, dependent variable (J. R. Hair et al., 1992), in this case, the presence or absence of landslides. The result will be a map (fig. 1) in which for each pixel, the landslide susceptibility is represented by a value included in the interval 0-1 (0-100%).

The relation between landslides and the factors contributing to their occurrence in the area of study is described by a set of coefficients which were generated by the logistic regression performed with the help of the free statistical software R, available at <http://www.r-project.org>.



**Fig. 1.** GIS application in multivariate statistical analysis of landslide susceptibility (after C. J. van Westen et al., 1997).

A positive coefficient increases the probability of landslide occurrence, whereas a negative one diminishes it (J. R. Hair et al., 1992). As illustrated in fig. 1, the susceptibility of the whole area was computed using the Map Algebra functions and the following expression which multiplies the regression coefficients ( $a_0, a_1, a_2, a_3$ ) and the independent grids used to derive them ( $x_1, x_2, x_3$ ):

$$prediction = 1 \div (1 + (exp(- (a_0 + a_1x_1 + a_2x_2 + a_3x_3 + \dots))))^1.$$

### 2. 3. Validation

For the first method, the validation is performed by comparing the spatial distribution of the mapped landslides with the susceptibility map generated. The percentage of the surface affected by landslides which coincides with the area with high susceptibility will give the goodness of the model.

For the statistical method, the validation stage is based on the cross-validation technique (e.g. C. J. F. Chung et al., 2003, C. J. F. Chung, A. G. Fabbri, 2005, 2008, R. Bell, T. Glade, 2004, M. J. Crozier, T. Glade, 2005) which uses a training data set and a test data set, the first one used for building the model and the second for validating it (A. Brenning, 2005) and estimating its ability to predict future landslides (F. Guzzetti et al., 2006).

The goodness of the model is given, as for the first method, by the percentage of landslide surface which matches the highest susceptibility classes. In order to compare the results of the two methods, the classes employed were determined using the same value intervals: low (<0.10), medium (0.10-0.50) and high (0.51-1), as specified in the legislation.

### 3. PROBABILITY OF LANDSLIDE OCCURRENCE

Estimating landslide hazard usually includes two stages: determining the susceptibility of the territory to the process and estimating the probability that a triggering factor might activate or reactivate a landslide. The latter consists of the relationship established between the magnitude and the return period of landslide occurrence under the influence of a particular triggering factor (C. J. van Westen et al., 2003).

As the seismic factor does not act as a trigger in the study area, the most important influence upon landslide activation and reactivation is manifested by rainfall. The lithology of the area is dominated by covering contractile clay deposits. During the years with low precipitation, deep fractures develop, reaching the underlying marl. When rainfall eventually occurs, these fractures, which can be up to 20 cm wide, enable rain water to rapidly reach this level and create a sliding surface on the marl deposits, located at a depth of approximately 2-4 m.

The lag time between heavy rainfall and landslide occurrence, as well as specific rainfall thresholds depending on the water already infiltrated, require a detailed analysis, which is still lacking at this point. Therefore, the only way to establish a general relationship between past landslide events and rainfall is heuristically, taking into consideration the average annual rainfall in order to determine the rainy years (more than multiannual average rainfall) which have a correspondence in landslide activity, preferably following a sequence of 2-3 years with low precipitation, which favour the occurrence of fractures into the covering deposits.

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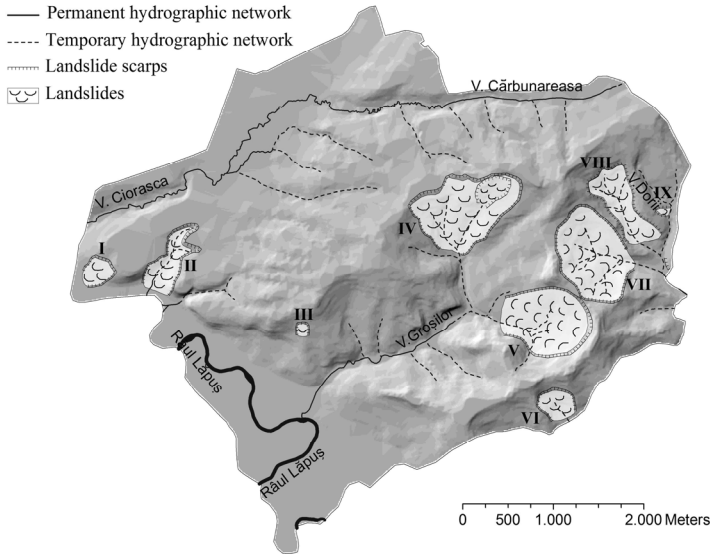
<sup>1</sup> [http://webhelp.esri.com/arcgisdesktop/9.2/index.cfm?TopicName=Regression\\_analysis](http://webhelp.esri.com/arcgisdesktop/9.2/index.cfm?TopicName=Regression_analysis)

The volume of each landslide was then approximatively estimated and was used to heuristically determine the magnitude classes which characterise the Groși area. The return periods established for the years with landslide potential were used to determine the return periods of landslides with different magnitudes, inferred from the surface affected and the displaced volume.

Validating these results is very difficult, due to the lack of complete temporal information for each of the mapped landslides. Therefore, the results are considered as a general estimation which could eventually be used in a more accurate and detailed landslide probability analysis.

#### 4. THE GROȘI STUDY AREA

The study area includes an administrative unit from Maramureș County, situated 5 km south from the Baia Mare municipality and is represented by a former piedmontal unit from the foot of the volcanic mountains Gutâi (P. Coteț, 1973), fragmented by the Săsar and Chechiș rivers, in the northern part of the Baia Mare Depression.



**Fig. 2.** Mapped landslides in the Groși study area: I-DJ 182B, II-DC 79, III-Ocoliș, IV-Dâmbeni, V-La groape, VI-Habra, VII-Strujereilor, VIII-Bulbuc, IX-DN 18B.

The lithology of the Groși area is represented by Quaternary deposits (up to 20 m thickness), above a much thicker layer (more than 800 m) of Pannonian marl (Miocene - Pliocene). The covering deposits, which are affected by mass - movements, consist mostly of contractive clays, with a high water - retentive capacity (values of the retention coefficient range between 150 and 250, according to the NE 00196 normative<sup>1</sup>) and the sliding surface is generally found at their basis, on the marl deposits.

The climate is characterized by an average annual temperature of 9.7°C and an average rainfall of 890.8 mm/year (1971-2007), due to the orographic convection of the western air masses. The hydrographic network consists of two permanent streams, Cărbunăreasa and Groșilor Valley, which are collected by Lăpuș River, and some temporary streams, collected by Chechiș River. 47% of the runoff comes from rainfall, 50% from rainfall and snow melt and 3% from snow melt (I. Ujvari, 1972).

<sup>1</sup> P.U.C.M. (1978) - *Instrucțiuni tehnice pentru proiectarea și executarea construcțiilor fundate pe pământuri cu umflări și contracții mari*, Institutul central de cercetare, proiectare și directivare în construcții, București.

The land use reflects the main activities, fruit cultivation and raising animals. Thus, 45% of the territory is used as grassland and 21% as pastures, while the southern and south-western slopes are cultivated with fruit trees (9%). The arable land occupies 25% of the area and only 1.78% is represented by forests<sup>1</sup>.

## 5. RESULTS OF THE SUSCEPTIBILITY ASSESSMENT

In assessing the landslide susceptibility of the Groși area, two methods were tested, as previously presented. The spatial data used in both cases consisted of a landslide map and several other maps illustrating the spatial distribution of each factor considered. Fig. 2 illustrates the 9 main landslides mapped in the study area. They are generally historical landslides which had periods of activity in the past and incorporate smaller reactivated landslides (fig. 3). The covering deposits are generally 2 m thick, including them in the category of shallow landslides (V. Surdeanu, 1998), but some reactivated portions accumulated thicker deposits of up to 4m.

### 5.1. Applied legislative methodology

According to the legislative methodology used to generate the landslide susceptibility map (GT-019-98 normative), 8 factors were included in the final calculation, which was performed with Map Algebra, included in the ArcGis 9.3 software:



**Fig. 3.** Toe of a more recently reactivated landslide body on the DC 79 landslide.

*Ka* - the lithologic factor consists of 4 lithologic units, for which the susceptibility coefficient was heuristically appreciated. Thus, most of the study area (74%) is characterised by Quaternary covering deposits with an average thickness of 2-4 m, occasionally reaching up to 20 m, consisting of unconsolidated sedimentary rocks (contractive clays), over a more than 800m thick deposit of Pannonian marl (fig. 3). The northern sector, represented by the medium level of fluvial terraces (9%), is also covered with contractive

clays on a layer of Pleistocene sediments. For both of these areas, the landslide susceptibility was considered as very high, therefore the corresponding coefficient, *Ka*, has the value 0.8. The south-western and western sector, corresponding to the fluvial plane of the Lăpuș River, consists of alluvial deposits (13.5%), while the fourth lithological unit characterises the interfluvial sector with colluvium (3.5%). For both units, the susceptibility coefficient was appreciated at 0.25 (medium susceptibility);

*Kb* - The geomorphologic factor is represented by a combination of slope (I. A. Irimuș, 1997), drainage density and relative relief. Each of these parameters was classified according to their influence upon landslide susceptibility (table 1);

<sup>1</sup> *Strategia de dezvoltare socio-economică a comunei Groși, Județul Maramureș, 2009, <http://subm.ro/>.*



**Classification of geomorphologic parameters used to determine the susceptibility coefficient Kb**

**Table 1**

Kb	Slope (°)	Drainage density (km/km <sup>2</sup> )	Relative relief (m/km <sup>2</sup> )
0	0	0	0
0.05	1-2	0-0.5	0-10
0.10	2-3	0.5-1	10-20
0.20	3-4		20-40
0.30	4-5	1-1.5	40-60
0.40	5-6		60-80
0.50	6-7	1.5-2	80-100
0.60	7-8		100-110
0.70	8-9	2-2.5	110-120
0.80	9-32	2.5-3.5	120-140

*Kf* - The seismic factor has a 0.5 value of the corresponding coefficient. This was given by the 6 seismic intensity degree (MSK<sup>1</sup>), characteristic for Maramureș County;

**Land cover classes and the corresponding Kg coefficient**

**Table 2**

CLC code	Forest vegetation (%)	Kg values
2	<20	0.80
3	<20	0.80
8	<20	0.80
12	<20	0.70
16	20-80	0.55
18	<20	0.85
20	<20	0.70
23	>80	0.10
40	-	0

2 = Discontinuous urban fabric; 3 = Industrial and commercial units; 8 = Dump sites; 12 = Non-irrigated arable land; 16 = Fruit trees; 18 = Pastures; 20 = Complex cultivation patterns; 23 = Broad-leaved forests; 40 = Water courses.

*Kc* - The structural factor is considered to have a corresponding coefficient of 0.10, unitary for the whole study area, characterised by rather horizontal lithologic bands;

*Kd* - The hydrologic and climatic coefficient was considered given the hydrologic and climatic characteristics of the study area and it was appreciated to have a very high influence upon landslides, both as a conditioning and triggering factor. Thus, it has a homogenous value of 0.85;

*Ke* - The hydrogeologic factor is represented by a general phreatic depth of less than 5m, with frequent springs at slope toe and on the slope surface. This corresponds to a high level of influence upon landslide susceptibility, with a 0.70 value of the Kb coefficient for the entire area;

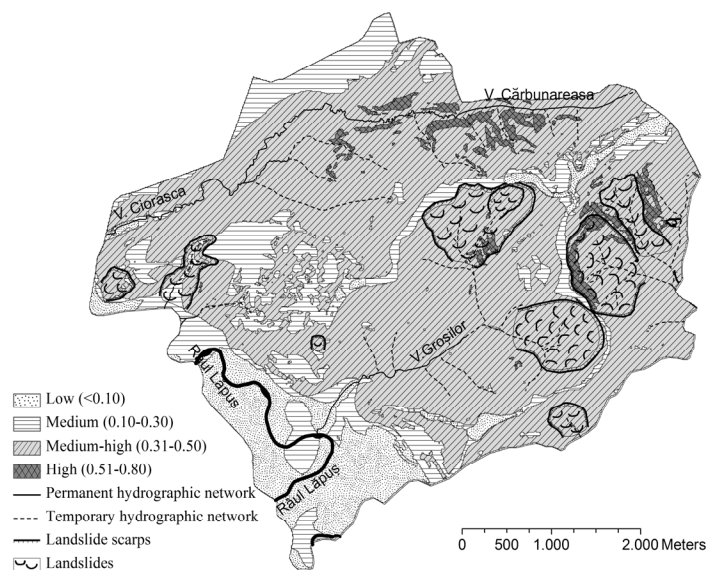
*Kg* - The forest coverage factor was determined using the land use map, by taking into consideration the percentage of forest vegetation. Thus, a specific coefficient was determined for each of the 9 Corine Land Cover (CLC) categories identified in the study area, as presented in table 2. The special situation of the fruit trees plantations, which are frequent in the study area, was considered from the stability point of view;

*Kh* - The anthropic factor influences the landslide susceptibility by specific constructions which determine the overburden pressure on the slopes, change the slopes profiles or the ground water level. As this is the case especially on the quasi-levelled terrace surfaces, while the transport network spreads on the slopes, the value of the coefficient was appreciated separately for built areas at 0.30 (CLC 2, 3, 8) and un-built area at 0.20 (CLC 12, 16, 18, 20, 23, see table 2).

With the expression previously presented, the 8 classified factor maps were combined in order to determine the average

<sup>1</sup> Medvedev-Sponheuer-Karnik seismic intensity scale (MSK-64).

susceptibility coefficient ( $K_m$ ). The resulting susceptibility map was then reclassified into three susceptibility classes, according to the  $K_m$  value: low ( $<0.10$ ), medium ( $0.10-0.30$ ) and high ( $0.51-1$ ). As a result, 11.1% of the area is included in the lowest susceptibility class, 85.8% in the medium susceptibility class and 3.1% in the high susceptibility class. The highest value of the average susceptibility coefficient was 0.57. As most of the study area was classified as



**Fig. 4.** Landslide susceptibility map of the Groși area, generated by applying the legislative methodology.

medium susceptible to landslides, a better illustration of the susceptibility variation is obtained by using the more detailed classes, as shown in fig. 4.

The validation of the results included 89.8% of the mapped landslides in the medium-high susceptibility class ( $K_m$  between  $0.31-0.50$ ) and 6.6% in the high susceptibility class ( $K_m$  between  $0.51-0.80$ ). Taking into consideration the fact that the very high susceptibility class ( $K_m > 0.80$ ) is usually attributed in practice to active, massive landslides, which is not the case in the

study area, the absence of such a class is seen as a valid result. In addition to this, the fluvial plain and the most extended interfluvial sectors were correctly classified in the low landslide susceptibility class. Therefore, the overall susceptibility map was considered as satisfactory and realistic.

## 5. 2. Applied statistical methodology

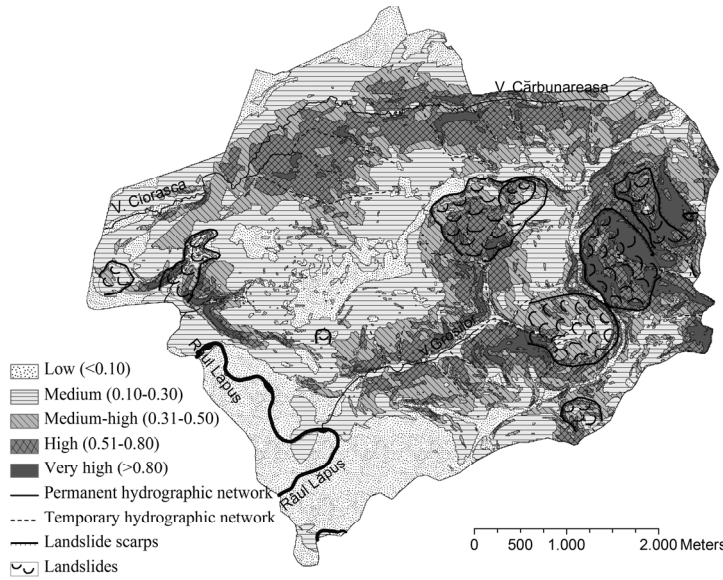
The landslides used to generate the susceptibility map of the Groși area were represented by the landslides DJ 182B (I), Ocoliş (III), Dâmbeni (IV), Habra (VI), Strujereilor (VII), and the test set used for validation included landslides DC 79 (II), La groape (V), Bulbuc (VIII) and DN 18B (IX) (fig. 2).

The factors selected for the multivariate statistical analysis were the Digital Elevation Model, slope, aspect and drainage density derived from the DEM, a geology grid and a land use grid. The latter two included the same lithology and land use classes used in the previous section (table 2).

The landslide and factor layers were transformed into grids with 10 m resolution. Based on a reclassified landslide grid with the value 0 for non-landslide pixels and 1 for landslide pixels, 400 randomly generated pixels were selected and used to extract 400 pixels as samples from each factor grid.

These were eventually used to determine the coefficients of the logistic regression.

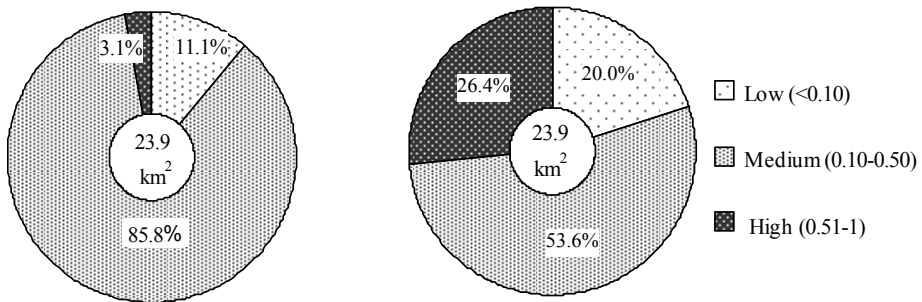
The susceptibility map (fig. 5) was generated using the Map Algebra included in the



ArcGis9.3 software, multiplying each original grid by its respective coefficient, thus, applying the results of the logistic regression to the whole study area. Reclassifying the results according to the susceptibility classes previously employed in the legislative method, 20.0% of the study area was included in the low susceptibility class, 53.6% in the medium susceptibility class and 26.4% in the high susceptibility class.

**Fig. 5.** Landslide susceptibility map of the Groși area, generated by statistical analysis.

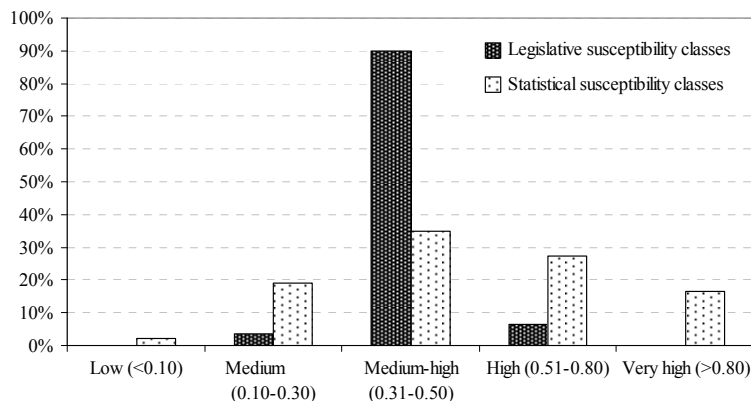
In order to validate the capacity of the statistical model to predict future landslides, the testing set of landslides was transformed into a grid and using Map Algebra it was statistically



**Fig. 6.** Percentage of the study area classified in the three susceptibility classes, according to the legislative method (left) and statistical method (right).

compared to the susceptibility grid, already classified into the 5 detailed susceptibility classes (fig. 5). Thus, only 2.2% of the mapped landslides were included in the low susceptibility class, 19.0% in the medium class, 34.8% in the medium-high class, 27.3% in the high class and 16.7% in the very high susceptibility class, indicating a good validation of the model.

Fig. 6 illustrates the percentage of the study area included in the three susceptibility classes from the two sets of results. At first sight, the statistical method seems to overestimate the class of high susceptibility (26.4%), although this is validated by 44% of the mapped



**Fig. 7.** Percentage of test landslides mapped in each susceptibility class.

are included in this category by the legislative susceptibility map. Based on field experience and the observation of recent reactivations inside past landslides, the results of the statistical method are closer to reality than those of the legislative one.

In what concerns the medium susceptibility class, the legislative results suggest a general condition of the Groși area as susceptible to shallow landslides. The statistical results indicate the same tendency, but to a lesser extent, nevertheless, characterising more than half of the study area (fig. 6).

The areas with low susceptibility generally coincide for both sets of results. Thus, the interfluvial sector and the fluvial plain of the Lăpuș River were mapped in this category. Nevertheless, the stability of the interfluvial band depends of the time scale used for its analysis, as some narrower sectors are already being affected by a regressive evolution of the landslide scarps, determined by mud flows and slumps. Eventually, this would damage the local roads which generally follow the interfluvial surface.

Finally, both susceptibility maps indicate the Cărbunăreasa Valley as highly susceptible to landslides, although there are no visible traces of landslide activity. A possible explanation for this result would be the influence of the drainage density which has rather high values in this area. However, excluding this factor would reduce the level of susceptibility from the southern slope which is highly affected by landslides. Further analysis of this aspect is still required.

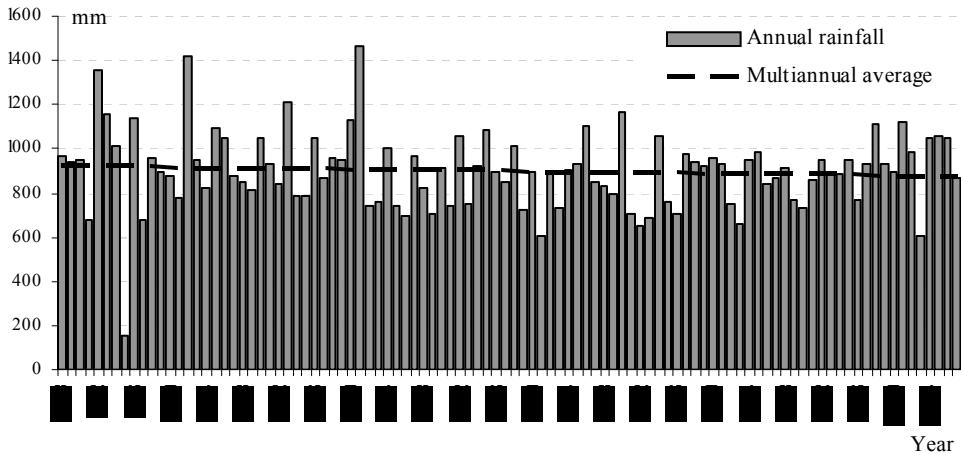
## 6. PROBABILITY OF LANDSLIDE OCCURRENCE IN THE GROȘI AREA

Landslide data related to the moment of occurrence and intensity of the past events is available only for recent activations and reactivations (for the last 40 years). Thus, the years with known landslide activity were: 1970, 1977 (with the particular activation of Dâmbeni landslide on May 13th), 1985, 1988, 2002, 2005, 2007 and 2010. Knowing the variation of annual rainfall for the 1908-2007 interval (fig. 8), it was possible to compare the years with landslide activity with those of higher than average rainfall.

landslides and also by past landslides with dramatic activity, like the Dâmbeni landslide (fig. 2) which on May 13th 1977, moved on a distance of up to 12 m and required the evacuation of several families.

On the other hand, only 6.6% of the mapped landslides (fig. 7)

What is easily noticeable is that the years with known landslide activity generally have an annual rainfall of 950-1150 mm, following a period of 2-3 years with rainfall values between 600-800 mm/year. This situation has an average return period of 1/7 years. Another landslide triggering condition is a succession of several years with annual rainfall above the multiannual average (900 mm/year), which is the case for the landslide reactivations which took place in 2002.



**Fig. 8.** Annual rainfall variation at Baia Mare meteorological station (1908-2007) (Data sources: 1908-1970 <http://www.ncdc.noaa.gov/ghcnm/>, 1971-2007 PUG Baia Mare (2010)).

The landslide volumes differ according to the mapped surfaces of the affected areas, but a specific characteristic of the Groși area is the occurrence of several adjacent smaller landslides which eventually converge, forming a larger surface. The situations when larger failures take place at once are less frequent. Therefore, an average magnitude of 40000 m<sup>3</sup> was inferred from the estimated landslide volumes, which generally characterises the most frequent events (comparable to landslide DN 18B, see fig. 2) and corresponds to a return period of 1/7 years or less. An average volume of 600000 m<sup>3</sup> characterises larger events (May 13<sup>th</sup>, 1977, Dâmbeni landslide) for which the return period is estimated at 1/30 years.

## 7. CONCLUSIONS

Using two different methods which combine heuristic reasoning with computer-assisted models, the landslide susceptibility estimated for the area of study indicates in both cases a general condition for most of the territory of medium and medium-high susceptibility, given by high annual rainfall and the presence of contractile clays as covering deposits.

The areas mapped as high and very high susceptible to landslides differ to a great extent between the two models, 3.11% in the case of the legislative model and 26.40% for the statistical analysis. This is not necessarily considered an error, because the two methods use different principles.

When considering the legislative methodology, the most important problem is the process of establishing the value of each coefficient, which depends to a great extent on the experience and field knowledge of the specialist who analyses the hazard, therefore it is a rather

subjective endeavour which needs a more detailed description of factor classes, especially with quantitative specifications. This limitation might be the cause for mapping the Cărbunăreasa Valley as highly susceptible to landslides, although no past landslides were identified there.

As local authorities use the legislative methodology to define hazard and risk areas, comparing the results with those of an alternative method, like the statistical analysis, could correct subjective errors and would give a better understanding of the local processes.

Although it requires further information and analysis, a general estimation of the landslide probability was also determined for the Groși area, characterised by landslides with an average magnitude of 40000 m<sup>3</sup> and a return period of 1/7 years, and not so frequent (1/30 years), larger and potentially more damaging landslides of 600000 m<sup>3</sup>.

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## DELIMITATION OF RISK GENERATING GEOMORPHOLOGICAL PROCESSES IN CLUJ'S METROPOLITAN AREA

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**ABSTRACT.** – **Delimitation of Risk Generating Geomorphological Processes in Cluj's Metropolitan Area.** The geological substrate, chemical and physical processes, epigenetic movements, the great diversity of landforms from Cluj metropolitan area are all conditioned by its location at the intercourse of three geographical units (Apuseni Mountains, The Someș Plateau and The Transylvanian Plain); moreover, the climatic conditions are influencing the intensity of the erosion processes and also the type and density of the vegetation which is installed in certain conditions of linear and local erosion. The identification and localization of geomorphologic processes plays an important role in drawing, designing, developing and implementing the local, regional and national development strategies. Once the geomorphologic processes are identified, the next step is to execute risk maps, which are essential in urbanism studies and territorial planning, since on their bases the next direction of town expansion, localization of economical implements, (interdictions, conditionings), real estate investments, transportation networks etc. will be drawn. The research was focused on identifying contemporaneous geomorphologic processes from Cluj metropolitan area and their repartition in the territory. Risk generator geomorphologic processes from Cluj metropolitan area are landslides, torrential bodies, ravines and areas of instability.

**Keywords:** *geomorphologic processes, metropolitan area, landslides, area of instability*

### 1. GENERAL PREMISES

The establishment of Cluj metropolitan area was made through *Decision no.415/2008* of the Cluj-Napoca Local Council as well as on the grounds of the decisions taken by the Local Councils of the related municipalities, resulting in the new structure called *The Intercommunity Development Association – Cluj Metropolitan Area*. It includes the city of Cluj-Napoca and the communes: Aiton, Apahida, Baci, Bonțida, Borșa, Căianu, Chinteni, Ciurila, Cojocna, Feleacu, Florești, Gârbău, Gilău, Jucu, Petreștii de Jos, Tureni and Vultureni, its purposes being economic development, as well as the development of local, rural and urban investment, environmental protection, improving and developing infrastructure, developing public services in order to increase people's welfare. The present study aims to identify and localize the geomorphologic processes from the Cluj metropolitan area which are susceptible of geomorphologic risks.

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## 2. METHODOLOGY

In order to identify the geomorphologic processes existing in the Cluj metropolitan area we began by consulting the existing bibliography and risk studies, orthophoto maps (2009), maps with a scale of 1:25000, as well as Google Earth website, using GIS software, and field observations. Using the orthophoto maps (2009) and satellite images, we have identified and digitised (using GIS) geomorphologic processes susceptible of geomorphologic risk, as well as landslides, torrential bodies, ravines and instable areas presenting complex geomorphic processes. By means of comparison between the orthophoto maps and Google Earth website we managed to observe some changes which occurred in the evolution of geomorphologic processes (reactivated landslides, ravine expansions, torrential bodies etc.). Therefore, we identified and digitized landslides, instability areas (generated by landslides, torrential bodies, erosions, creep, solifluction etc.), torrential bodies, ravines, areas dominated by surface erosion (denudation of rain, torrent, stream etc.).

## 3. PHYSICO-GEOGRAPHICAL AND SOCIO-ADMINISTRATIVE PREMISES

From the geographical point of view, according to the communes' administrative limits belonging to the metropolitan area, the northern limit of the metropolitan area is given by the hills between Lonea valley and Borșa valley, placed in the proximity of the Bonțida village (Cocoșului hill of 492 m, Ucigașului Hill of 527 m, Bislăului Hill, Crăcinoasei Hill), in the north – west Măzărești Hill of 610 m. The western limit is given by the Dâmbului Hill of 627 m, Morilor Hill, Pietri Hill of 685 m, crossing the lane of the Someșul Mic River stretching up to the Tarnița Lake. The southern limit is given by the Sec Hill, Agrișului Hill of 800 m, (the hills between Iara and Hășdate Rivers), Cheia Hill (near Tureni village), Bărnățoiu Hill, Lobodoș Hill, Răzoarelor Hill of 488 m. The eastern limit is marked by the Găina Hill of 509 m, (the hills between Suatului and Cătunului valleys), Căianului Hill, Sic Hill, Tanlău Hill of 522 m (near Bonțida village), Hârșa Hill, at the border with Iclod commune. Although we do not completely agree with the manner of constitution and today's limits of the Cluj metropolitan area, in our scientific approach we will take into account this situation given by the legislation, because only under such circumstances this given study will find a practical applicability.

*The Cluj Metropolitan Area Geology* is given by two big structural entities placed here: *the crystalline-Mesozoic* area of the Carpathian orogen, made of crystalline shales, dolomites and granites (Gilău-Muntele Mare Massive), banatitic eruptive (manly dacites, rhiolites and andesites) and several areas with Mesozoic limestone (the northern extension of Trascău Mountains until Hășdate-Tureni area) and also formations belonging to the *Transylvanian Basin* which were assigned to the Paleogene, Neogene and Quaternary (D. Ciupagea, 1970).

*The geographic relief* of the metropolitan area appears as an amphitheatre, descending from the west, southwest, towards the northeast, east, from the Someșan Plateau (Cluj and Dej Hills) towards the Transylvanian Plain, the limit between these two relief units being delimited in the northern part by the Someșul Mic Corridor up till Cluj-Napoca, Zăpodie valley, the eastern part of Feleac Massive, Racilor Valley until the inferior corridor of Aries. The main feature of the Cluj metropolitan territory is complexity, given by the relief units the metropolitan area contains. *Dej and Cluj* in the northern side, *Feleacului Massive*, in the southern - representing a particular territory within the marginal region, *Cojocna-Sic Hills*, in the east - measuring more than 500 m height only in some places, *Aiton-Viișoara Hills*, in the southeast, *Gilăului Mountains* in the metropolitan southwestern side - stretching on a small surface (on the administrative

territory of Gilău commune), *Someșului Mic Lane*, which stands as an obvious geographical discontinuity area, *Căpușului Lane* which, apparently extending, represents a modest sized unit, stands out due to its geographical position, orography and function: making Cluj and Dej Hills meet Gilăului Mountains (Gr. Pop, 2001).

*Hydro-climatic elements.* From the *climatic* point of view, the Cluj metropolitan area territory falls into the continental climate section i.e. moderate; its southwestern side pertains to the medium-height mountains climatic region (partially), whereas the eastern part to the Transylvania Plateau climatic region. Average annual rainfall range from 600 – 1000 mm, while quantities exceeding 1000 mm are more frequent in the mountain area. The least amount of precipitations is in the east, exceeding 700 mm only in a few places. The value of multi-annual average temperature is 8.4°C, ranging between 6,9°C and 9,9°C, having a multi-annual amplitude of 3°C. The coldest month is January (-4,6°C) and the warmest is July (19,3°C).

*Hydrographical network.* Most of the rivers in the metropolitan area belong to the Someșul Mic hydrographical basin; this is the main river that drains the metropolitan area grounds (from Gilău downstream to Bontida), along 153 km, and the hydrographical basin measures 3.775 km<sup>2</sup> in surface (the entire Cluj county). The hydrographical network of the southern part of the metropolitan area belongs to Arieșului hydrographical basin (Hășdate, Micuș, Valea Racilor, Cheița, Valea Caldă Mare).

*Alluvial aquifers.* Alluvial fan and terraces are made of coarse gravel deposits, boulders and sands, of variable thickness, thicker in areas with active subsidence until the late Quaternary (areas which also are hydrographical convergence). On Someșul Mic River the thickest silts were evident at the confluence with Nadaș where they reach 11 m thickness; generally the alluvial aquifer is up to depths of 4 m. On the tributaries, alluvial deposits are generally sandy, developed up to depths of 2 m; maximum thickness was found on Nadaș, 5 m.

*Lithology* is characterized by complexity and high alternation of litho-types. Diorite sands, tuffs are present in the eastern part of Cluj and Dej Hills, exceeding in the east Someș Mic lane (up to the metropolitan area) and in the south the Feleaacului Massif consisting of diorite, gravel and sands. In the north-eastern metropolitan area what stands out is the presence of conglomerates, sandstone, diorite clay (Hida layers). Limestone, diorite, gypsum can be found in the northwestern metropolitan area (Gârbău commune) and in the southwest (Ciurila, Petrești de Jos). Crystalline schist (Arada series) present in the Gila Mountains occupies small areas. Gravel and sands are predominant on the valley lanes.

Climatic elements, together with soil types and lithology lead to geomorphologic processes (landslides, torrents etc.). Excessive rainfall has contributed and still contributes to the emergence and evolution of misbalanced phenomena, since through the infiltrated rainwater the slope's overload increases, thus reducing its stability.

*Vegetation.* Although the difference of heights is not very much outstanding over the metropolitan area, the variety of landforms and environmental conditions lead to a diversification of the vegetal layer, reflecting in the distribution of the geomorphic processes. The presence of salty soils favours the development of *intrazonal and azonal vegetation* on small areas (halophile associations with *Salicornia Europaea* and *Suaeda maritime*). On the metropolitan area level, forests represent 16,68% of the total area (25 655 ha). Vegetation can play both a positive and a negative part in triggering and enhancing geomorphologic processes. Roots can contribute to increasing soil cohesion or, on the contrary, they can produce cracks on the rock surface. Forest vegetation stabilises areas subject to risks of geomorphologic processes, adjusting the hydric balance in the soil by retaining rainfall in the crowning and litter, just like it's done in large water consumption (V. Surdeanu, 1998).

*Usage of land.* Analysing the usage of land within the metropolitan area territory we can notice that agrarian lands occupy the most significant surface i.e. 104.172 ha, representing 67,75% of the metropolitan territory, followed by forests 25.655 ha (16,68%) and unproductive lands 12.029 ha (7,8%). The consequence of the high percentage of agrarian lands and unproductive lands is the great number of geomorphologic processes susceptible of risk.

#### 4. IDENTIFYING GEOMORPHOLOGIC PROCESSES

The geomorphologic processes in the Cluj metropolitan area derive from the complex features of the earth surface. The most frequent geomorphologic processes within the Cluj metropolitan area are *landslides* (present in most of the places of the metropolitan area, more active the built area of 9 communes and in the city of Cluj-Napoca, but stretching all over the territory, including the outskirts of the Cluj metropolitan area), *torrential bodies*, *instability areas* (generated by complex geomorphologic processes, landslides, torrents etc.), *ravines*, *erosion affected areas* – rain-denudation, torrents, streaming etc.).

Over the metropolitan area there were identified and mapped (digitized using GIS software on orthophoto-maps) 686 geomorphologic processes susceptible of generating geomorphologic risk, of which approximately 300 landslides, 73 ravines, 145 torrential bodies, 123 instability areas (coastal slopes), 45 areas with serious surface erosion (rain-denuded, torrents, gutters, streaming etc.). Due to the complexity of the earthly surface on which the Cluj metropolitan area stands, we can identify three specific units for grouping geomorphologic processes: *plains unit* (Transylvania Plain), *hills unit* (Cluj and Dej Hills, Feleacu Heap), *mountain unit* (Gilău Mountain), presenting geomorphologic processes typical of every relief unit. The “plain” fraction that falls within the Cluj metropolitan area’s territory is characterized by a strip of the medium Miocene, consisting of badenian (diorite clay, sandstone, salt, tuffs) but more than anything of inferior Sarmatian (diorites and tuffs) on top of which there still are some remaining patches of the rest of the Sarmatian (diorite, sands and gravel). The strip stretches along the left side of Someșul Mic too, but on the “plain” it is also marked by salt appearances, diapiric crimps apparently arranged on a saddle which starts from Ocna Dejului, passing by Gherla, Coasta Gădălin, Cojocna, where it meets the saline saddle coming from Apahida and Someșeni and ending up in Ocna Mureș. This alignment stimulates a valley enlargement, especially where salt is present, triggering massive slope slides. There are fewer and less powerful slides on those slopes with harder rocks (sandstones, tuffs) and on forest covered slopes. Other than that, slopes gather into bigger complexes starting from the watershed, meeting again in some kind of tongues which widen towards the river meadows. Under the watershed they are shaped like a staircase, like waves, sometimes huge, presenting various stages of evolution. Over the “tongue” grouped slides there are streaming torrents which sometimes stimulate the sliding of certain portions, and sometimes act as drainage, helping their stabilization.

In this unit there have been identified and mapped (digitized using GIS software from the orthophoto-maps) 336 geomorphologic processes susceptible of generating geomorphologic risk, out of which 55 are active slides, 10 are re-activated slides, 118 stable slides, 21 ravines, 49 torrential bodies, 61 instability areas (coastal slopes), 22 areas with surfaces seriously affected by erosion (rain-denuded, streaming, gutters etc.). For a better identification and analysis of geomorphologic processes, in their distribution we shall take into account their framing within municipalities. Thus, the most significant areas presenting landslides, prone to geomorphologic risk, can be found in such communes as Cojocna, Aiton, Jucu. This is also due to their positioning

inside built-in areas of the villages or right next to it. However, most of the geomorphologic processes susceptible of generating geomorphologic risk are situated outside built-in areas, affecting, therefore, mostly agricultural lands. Therefore in Cojocna commune – Cojocna village there are landslides around the large cemetery area (prone to affect 7 households and 1.5 km of the road), Republicii St. (prone to affect 15 households and 0.6 km of the road), S. Barnuțiu St. (prone to affect 6 households and 0.6 km of the road), Durgau Lake area, prone to affect the access road; Cara village – Republicii St. (prone to affect 5 households and 0.3 km of the road). These landslides are slow and have low motion speed. The greatest landslide is in Boju village, measuring 1000 m length, 2500 m width, 1-3 m depth, 2,500,000 sq m, volume 5,000,000 m<sup>3</sup>. Prior preparation causes to these landslides are: the slope, ravines and streaming; triggering causes are excessive humidity, abundant rainfall etc. (*Cojocna village sheet*). Outside the built-in area, landslides are more frequent in the south-eastern part of the commune, on those slopes which present more exposure to the south-west, south and south-east, at heights ranging between 350-450 m (north-west of Iuriu de Câmpie village, Straja Hill).

Most of the landslides from Aiton commune occur in the south-east of the commune, outside built-in village areas. These are “primary” landslides (an area with a high landslide likelihood) generally occurring in springtime, on clays and flysch, and have been identified in the built-in areas of Aiton and Rediu villages. The slides measure 130 m (Rediu) and 900 m (Aiton) in length, their widths ranging from 300 m (Rediu) to 2000 m (Aiton) and depths from 1 to 5 m, having a low motion speed. These slides present preparation causes such as the slope, streaming, torrential erosion, surface erosion and triggering causes such as excessive humidity (*Aiton village sheet*). Outside built-in village areas, landslides affect agricultural lands (pastures) and are more frequent on south and south-west oriented slopes (Viilor Hill, Borzâc Hill).

In Jucu commune, landslides have been located only inside built-in areas of Jucu de Sus village, on the slope standing on the right of Someș, in the area covered in orchards and briers. This landslide is “reactivated” on vegetal soil, clayey diluvium, sliding very slowly due to such causes as the slope and erosion, and triggering causes such as excessive humidity (*Jucu village sheet*). Outside built-in areas landslides are more frequent in the eastern part which overlaps Cerghes Hills, Netedu Hill, Someș Hill, at heights between 350-400 m, occurring more often on those slopes that have a south-western orientation. In the northern part of the unit (the eastern part of Bonțida commune), landslides (partially stabilized landslides) occur outside built-in areas, in the eastern part of the commune (Urieșului Hills), at heights ranging between 350-400 m, on slopes with southern and south-western orientation.

Landslides in Căianu commune arise outside built-in areas of Căianu Vamă village, Căianu Mic village, the north-eastern part (Soma Hill), the eastern part of Căianu. These are active and partially stabilized landslides, arising at 350 -450 m height on north-east and north-west oriented slopes.

In Apahida commune landslides are generated outside built-in areas (partially stabilized landslides), in the proximity of Pata village (Bodrog Hill), Dezmir (the northern part of the village) and it affects agricultural lands. They are more frequent on those slopes oriented towards the north-east and north-west, at heights of 350-400 m. Landslides arise mostly in springtime by reactivating old sliding bodies, on diluvium and clay. The great number of geomorphologic processes existing in this section is also due to the alignment of diapiric creases on the western side of the Transylvanian Plain. The geomorphologic processes arise at the same heights, reaching up to 500 m, except for the strip that meets Feleacului Mountain, where they reach 600 m, and along the valleys where they go under 400 m. The diapiric creases are marked by

badenian formations (including salt grains in Cojocna), are embedded in sarmatian stacks (consisting mainly of clays and sands), and have speeded up not only the arousal of old landslides on the Cojocna hillsides (Dărvșteu Hill at 350-400 m high) but also along Mărăloiu, Văii Florilor vally (Gr. Pop, 2001a). The presence of salt and limestone in these spaces triggers more complex manifestations of the processes by speeding them up. Usually, actual processes affect both surface stacks (disturbed in a previous dynamic activity) and the rock of that place. On the slopes one can find driving of materials of several thicknesses (from meters to tens of meters), which consequently make post-occurrence interventions very expensive and, more often than not, without an exact result. Torrential bodies represent another category of geomorphologic processes susceptible of geomorphologic risk. All over the sub-division there are approximately 51 torrential bodies, having a greater density in the northern part of the sub-division (Jucu, the northern part of Bonțida commune, Căianu, the northern part of Apahida commune). Their dimensions vary and they arise on highly inclined slopes, sometimes overlapping old landslides. They are predominantly directed to the south-east, at heights between 500-300 m. They arise outside built-in areas, affecting agricultural lands.

The presence of small torrents and ravines within the Cluj metropolitan area is closely related to the lithologic substrate, the slope side, the usage of the train etc. Ravines are present especially in the middle and inferior part of the slopes (in Someșeni-Apahida peripheral hills sphere, the border area of the Transylvania Plain etc.) and are associated with landslides, solifluction, swampy areas caused by the presence of a large number of springs, so that in some places one can find bad-lands (I. Mac, T. Morariu, 1969). Within this sub-division there have been identified approximately 21 ravines outside the built-in area of the villages. Due to the complexity of the landforms present in this subdivision we have identified 61 areas with complex geomorphologic processes, which, considering affected areas and spreading, represent causes of slope instability. Moreover, they are the main processes that generate geomorphologic risk. These instability areas have as characteristics complex geomorphologic processes, active landslides, reactivated or partially stabilised, torrents, ravines, streaming, rain-denude, solifluctional flows etc. These "instability areas" are present along the whole sub-division, more pronounced on the top areas, featured by steep slope (15.1 – 35%), with south-western, southern and south-eastern orientation. They expand outside built-in areas, affecting agricultural lands (pastures). On some surfaces there are pine "clumps" which have been artificially planted in order to stabilise the slopes. On the municipalities' level most "instability areas" are found in Cojocna 27 commune's territory, due to the presence of diapir, various hills and reduced wooded areas.

Because of special geological, relief, climatic, hydrographical and vegetation conditions but, even more, due to anthropogenic interference in this sub-division, there are approximately 22 areas affected by surface erosion processes (creep, rain-denudation, streaming etc.). These usually arise outside built-in areas (in the proximity of settlements) on agrarian lands subject to excessive grazing. The most affected ones by this process are the soils - great quantities of material that comes especially from the fertile section are carried towards the grounds of the slope. In these sections geomorphologic processes are highly effective during transition season (when there is no plant layer) and torrential rain seasons.

#### **4. 2. Geomorphologic processes associated to plateau units**

The plateau unit comprises most of Cluj metropolitan area: in the North – Cluj Hills, and in the South the Feleac Massive. There have been identified and marked (digitized using

GIS system from the orthophoto-maps) 350 geomorphologic processes susceptible of generating geomorphologic risk, out of which: 118 landslides, 52 ravines, 94 torrential bodies, 63 areas of instability (hill slopes), 23 surface erosion areas (rain-denudation, streaming, torrents, small torrents etc.). Due to the complexity of this area and for a better identification and regionalization of the geomorphologic processes, we shall divide this unit into two sub-units: The Hills of Cluj and Dej, and the Feleac Massive.

*The Hills of Cluj and Dej*. They are characterized by the presence of Eocene formations (inferior course chalk, sandstones, gypsum and superior striped clay) and Oligocene- inferior Miocene (sands, sandstones and clay). This relief unit owes its essential feature to the frequency slope the presence of terraces on every valley, maintained in the sectors where they pass the Dej tuffs. (I. Savu, 1963). In the hills of Cluj and Dej, under the top areas, for example Capuș or Nadaș, the landslides are more abundant and massive, but, on the other hand, on the slope ridge, rain-denudation and streaming prevail. All the basins of the valleys tributary to the Someșul Mic, on the left, are inflicted, sometimes on very extended surfaces, by storied landslides (Borșa, Lonea), divided according to the form, in two-three levels; close to the valley riverbed tongue-shaped slides can occur, directed sometimes by torrential valleys, on the median slope dominate the superficial but extended and mostly in the spring-slides, on the pastures and grasslands, under the inter-fluvial sweeps, there are detachment gaps, in massive stairs, a combination of slides and collapses.

The most important slide areas susceptible of geomorphologic risk can be found in Vultureni, Chinteni, Floresti, Feleacu Ciurila and in Cluj Napoca, this also being due to their localization inside the cities or in their immediate vicinity, generating material damage. The Northern part of the Cluj and Dej Hills, in the Vultureni commune there where identified two surfaces with slide risk inside Chidea, in the Central-East and Central-North-West, affecting orchards, gardens and built areas. In Faureni, situated South-West from the commune residence, on Dc 150, a surface with high risk of slide which occupies the entire central part of the area (built area, orchards, grasslands) was identified. These are 'primary' slides, on sandy clay, diluvium, with small motion speed. The slides measure between 220 m (Chidea) and 472 m (Faureni) in length, and between 235 m (Chidea) and 765 m (Faureni) width, the depth ranging between 1 and 2 metres. An active slide has been identified in the North-West of Soimeni. In the commune there have been identified 13 areas of geomorphologic processes susceptible of risk. The slides have as preparatory causes the slope, the streaming, torrential erosion, surface erosion, and trigger causes rainfall. Outside the localities, the landslides affect agricultural fields (pastures) and are situated on the slopes with a South Eastern, South Western orientation, at altitudes between 300-450m. In the Southern part of the subdivision, landslides are found in Baci commune, and occur usually in springtime due to the reactivation of old slide bodies, on sandy diluvium clays, sands, diluvium clays and sandy clay. The slides measure between 150 m (Popești) and 900m (Corușu) length, and widths between 150 m (Corușu) and 1100 m (Corușu), the depth varying from 1 to 10 m, with a small movement speed, but there are also slides with high speed (Popești). The biggest landslide has been in Corușu, having a length of 900 m, 400 m width, 5-10 m depth, surface 360000 sq m, volume 1 404 000 m<sup>3</sup>. Outside the built-in areas, the slides affect agricultural fields (pastures), with a larger frequency on the slopes with a Southern and South Western orientation (Lorin Hill), at altitudes of 350-450 m. In the Northern, North-Eastern, and North-Western part of Chinteni, on both slopes of the Chintenilor Valley, there is an area highly affected by sliding phenomena. This area is partially covered with constructions, orchards, pastures and forests, while in the intensely affected areas there is a lack of vegetation.

In Padureni locality, situated on Dc 148 and Dc 147, at approximately 4 km from Chinteni, the slides are present in the North Eastern part of the village, on both slopes of the Hurudelor river. The slides occur usually during the spring by reactivating old sliding bodies on clay, diorite clays and sands. The slides' lengths vary between 500 and 1000 m (Chinteni), their widths between 130 m (Pădureni) and 1000 m (Chinteni), and their depths vary from 2 m (Pădureni) to 13 m (Chinteni); they all have small movement speed. The biggest landslide is in Chinteni with a length of 1000 m, width 1000 m depth 10-13 m, surface 1000000 sq m, volume 62400000 m<sup>3</sup>. Outside the built-in areas, slides arise on agricultural fields (pastures), with a bigger frequency on the slopes with a Southern orientation (Chinteni Hill), on the superior part of the slopes at altitudes between 400-500 m. In the commune there have been identified 16 areas with geomorphologic processes susceptible to risk. The slides have as preparatory causes the slope and the surface erosion, and as triggering factors the torrential erosion, the excessive humidity.

In Cluj Napoca, massive landslides occur mostly in the sectors where the peaks of the hills are covered with gravel sarmatian sands that have a diorite-clay base, these representing slide surfaces for the covering deposits. Inside Cluj Napoca, the slides have occurred in Eocene striped series of the Cetatua Hill, Southern slope (Dragalina Street, Taietura Porcului Street, Uliului Street). These deposits are characterized by the alternation of pervious powders and impervious clays, the latter being sliding surfaces for the pervious and semi-pervious humid deposits, lacking the protecting vegetal coverage. In the Southern part of the city, the slides occur on the entire Northern edge of the peak of Feleacul, the springs of Becaş-Borhanci streams and small torrents, these geodynamic phenomena occurring in most of the locality.

The slides occur usually during springtime, by reactivating old sliding bodies, on sandy diluvial clays, sands. The slides measure between 100 m and 150 m length, between 75-90 m width, the depth varying between 1 and 5 m with a small movement speed. The slides have as preparatory causes the slide and the surface erosion, and as trigger cause rainfall. Outside the built-in areas, the slides affect agricultural fields (orchards, pastures), with a higher frequency on the slopes oriented to the South, South West, with altitudes between 350-450 m. Between the landslides there can be found quartered swampy micro-ground submergences, many springs that maintain humid the substrate, determining the apparition of hydrophilic vegetation (Chinteni Hill). In Gârbău, Borşa, the landslides are fewer, present only outside the localities, affecting the agricultural fields (pastures). They are situated at altitudes of 350 m-450 m, on slopes with a Southern, South-Western orientation (Porumbului Hill, Morii Hill- Gârbău commune, Cetatea Caprei Hill- Borşa commune).

The Felacului Massive represents a particular territory, situated at the convergence of well-known units: The Someşan Plateau (Dejului and Clujului Hills), in the North, being separated from it by the lane of the Small Somes, in the East it meets the Transylvanian Plain, on the Dezmir- Aiton alignment, (Valea Zăpodie – Mărtineşti – Valea Racilor) - Ceanu Mic – Tureni, in the South descending towards the calcareous bare of the Sandulesti Mountain (Sandului Hill 795 m), and the Hasdate depression, in the West arriving at the Savadisla-Luna de Sus Lane. Between these borders, the Feleacului Massive represents a crystalline schist hillock, similar to the ones in the Intra-Carpathian yoke or the Western Hills, well buried in Miocene, Eocene, Oligocene sedimentary formations, so that the crystalline schist have only been uncovered in a small area in Magura Salicii, while on Peana Peak (832 m), there are present only in situ crystalline schist. The sarmatian sands dominate, followed by clays that have formed diagenetically (successively from the deposition of sandy formations)- the well-known grate concretions of Feleac, to these being added, in the Western part, on the Savadisla-Luna de Sus lane, the Eocene and Oligocene deposits, represented by inferior coarse chalk, inferior striped clay, sands etc. (Gr. Pop, 2001a).

The most important areas with slides susceptible at geomorphologic risk are found in Feleacu, Ciurila, Florești, and due to their localization inside the localities they can produce material damage. The slides occur usually during springtime, by reactivating old sliding bodies, on sandy diluvial clays, sands, sandy clay (Gheorgheni). The slides measure between 200 m (Flelecu) and 450 m (Georgenes) in length, between 300 m (Feleacu) and 1500 m (Gheorgheni) width, the depth ranges between 1 and 4 m, having a small movement speed. The biggest land slide is in Gheorgheni, with a length of 450 m, 1500 m width, 4 m depth, a surface of 67 500 mp, volume of 2 000 000 m<sup>3</sup> (wave shaped slides). Outside the built-in areas, the slides affect agricultural fields (pastures, orchards) with a larger frequency on the slopes oriented to the South, North (Feleacului Massive, Rediu Hill), in the superior part of the slopes at altitudes between 500-700 m. In the commune there have been identified 26 areas with geomorphologic processes susceptible to risk. The slides have as preparatory causes the slope, the surface erosion, and as trigger factors torrential erosion and excessive humidity. In Ciurila commune, slope geomorphologic processes (collapses, slides) have been identified inside Ciurila, in the North-Eastern part of the locality and in Sălicea, where inside the locality there have been identified three areas with sliding risk, areas covered with houses and orchards. The slides occur usually during springtime, by reactivating old sliding bodies, clays and sandy clays. The landslides measure between 50 m (Sălicea) and 300 m (ăalicea) in length, between 50 m (Sălicea) and 600 m (Ciurila) width, the depth varying from 3 to 5 m with a small movement speed, but there are also high speed slides- translation slides (Ciurila). Outside the localities, the landslides affect agricultural fields (pastures, orchards). Most of the slides are quartered on the slopes with a Southern, South-Eastern orientation, at altitudes between 550-650 m. Inside Florești commune, there have been localized two areas of slides in Tauti locality, situated in the North of the locality. In Luna de Sus, in the North-West of the locality, there has been outlined an area affected by erosion, area covered with Greenland and agricultural cultures. The slides occur mostly during the spring, primary slides, on diluvium and clay. The slides measure between 143 m (Tauti) and 200 m (Luna de Sus) in length, between 420 m (Tauti) and 840 m (Luna de Sus) in width, the depth varying from 1 to 3 m, with a small movement speed. The biggest landslide is in Luna de Sus, measuring of 200 m length, 840m width, 1-2 m depth, surface 168 000 sq m, 252 000 m<sup>3</sup> volume. In the commune there have been identified three areas with landslides. The landslides have as preparatory causes the slope and the erosion, and as triggering cause excessive humidity. Outside the localities, the landslides affect agricultural fields (pastures) situated on the slope oriented to the North and East (Gârbău Hill), at altitudes between 350-450 m. In Tureni commune, the landslides are found in the North-Eastern (Argil's Hill), Eastern part of the commune, they are active slides of great dimension and partially stabilized slides (Cheița Valley). The slides are situated on the South Western slope at altitudes of 350-500 m. The Northern part of the Communes locality is affected by an active slide of small dimension. These slides are found outside the localities, affecting only agricultural fields.

In Petrești de Jos commune, the active slides are found in the Northern part of the commune outside the localities, where there have been identified 9 areas with slides (Muncelu Hill, Rotund Hill). The slides are situated on the slopes with a predominantly Western orientation, at altitudes between 400-500 m.

Another category of geomorphologic processes susceptible of geomorphologic risk are torrential bodies. In the entire hill unit there are present about 96 torrential bodies, with a greater density in the Northern, North Eastern (Vultureni, Borșa, Bonțida), Western part (Gârbăd, Gilău, Florești), in the South (Ciurila, Petrești de Jos). They vary in size and are situated on inclined



slopes, overlapping sometimes old landslides. Most of the torrential bodies are situated outside the localities, affecting agricultural fields. Just like the case of torrential bodies, the presence of *ravines and small torrents* is more frequent in the northern part (Vultureni, Chinteni) and in the southern and south-western part (Florești, Ciurila). Ravines are more pronounced especially in the middle and inferior slope sides, sometimes being associated to landslides, solifluction, swampy areas caused by a large number of springs. Thus, in some places we can find bad-lands (I. Mac, T. Morariu, 1969). On the grounds of this subdivision we have identified 52 ravines outside built-in areas. Due to the complexity of the landforms present in this subdivision we have identified 62 areas with complex geomorphologic processes, which, considering affected areas and spreading, represent causes of slope instability. Moreover, they are the main processes that generate geomorphologic risk. These instability areas have as characteristics complex geomorphologic processes, active landslides, reactivated or partially stabilised, torrents, ravines, streaming, rain-denude, solifluctional flows, creep etc. These "*instability areas*" are present along the whole hill unit, outside built-in areas, and are more frequent in the northern part, on slopes which feature steep slopes with south-western, southern and south-eastern orientation (the left slope of Feiurdeni valley). Moreover, they feature active slides, torrential bodies, ravines on the north- oriented slopes as well (south of Măcicașu village, Teleacului valley, the right slope of Borșa valley), characterized by partially stable slides, torrential bodies, creep, solifluction. In the southern part of the hill area the "instability areas" are present on the slopes facing the north (Feleacu, Ciurila). They are situated at heights ranging from 350 to 700 m and they affect agrarian lands (especially pastures).

Because of special relief, climatic, hydrographical and vegetation conditions but, even more, due to anthropogenic interference in this subdivision, there are 23 areas affected by *surface erosion processes* (creep, rain-denudation, streaming etc.). These usually arise outside built-in areas (in the vicinity of settlements), affecting agrarian lands (pastures) subject to excessive grazing. The most affected ones by this process are the soils - great quantities of material that comes especially from the fertile section are carried towards the grounds of the slope. In these sections geomorphologic processes are highly effective during transition season (when there is no plant layer) and torrential rain seasons. The mountain unit is the only unit in the southwest of Gilau Mountains (commune Gilau), composed of hard rocks, which makes this to be the dominant processes and river-torrential plus other processes, differentiated by as we are in alpine or woodland on steep slopes, the valley bottoms or other local conditions.

Alpine, greatly expanded by anthropogenic processes, it is dominated by crionivale of rain-denuding. (Gr. Pop, 2001). Because large areas occupied by forest and geological and lithologic constitution landslides are very small (hardly noticeable).

## 5. CONCLUSIONS

The morpho-graphic and morpho-metric characteristics of landforms of Cluj metropolitan area, as well as climatic elements, vegetation, excessive rainfall etc. have played and continue to play a part in generating and development of present geomorphologic processes. The great number of geomorphologic processes from Cluj metropolitan area derives from the complex features of the earth surface. The "plain" zone is affected by current excessively intensive geomorphologic processes. Here, slides are very widely developed and torrential bodies, ravines, streaming, rain-denuding affect the whole region, being more intense on steep hill slopes oriented towards the south-west, south and south-east. The hill zone is highly affected by

landslides, torrents, streaming, rain-denuding and solifluction. Massive landslides are not as frequent as in Transylvania Plain and are to be found at the contact of the badenian and sarmatian: the slides under Feleacului Massive, shaped like waves and having small lakes behind them, or those on the left side of Chinteniilor valley stand as examples. The mountain unit, present only in the south-western part, is dominated by fluvial-torrential processes, on top of which we can add other processes: small torrents and torrents whose dejection cones reach the main valleys, often affecting roads. There are, frequently, superficial slides, but they are not very extended (they affect only the alteration layer).

Among the causes that have enhanced these geomorphologic processes we must emphasize wood clearings (sometimes total), ploughing on steep slopes, excessive grazing, excavation works at the grounds of the slope, resource exploitation on the slopes (overcharging the slopes, modifying slopes), geotechnical works, increase of wasted water from the water and drainage systems, the expansion and enhancement of communication channels etc. These represent some of the anthropological causes which contribute to the arousal of geomorphologic processes.

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## GLIMEE DEEP-SEATED LANDSLIDES FROM TĂURENI (TRANSYLVANIA PLAIN)

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**ABSTRACT.** – **Glimee Deep-Seated Landslides from Tăureni (Transylvania Plain).** Glimee deep-seated landslides present a specific morphology that defines them in the category of landslides. The morphology of those landslides present mounds that have conic forms, low angle slopes and usually are modeled by recent landslides and linear erosion. The elevation of the mounds has values that increase from the bottom of the slide to the upper part of the slope; from 5 to over 25 meters. Comparing the data from the maps with the reality from the field we identified the evolution stages and a now slide, a present block that was slid in 2008. From this we can consider that this type of landslides can occur nowadays.

**Keywords:** *glimee, deep-seated landslides, Tăureni, Transylvania Plain.*

### 1. INTRODUCTION

The study area is situated nearby Tăureni village, in the Pârâul de Câmpie basin, on the South slope of the Triciului Hill. This basin is modeled by many deep-seated landslides (over eighty areal with deep-seated landslides were identified by us), which means over 12% of the total area of the basin.

The total area affected by landslides at the Tăureni-Fundătura is 54 ha, from which 23 ha are with deep-seated landslides. The specificity of this site is given by the morphology of the forms, known as glimee (mound) – which manifest themselves in various forms and in distinct evolutionary stages – and by the dynamic of the landslides.

The development of those deep-seated landslides has started in the beginning of the 70', when in 1970 and 1975 were registered high quantities of precipitations. The slope of the Triciului Hill has less than 17° steep and the altitude of it is only 472.6 m. The low steep and the altitude of the slope are essential in the morphology of this type of deep-seated landslides.

### 2. METHODOLOGY

This study has had as start the topographic documents (scale 1:5000 from 1973 and 1:25000 from 1964 and 1980) and aerial images (from 2002-2005 and 2009). By comparing the data from those documents we were able to observe the difference that occurred during the period that we had materials. The most obvious modifications were regarding the scarp and the mounds.

By comparing the data from the maps with the field we identified a now slide, in the upper part of the site, where a now block was detached.

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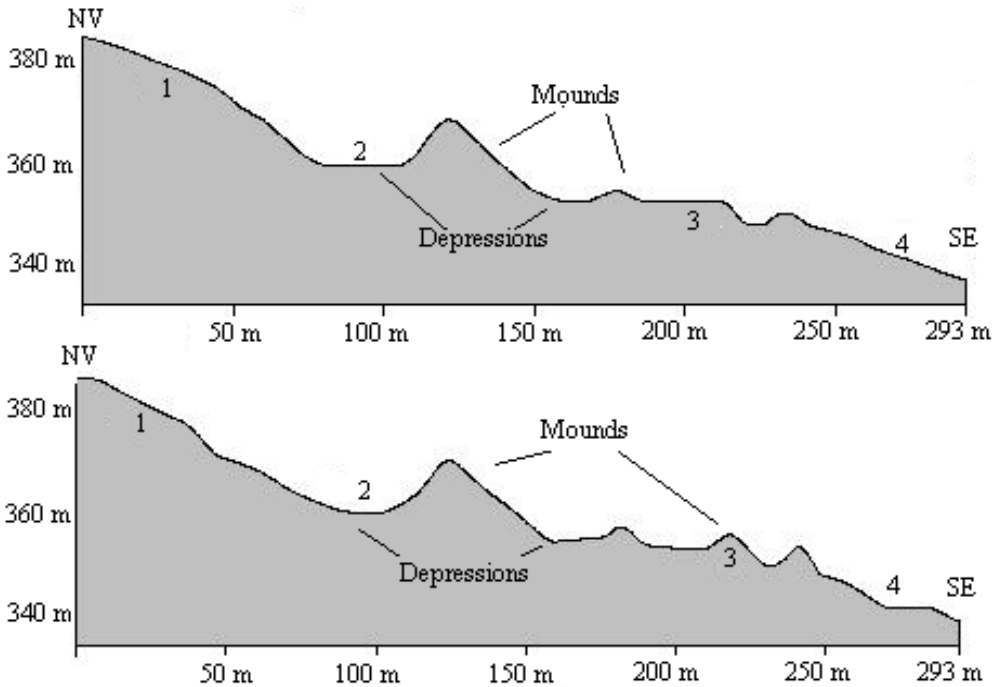
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### 3. MORPHOLOGICAL ASPECTS OF THE DEEP-SEATED LANDSLIDES FROM TĂURENI

By overlaying the data from the topographic maps (from 1973) on the aerial images we were able to identify the parts where the slide blocks were fragmented and transformed into mounds as well as the evolutionary stages that the mounds have.

Analyzing the longitudinal profiles (fig. 1) made over several topographic maps and on the field, we were able to emphasize the following: the mound can be detached from another mound, by the same process as the original one; there are mounds that are flattened by the geomorphological processes that are acting post sliding; the negative forms (depression between the mounds) are gnawed and there for the mounds appear with a higher elevation; also, the depressions are filled with materials from the mounds' slopes; and in this particular case, the deep-seated landslides are active, the last slide occurred in 2008.



**Fig. 1.** Longitudinal graphs of the glimee deep-seated landslide from Tăureni. It is shown the evolution of the forms – positive and negative – during 1973 and 2005. The numbers represent: 1. the scarp – shaped by the geomorphological processes post-slide; 2. depressions – which was filled with materials from the mounds slopes; 3. mounds that were identified after the depressions were deepened 4. toe – modeled by recent landslides and erosion.

On the longitudinal graphics (fig. 1) are shown the differences that occurred during last 30 years, period in which the depressions between the mounds – longitudinal and transversal – were either deepened by the erozionale processes or filled with the materials from the mounds slopes.

The evolution of the depressions between the mounds is due to the materials accumulated there, that were brought by the geomorphological processes that were shaping the mounds' slopes (fig. 2). The evolution of the mounds and of the depressions follows the rule of compensation: when the mounds are shaped and the materials are filling the depressions, the elevation differences are less high; and on the other hand, when the depressions are deepened (especially by linear erosion) the elevation of the mounds "froze" although they are shaped and they lose materials with each new landslide that is active.

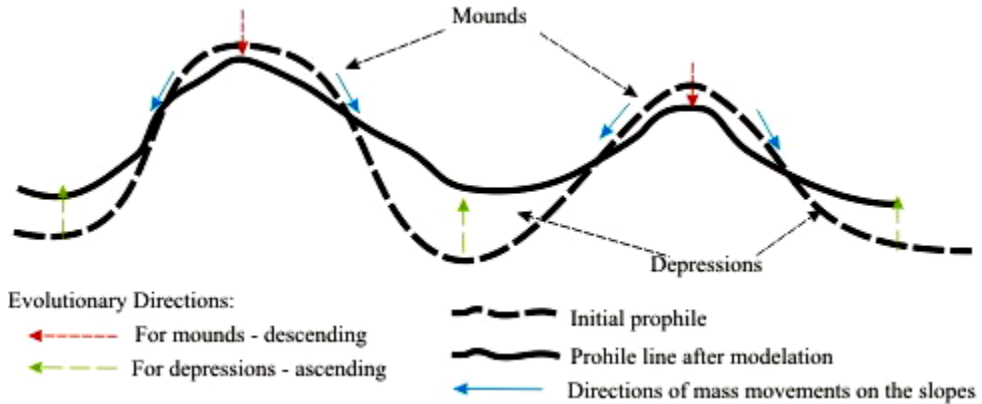


Fig. 2. A scheme of how are shaped the depressions and the mounds.

For our deep-seated landslide we could identify four possible evolution stages. Due to the position of the mounds and their morphology, we consider that in each stage there could have been detached one or more blocks, situated in different parts of the landslide.

The morphological aspect of the deep-seated landslide present mounds with different evolutionary stages, starting from the bottom of the slope towards the top. At the top of the slope, near the scarp are the newest slide blocks.



Fig. 3. Scarp of the deep-seated landslide from Tăureni (Mureș County), (august 2011).

On a longitudinal profile of the deep-seated landslides are shown mounds with a low slope angle in the lower part of the site, and on the upper part of it there are high angle of the slopes, that can go over  $42^{\circ}$ . These values of the slopes (from the upper part of the site) are due to the recent sliding movements, which had as result new individualized blocks.

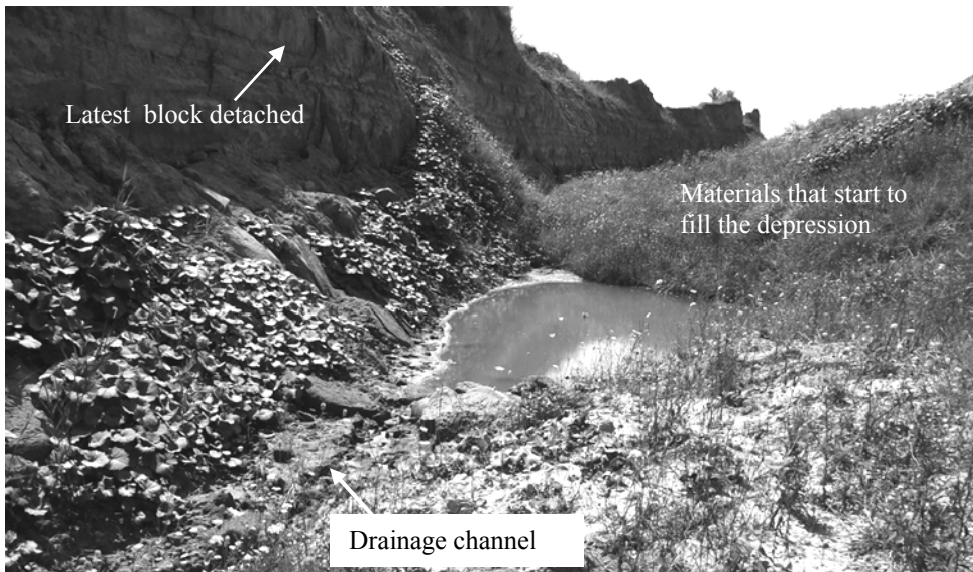
The scarp of this deep-seated landslide (fig. 3) has an altitude of 400 - 410 m, being shaped by geomorphological processes such as landslides and linear erosions. The activities of those processes have a substantial contribution at the slope angle, but only in the upper part of it. At the bottom of the scarp there

are materials accumulated – which form an accumulation glacia – and that lower the slopes angle. This glacia is formed especially with clays and sands, and because of its recent age, there is a maze of cracks (with openings over 30 cm).

The stata that are sown on the scarp and on the new detached block are composed by clays, marls, gypsum and sands. The last slide had brought up to date the gypsum, and cristals of gypsum are between the materials that fill the depression formed, but more than that the scarp's slope and the block's slope are covered with a layer of precipitated gypsum.

On top of the scarp there are several springs, which covered the scarp's slope with a gully web. At the same time, that springs supplies that lakes that are formed in the depression that lies between the scarp and the most recent block.

The depression formed recently by the detachment of the latest block has a width of 5 to 10 m, being mostly filled with materials that were brought from the scarp's slope. On its surface are five lakes, which have a variable volume, depending on the amount of precipitation. Those lakes communicate with each other through a drainage channel (fig. 4), but at high amount of precipitation two of the lakes join.



**Fig. 4.** The morphology of the depression formed between the scarp and the latest block. (August 2011).

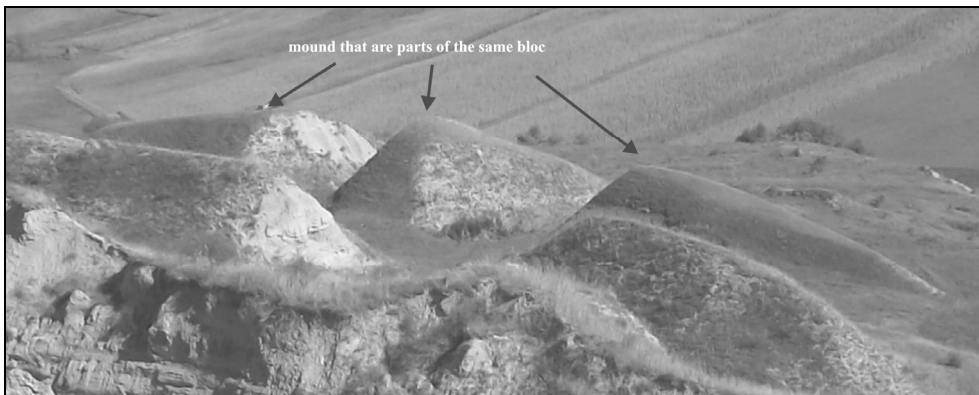
The mounds present different form, starting with the rounded ones from the bottom of the slope on which the deep-seated landslide is, towards the ones with a pyramidal or conical shape (from the center of the site) and continuing to the scarp the mounds are replaced with the blocks that are not yet modeled into mounds

The mounds from the bottom of the deep-seated landslide are strongly shaped by the geomorphological processes. Those mounds are flattened (fig. 5). Now and they have a low elevation (under 5 m). We consider that those are parts of the first blocks that were slid. The ones from the center of the site present a gradual evolutionary stage, being fragmented by the post-slide agents. Those mounds are the “elements” that prove us that the post-sliding modeling

has a very important role (fig. 6). After the block/blocks is/are detached, the fragmentation of them comes as a result of the post-sliding modeling. There for, the mounds now present in the center of the deep-seated landslide from Tăureni have the slope that faces another mound with an angle over  $32^{\circ}$ .



**Fig. 5.** Mounds from the bottom of the deep-seated landslide (October 2010).



**Fig. 6.** Mounds individualized after fragmentation of the slide blocks (August 2011).

In the upper part of the slide we cannot talk about mounds, because there are only blocks, with elongated shape, and with no specific morphology for mounds. There for, we consider those positive forms as being the most recent ones, with none or less fragmentation. From a morphometric point of view those forms have lengths between 90 – 260 m (fig. 7).



**Fig. 7.** Newest slide block from Tăureni deep-seated landslide (August 2011).



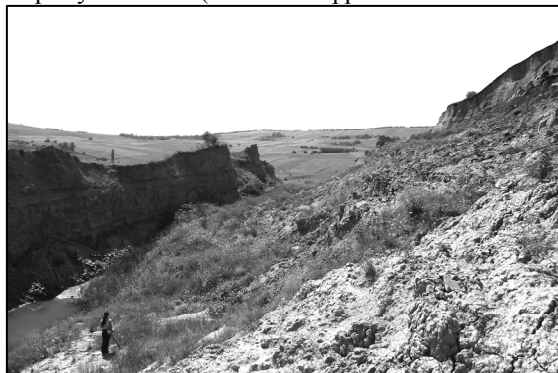
#### 4. EVOLUTION OF DEEP-SEATED LANDSLIDE FROM TĂURENI

One of the most interesting aspects of this deep-seated landslide is that it is still active. This is one fact that gives identity to this site among all other site with glimee deep-seated landslides from Transylvania. Aldo, this site has an area of only 19 ha, the fact that there is a new slid block, a recent one, draw our attention upon the evolution of this site. Another reason for studying this site is that the latest slide confirms our hypothesis that the post-slide modeling has an important role.

The latest block has several cracks that are the result of the slide forces and those will be fundamental for the fragmentation. On those cracks the drainage network and the geomorphological processes will start to act, and we consider that there will be the next “lines” that will define the future mounds.

Some of the glimee deep-seated landslides are developed by sliding part by part (or block by block). The dimension of the “parts” or blocks can be different from slide to slide, but for all of those landslides we can identify the previous scarps. Those are imprinted on the morphology of the latest block. This is the case for our landslide, and on the latest block we can identify the previous scarp. Thus, the south slope of it has a slope angle of 17 to 32<sup>0</sup>, while the North slope exceeds 42<sup>0</sup>.

The block as seen in the figure 8 is not fragmented, being only affected on the south slope by landslides (which we supposed that were active even before the recent slide of the block).



**Fig. 8.** Panorama over the latest slide at glimee deep-seated landslide from Tăureni (Mureș County), (august 2011).

According to the cartographic documents and aerial ones, it is shown that the last block was detached and slid in 2008. Before this there were several cracks in the slopes morphology, which facilitated the access of the precipitations to get to the clay strata. Such cracks exist now in the upper part of the hill, above the present scarp of the glimee deep-seated landslide. Because of those cracks we consider that the activity of this deep-seated landslide is not yet fully complete, and, maybe, it will continue to the upper end of the hill.

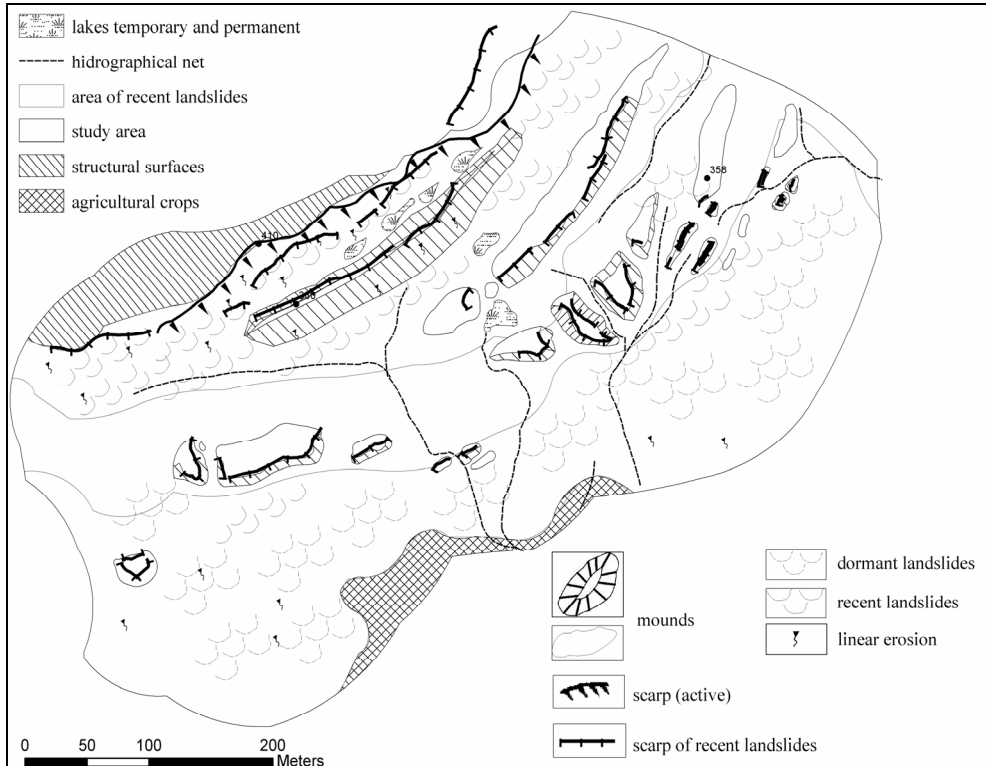
The latest slid block is now under the control of the geomorphological processes such as landslides, erosions, gully erosion (fig. 9), that are trying to transform it, as it happened with the others detached block.

#### 5. CONCLUSIONS

Aldo, there are researchers that believe that nowadays there cannot happened those type of landslides, there are examples that prove that it is still possible to have such slides. Our study case can be considered a very good example for analyzing this type of landslides, starting with the conditions that contribute to this slide, towards the evolution of the glimee. From a geomorphological point of view this deep-seated landslide has positive forms that are in different evolutionary stages, with a truly remarkable fragmentation and shapes.

GLIMEE DEEP-SEATED LANDSLIDES FROM TĂURENI (TRANSYLVANIA PLAIN)

This landslide can be used as a model, not only for the morphology of the glimee deep-seated landslides and their evolutionary stages, but only for the simple fact that the last slid is recent, being considered to have happened in 2008.



**Fig. 9.** Geomorphological map of the area with glimee deep-seated landslide from Tăureni (Transylvania Plain).

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## THE PRECIPITATION AND TEMPERATURE EVOLUTION, IN CLUJ COUNTY, IN JUNE 2010

IRINA BLAGA<sup>1</sup>, C. BLAGA<sup>2</sup>

**ABSTRACT.** – **The precipitation and temperature evolution in Cluj County, in June 2010.** June, in the Cluj County area, has been a month of extremes, in both heat and precipitation. In this paper, the synoptic situation for June, over Europe and Romania, was analysed. The first part of June was characterized by the persistence of a hot North African ridge over the European territory. Thus, at the beginning of the month, daily maximum temperatures were close to the normal, then, gradually, the maximum temperatures increased from day to day, reaching very high values - up 34 °C by the middle of the month when the temperature-humidity index (ITU) reached and exceeded, in relatively large areas, the critical level of 80. In the second part of June, the target area was characterized by atmospheric instability. At the 500 hPa at isobaric level across the continent the presence of a trough that extends from the north-east- over the central European countries, to the south-west, between two high pressure zones- one located above the North Atlantic (Azores High) and another over the Russian Plain (Eastern European anticyclone), can be detected. The synoptic structure from the altitude characterizes a strong blockage that will favor the polar cold air penetration to the south part of the continent, and cut-off type structure positioned above the Italian Peninsula will quickly cross the Mediterranean basin to the Balkan Peninsula. The presence of the thermal blocking to the east and northeast sides of the Black Sea will cause the stationing and reactivation of the cut-off core by the end of June. Strong convective structures developed- which led to the recording of large amounts of water from showers and heavy rain, that were associated with floods and strong winds, which turned into storms with hail and lightning. For the second half of the month, a particular case dated 06/21/2010 was analyzed, the day which registered the most destructive effects of the floods. The outcome of the floods were, as reported by the Inspectorate for Emergency Situations Emergency (ISU) in Cluj County: the death of a person, the flooding of 250 homes and landslides.

**Keywords:** *ITU, thermal convection, precipitation, floods.*

### 1. INTRODUCTION

The maximum temperatures recorded at the weather stations in the county of Cluj in the first days of June were close to normal values; the maximum temperatures increased day by day, reaching values up to 34°C in the middle of the month, when the temperature-humidity index (ITU) reached and exceeded the critical threshold of 80.

Pronounced instability characterized both Romania and the Cluj County area in the second half of June, when the precipitation that fell over extended areas led to the recording of large amounts of rain water from showers and heavy rain that were associated with floods, and the intensification of the wind, which transformed into storms with hail and lightning.

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The morphology of Cluj County induces, during summer, dangerous weather phenomena. Ascending movement on wind exposed slopes, the convergence areas on the sheltered side of the mountain, the water sources and the heat sources on the sunny slopes have strong influences on the dynamics of convective activity, and have a significant role in determining the favorable areas for the initiation of the convection and the subsequent evolution of the convective cells (fig. 1).



Fig. 1. The weather and precipitation stations in the county of Cluj.

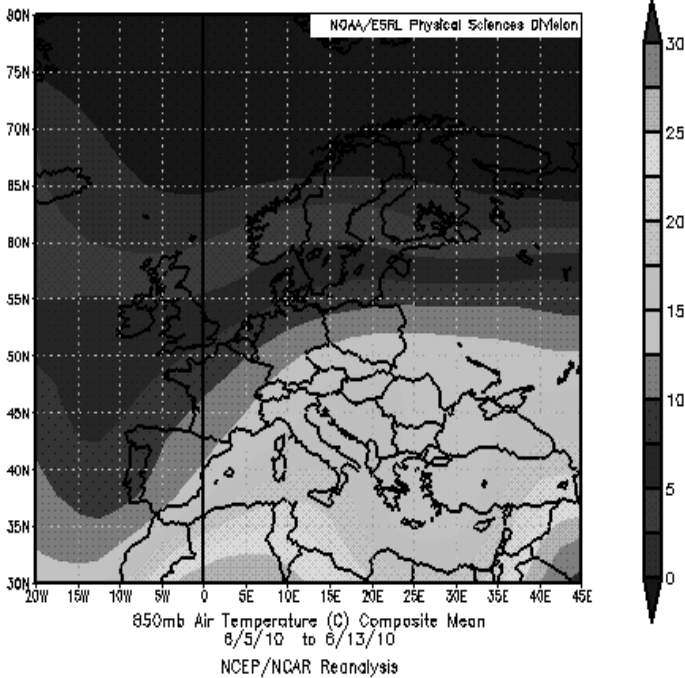
The severe phenomena recorded in the second half of June required radar monitoring and observational data provided by the Doppler radars in Bobohalma and Oradea, using OmniWeatherTrack applications and PUP and monitoring of the satellite images.

## 2. MATERIALS AND METHODS

Data from hourly, daily and monthly meteorological measurements obtained from meteorological and precipitation stations were used. Precipitation and temperature values recorded at all stations in the area were extracted. For the synoptic analysis, ground level and altitude maps of the standard isobaric surfaces of 500 and 850 hPa and reanalysis maps were used. Radar data have been analyzed: reflectivity, composite reflectivity, OHP's (1 hour precipitation) and THP's (3 hour precipitation).

### 3. EXCESSIVE HEAT IN THE FIRST HALF OF JUNE

In the beginning of June, the daily maximum temperatures recorded were lower by 2.5 - 6°C than the normal values (21-22°C) of the period. Afterwards, the temperatures increased day by day, reaching at the end of the first decade of June values of 29-31°C, temperatures that are higher than the average daily maximum of 23-24°C. Continuing this increasing trend, at the beginning of the second decade of the month, on the 13<sup>th</sup> of June 2010, the maxima reached the highest values of June (32-34°C). The value of 34°C was recorded in Cluj-Napoca and Dej, temperatures of 33°C were recorded in Turda and 32°C in Huedin. Then, a gradual decrease of the maximum temperatures occurred, but they were still higher than the normal values of the

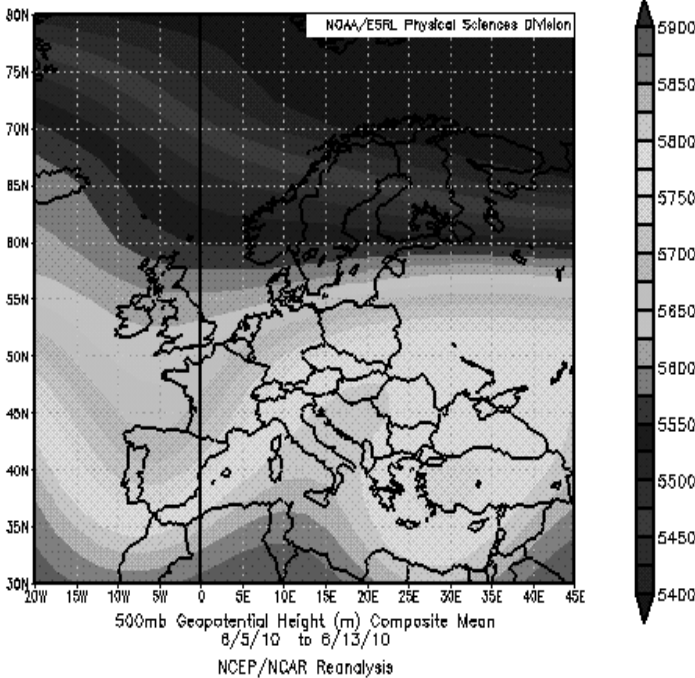


**Fig. 2.** Average distribution of isotherms at the 850 hPa level in the period 06/05/2010 - 06/13/2010.

period (22-24°C). In the third decade of the month, on June 23<sup>rd</sup>, the beginning of a cooling period is observed, which lasted until 27<sup>th</sup> June. Beginning with 27<sup>th</sup> June, the maximum temperatures were getting close to the normal values for the period (24-25°C). The temperature - humidity index (ITU) has reached and exceeded the critical threshold of 80 in large areas, on the 11<sup>th</sup>, 12<sup>th</sup> and 13<sup>th</sup> of June. For the synoptic analysis, the NCEP-NCAR reanalysis maps were used, as well as maps of altitude of geopotential and temperature from 850 to 500 hPa and ground level maps. In the first three days of the month,

at the 850 hPa level, the presence of a trough with a core of 136 gpdm in filling, having the 140 gpdm izopleth over Romania, and the 144 gpdm closed, with temperatures of 5-8°C, is highlighted. The western part of the continent is dominated by the presence of a ridge advancing to the north and center parts of the continent, gradually merging with the high pressure area in the east of the continent. From June 4<sup>th</sup> the geopotential and temperature are increasing, such that on June 6<sup>th</sup> 154 gpdm and 10°C were recorded, and then on June 7<sup>th</sup> the temperature rised up to 15°C. Warm advection was maintained for several days and increased on the 12<sup>th</sup> and 13<sup>th</sup> of June, when temperatures of 20°C were recorded. The warm ridge from the level of 850 hPa determined maximum ground temperatures between 30 and 35°C during several consecutive days. The NCEP/NCAR reanalysis maps (fig. 2) shows that in early June the mean temperature values were within the range of 17-19°C.

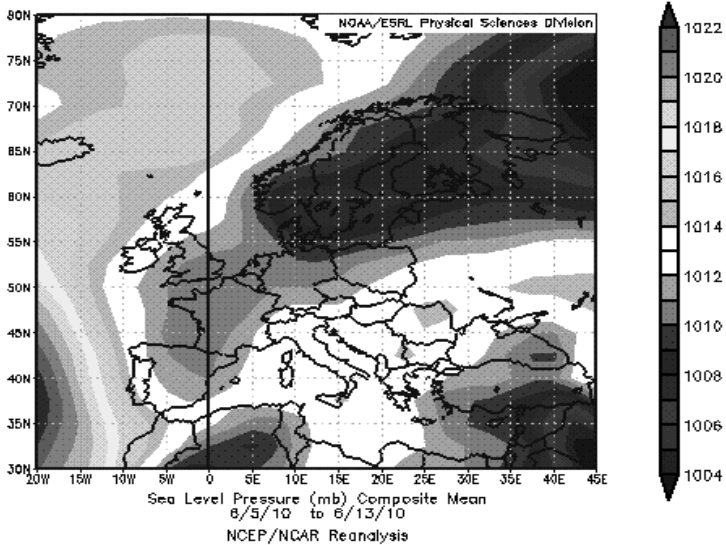
At the 500 hPa isobaric level, above Europe, the presence of a trough linked to the Icelandic Cyclone (extended from northwest to southeast of the continent) is observed in the early days of June. In the south-west of our country, the presence of a low pressure center with a value of 547 gpm is noticed; it is overlapped by a cold core of -20°C characteristic to the cut-off type. It has the isoplethes of 548, 552, 556 and 560 gpm closed. In the following days, the core is gradually weakening; on June 3<sup>rd</sup> at 12 UTC the center value was of 559 gpm and the izoplethes of 560, 564, 568 and 572 were closed. On June 4<sup>th</sup> the core of the low pressure area is centered on the south of Italy, only the 568 izopleth gpm remains closed on our country, to be incorporated into the trough, and the temperatures, increasing, reach -10°C. The western part of the continent is dominated by the presence of a ridge with values of 584 gpm (in Spain), and a warm air mass with high temperature values of up to -10°C, which will be expanded towards the northern and central parts of Europe, joining with the high pressure area in the eastern part of the



**Fig. 3.** Average distribution of the isopleths at the 500 hPa level in the period 06/05/2010 - 06/13/2010.

continent. From June 5<sup>th</sup> to 13<sup>th</sup> the geopotential is growing (576 gpm on June 5<sup>th</sup>, 584 gpm on June 10<sup>th</sup>) and the temperature values are maintained at high values (-10°C). These values remain almost unchanged until the 13<sup>th</sup> of June. The mean values of the meteorological elements in the middle troposphere during this period can be observed on the NCEP /NCAR reanalysis maps (fig. 3). At ground level, in early June, frontal systems operating across Europe are noticed, one in the far eastern part of the continent and another one linked to the low pressure area of the

Icelandic Cyclone, with values at the center of 990 hPa, which affect the western part of Great Britain, the western France, the southern Italy and whose movement towards the eastern parts of the continent will affect our country. In Western Europe, the Azores High ridge that was initially extended towards the northern part of Europe until it reached the British Isles, will include during the following days the central part of Europe, and, by uniting itself on the 5<sup>th</sup> of June with Scandinavian Anticyclone ridge will determine a field of high pressure over northern Europe. Over Romania, until June 4<sup>th</sup>, a low-pressure field with values of 1000-1005 hPa is present; after the 4<sup>th</sup> of June, the pressure is increasing. In the following days, the ground pressure remains weakly organized, with fluctuations around the value of 1015 hPa.

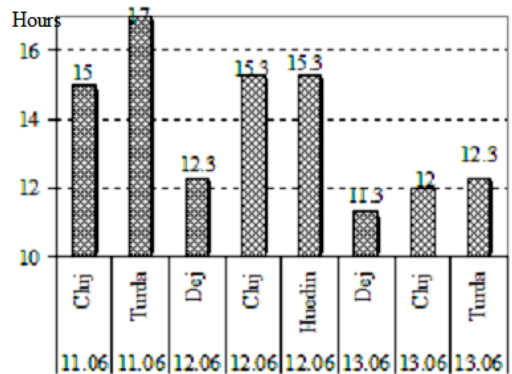


**Fig. 4.** Average distribution of isobars at the ground level in the period 06/05/2010 - 06/13/2010.

Beginning with the 13<sup>th</sup> of June, the eastward movement of a low pressure area from the western part of the continent causes the pressure in our region to drop, reaching 1010 hPa. The frontal system linked to this area will affect Romania starting with the 14<sup>th</sup> of June. From the NCEP/ NCAR reanalysis map in fig. 4, the fact that the mean value of the pressure is between 1012-1014 hPa can be observed.

From June 1<sup>st</sup> to June 13<sup>th</sup> the following amounts of water resulting from precipitation in Cluj county were registered: 14.8 l/m<sup>2</sup> at Turda, 23.9 l/m<sup>2</sup> at Huedin, 14.4 l/m<sup>2</sup> at Băișoara and 39 l/m<sup>2</sup> at Vlădeasa peak.

The temperature - humidity index (ITU) reached and exceeded the critical threshold of 80 at Dej (at 15:00) and Cluj-Napoca (at 17:00) starting on the 11<sup>th</sup> of June 2010. On the 12<sup>th</sup> of June, when the maximum air temperatures reached levels of 32-34°C, warnings were issued for Dej (at 12:30), Cluj-Napoca (at 15:30) and Huedin (at 15:30). Warnings were also issued on the 13<sup>th</sup> of June for Dej (at 11:30), Cluj-Napoca (at 12:00) and Turda (at 12:30). The time at which this warnings were issued was rushed ahead, such that in the first day (11<sup>th</sup> of June), they started at 15:00 and 17:00 respectively, and on the last day (13<sup>th</sup> of June) they started at 11:30 and 12:30 (fig. 5).



**Fig. 5.** Time at which the ITU warning was emitted, in Cluj county.



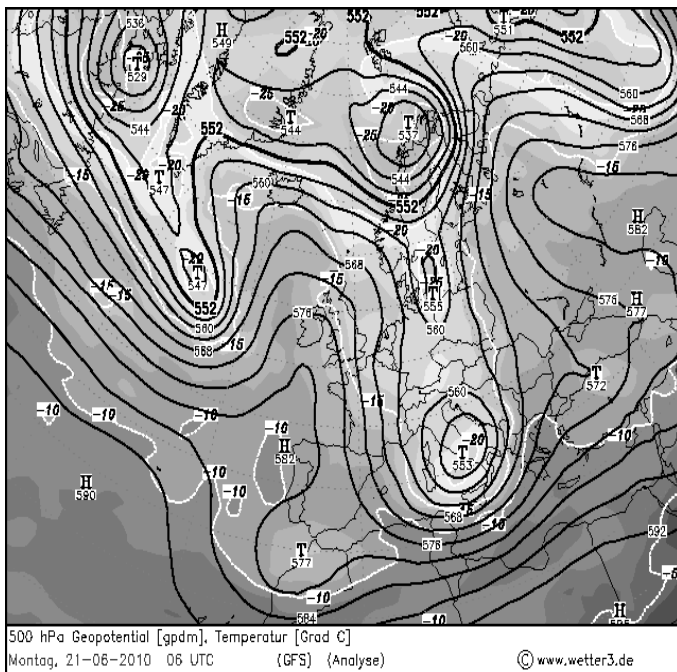
#### 4. ATMOSPHERIC INSTABILITY IN THE SECOND HALF ON JUNE. CASE STUDY: THE 21<sup>ST</sup> OF JUNE

The events in the second half of June 2010 occurred in the context of synoptic - scale blocking movement.

##### 4. 1. Synoptic situation

In the second part of June, the continuity of an accentuated air instability in our country's region, the high temperatures, high humidity and the physical and geographical conditions (extension, shape and altitude of the relief) favored the development of convective structures and prompted large amounts of rainfall, exceeding the monthly averages.

Thus, according to the meteorological and precipitation stations in the county of Cluj, during the month of June 2010, the value of the precipitation totaled an amount of between 236.6 mm at Beliș, 230.9 mm at Bonțida and 83.5 mm at Salatiu. In relatively large areas the quantity of water exceeded 100 l/m<sup>2</sup>. In the second part of June (14<sup>th</sup> - 30<sup>th</sup> of June) amount of water from rain and showers accompanied by lightning were recorded as follows: 147.6 l/m<sup>2</sup>



**Fig. 6.** Geopotential field and the distribution of the isotherm, in the 21/06/2010, at the 500 hPa level, at 06 UTC.

at Cluj-Napoca, 194.9 l/m<sup>2</sup> at Huedin, 119.5 l/m<sup>2</sup> at Dej, 157.8 l/m<sup>2</sup> at Turda, and in the mountain area 85.4 l/m<sup>2</sup> at Băișoara and 143.8 l/m<sup>2</sup> at the Vlădeasa Peak. Strong wind was recorded in Cluj-Napoca on 16<sup>th</sup> of June and in Turda on 18<sup>th</sup> of June. Gust was recorded on the 14<sup>th</sup>, 15<sup>th</sup>, 16<sup>th</sup>, 18<sup>th</sup>, 21<sup>st</sup>, 22<sup>nd</sup>, 23<sup>rd</sup>, 24<sup>th</sup>, 28<sup>th</sup> and 29<sup>th</sup> of June, hail occurred on the 14<sup>th</sup> of June at Apahida and Vlădeasa Peak, on the 18<sup>th</sup> of June in Turda, the 20<sup>th</sup> of

June at Borsă and 21<sup>st</sup> of June at Huedin.

On the 21<sup>st</sup> of June all the weather stations recorded the greatest amount of water of the month. Values above 30 liters per square meter per 24 hours were recorded at Mărișelu (30.5), Rădaia (37.2), Luna de Jos (38.2), Gilău (42.8), Apahida (57.3), Recea Cristur (54.3), Borșa

(55.2), Beliș (81.0). In the time interval June 14<sup>th</sup> to June 30<sup>th</sup> 2010, a total number of 28 warnings for immediate hazardous weather phenomena in the Cluj county and 10 warnings and general information for the north-west part of Transylvania were issued. The detailed analysis of the weather phenomenon produced on the 21<sup>st</sup> of June 2010 revealed a period with prefrontal and frontal instability; the weather observations taken from the weather and precipitations stations indicate the following convective phenomena: heavy rain, wind gusts, strong wind, lightning and hail. The 21<sup>st</sup> of June was marked by pronounced instability in which the synoptic situation was as follows: at 500 hPa isobaric level, above Europe, the geopotential structure decreased in altitude, having a low pressure center with values of 551 gpm centered over the Italian peninsula. Cold air mass related to it had low temperatures of -20°C, specific of cut-off type. The 552, 556, 560 gpm isopleth were closed; further north, above Denmark, another low pressure center was present, with values of 554 gpm at the center- both pressure centers were separated from the same trough. The cut-off nucleus above the Italic peninsula, moving towards the east of the continent, came across the Adriatic Sea, and its periphery caused pronounced instability in our country. On the 21<sup>st</sup> of June, at the 850 hPa level, a hot ridge with temperatures of 15°C dominates in the eastern part of Romania (the Black Sea), and the 10°C isotherm was situated in the western part of the country throughout the day, the interest area having temperatures between 12-14°C (fig. 6).

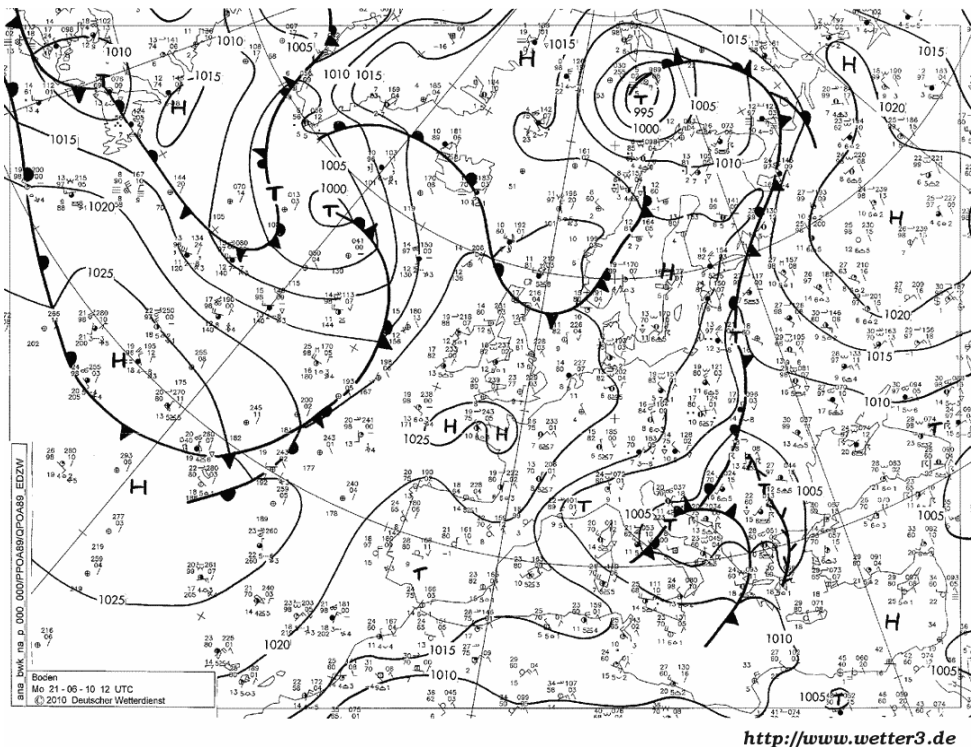


Fig. 7. Ground level field and the front position, on 06/21/2010, at 12 UTC.

At the ground level, on the 21<sup>st</sup> of June 2010, the western part of the continent was under the domination of the Azores High Ridge and the eastern part was still dominated by an anticyclone field, Eastern European Anticyclone ridge. Europe was crossed from north to south by an atmospheric front, the frontal line descending from the Kola Peninsula over the Baltic States, Ukraine, Western part of Romania, Croatia and the Adriatic Sea, down to the Mediterranean (fig.7). The cold front that crossed over our country in the next hours was preceded by a strong squall line located ahead of the front. Over Romania, the pressure drops below 1010-1005 hPa; this drop was caused by the movement towards north of the Mediterranean Cyclone zone.

Thus, in Sălaj County, the maximum quantity of fallen water was of 95.3 l/m<sup>2</sup> at Buciumi. In Cluj county, the water amount was of 81.0 l/m<sup>2</sup> at Beliș. In Satu Mare County, 68.0 l/m<sup>2</sup> at Corund were recorded and in Maramureș county 51.8 l/m<sup>2</sup> at Șieu-Rozavlea were also recorded. In Bistrița-Năsăud county, 24.8 l/m<sup>2</sup> were recorded at Bistrița.

## 4. 2. Radar analyses

All nowcasting warnings that were issued for Cluj county were based on the data and radar images received from the WSR98D radar from Oradea and Bobohalma, using OmniWeatherTrack and PUP applications, which allow the display on the screen of the radar products. On the 21<sup>st</sup> of June 2010, several convective cells were developed, initially in the western part of the county, then in the eastern part.

For the OHP products (1 hour precipitation) and the THP products (3 hour precipitation) which show the horizontal distribution of rainfall expected over a period of one hour, and the THP products (3 hour precipitation) which show the horizontal distribution of rainfall for a period of three hours, the threshold of 25 mm and 45 mm were used as lower limits for the accumulation of the amounts of precipitation that can cause damages. At 9:38, the OHP product near the city of Huedin had maximum rainfall amounts of up to 76.20 mm and the THP product, at 12.54, estimated that for three hours, the maximum values of rainfall were of 101.60 mm (fig. 8).

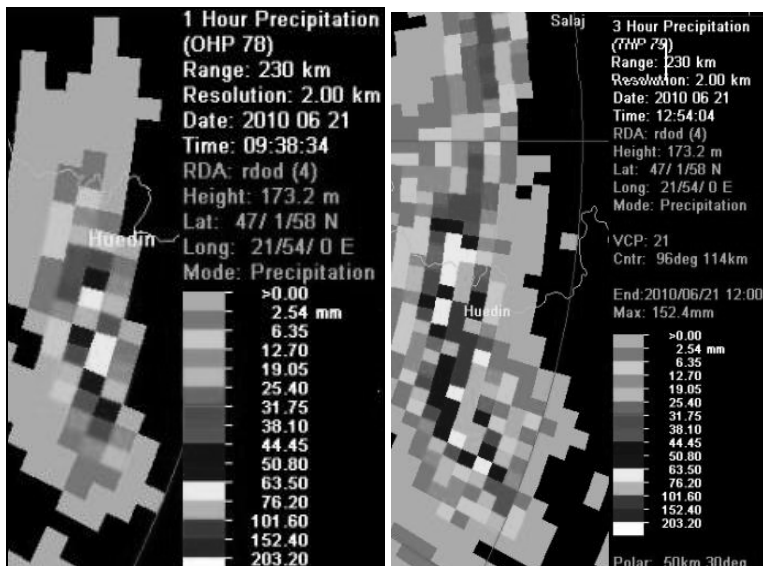


Fig. 8. OHP, at 9:38 UTC and THP, at 12:54 UTC (RDOD).

The amounts of water recorded at the weather and precipitation stations for which warnings were issued (32 l/m<sup>2</sup> at Huedin between the hours 9:35 and 10:35 UTC, 27.6 l/m<sup>2</sup> at Beliș from 10:00 to 11:00 UTC, at Călata between 8:30 to 10:30 UTC - 33.6 l/m<sup>2</sup> and between 10:30 to 12:30 UTC - 39.1 l/m<sup>2</sup>), confirmed the predicted precipitation. Due to the intense and sustained convective activity, the temperature at Huedin did not exceed the maximum of 22°C.

In this context, on the 21<sup>st</sup> of June 2010 the weather was generally unstable. The sky was cloudy and, on extended areas rain fell accompanied by lightning and short-term strong wind (47 km/h in Turda; in the high mountain areas, the wind speed was up to 72 km/h at the Vlădeasa Peak). Isolated small-sized hail was reported at Huedin. In small areas torrential rains were recorded. The maximum amount of water that fell was of 81.0 l/m<sup>2</sup> at Beliș. Maximum temperatures ranged from 22°C at Huedin to 28°C at Dej, and the minimum were between 14°C at Huedin and 18°C at Dej.

In many places, the storms caused damages and casualties among the population. A 21 years old man in Morlaca (Cluj County) died after the car he was in was taken by the elevated waters of the Tibat and Domoș streams. From the ISU reports: in the towns of Huedin, Morlaca, Sâncraiu, Săcuieu, Călata, Poeni (Cluj County), 250 households were flooded, and the E60 highway was covered with water. There have been floods in Turda, Mărtinești and Copăceni. All the events were reflected in the local press.

## 5. CONCLUSIONS

June 2010 was analyzed in a synoptic and mesoscale context, highlighting the differences between the first half of the month and the second half.

From the 11<sup>th</sup> of June 2010 until the 13<sup>th</sup> of June, heat warnings for thermal discomfort were issued, when the temperature-humidity index (ITU) has reached and exceeded the critical threshold value of 80 on extended areas.

In the second part of the month, the atmospheric instability was influenced by the development of convective structures related to the altitude nuclei of cut-off type and the presence of several frontal systems that have crossed our country.

The synoptic structure from the altitude characterizes a strong blockage that will favor the polar cold air penetration to the south part of the continent.

As a result of the ground-altitude synoptic context, the last decade of June was extremely unstable.

The structure of cut-off type positioned above the Italian Peninsula will quickly cross the Mediterranean basin to the Balkan Peninsula. The presence of the thermal blocking to the east and northeast sides of the Black Sea will cause the stationing and reactivation of the cut-off core by the end of June.

Instability manifested itself during the day and evening hours, when showers fell accompanied by lightning and strong wind.

On small areas, rains had torrential character and hail fell. The sum of precipitation fallen in June 2010 is close to the absolute maximum of June: 246.3 mm / month, in the year 2009.

High values of the quantities of precipitation in June 2010 (compared to the climatologically normal) were recorded at Turda 172.6 mm (77.9 mm), Cluj-Napoca 166.8 mm (85.9 mm) and Dej 134 mm (87.0 mm).

On the 21<sup>st</sup> of June, the most intense effects of rainfall in June were recorded: one death in Morlaca; 250 flooded households in Huedin, Morlaca, Sâncraiu, Săcuieu, Călata, Poeni, floods in the cities of Turda, Copăceni and Mărtinești and landslides were recorded in Domosu and Horlacea.

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## THE DEFICIT OF HUMIDITY AND THE ASSOCIATED RISKS IN THE REGHIN HILLS

J. SZILÁGYI<sup>1</sup>, I.A. IRIMUȘ<sup>1</sup>

**ABSTRACT.** – **The Deficit of Humidity and the Associated Risks in the Reghin Hills.** Droughts are atmospheric phenomena of complex risk, due to the reduction or even to the absence of rainfall, characterized by a deficit of humidity (rainfall, underground waters, surface leakage) which can affect the geographical covers over a long period of time. This paper presents an analysis of the pluviometric conditions in the Reghin Subcarpathians with a special view of the periods of pluviometric deficit. In order to identify the periods of pluviometric deficit, in a first stage, we analysed the main parameters which define the pluviometric conditions (the annual, the seasonal and the monthly variations and deviations, the degree of assurance of the different quantities of rainfall), and in order to emphasize the intensity and the character of the periods showing a deficit we calculated the Standard Rainfall Anomaly, the Angot index, the analysis of the negative deviations in the rainfall quantities with the help of the Hellmann method and the Martonne aridity index.

*Keywords:* quantity of rain-fall, excess of humidity, natural risks, vulnerability.

### 1. INTRODUCTION

Droughts are atmospheric phenomena of complex risk, due to the reduction or even to the absence of rainfall, characterized by a deficit of humidity (rainfall, underground waters, surface leakage) which can affect the geographical covers over a long period of time.

According to the definition given by Hellman, through drought period we understand that period of at least 14 consecutive days in the October-March period and at least 10 consecutive days in the April-September period, in which there was no rainfall or the total quantity of rainfall was not larger than 0,1 mm.

Through dryness period we understand that period of at least 5 consecutive days without any rainfall or, if it rained, the quantity was not useful to the vegetation.

We can distinguish several types of drought: atmospheric drought, agroforest drought, hydrological and hydraulic drought, soil-related drought, phreatic drought.

### 2. MATERIALS AND METHODS

In order to identify the periods of pluviometric deficit in the Reghin Subcarpathians, in a first stage, we analysed the main parameters which define the pluviometric conditions (the annual, the seasonal and the monthly variations, the degree of assurance of the different quantities of rainfall) and in order to emphasize the intensity and the character of the periods showing a deficit we calculated the Standard Rainfall Anomaly, the Angot index, the negative deviations in the rainfall quantities with the help of the Hellmann method and the Martonne aridity index, having as a basis the data regarding the pluviometric conditions for the 1978-2008 period, recorded

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at the Tg.Mureş station ( $\varphi=46^{\circ}32'$ ,  $\lambda=24^{\circ}32'$ ,  $H=308\text{m}$ ), the Eremitu station ( $\varphi=46^{\circ}40'$ ,  $\lambda=25^{\circ}00'$ ,  $H=510\text{m}$ ), the Gurghiu station ( $\varphi=46^{\circ}46'$ ,  $\lambda=24^{\circ}51'$ ,  $H=415\text{m}$ ) and the Batoş station ( $\varphi=46^{\circ}32'$ ,  $\lambda=24^{\circ}32'$ ,  $H=308\text{m}$ ).

### 3. THE ANNUAL VARIATIONS IN THE RAINFALL QUANTITIES AND THEIR NEGATIVE DEVIATIONS

The lowest annual rainfall quantities for the 1978-2008 period have recorded values between 400-500 mm at Târgu Mureş, 500-600 mm at Gurghiu and 600-700 mm at Eremitu. At the Batoş meteorological station, in the 1987-2008 period, the lowest annual rainfall quantities have been between 400-500 mm, the lowest one -421,2 mm, being recorded in 2003.

The evolution of the sliding averages of rainfall quantities for periods of ten years with successive one year differences, emphasises, for the studied area, periods with rainfall quantities under the multiannual average, in the successive periods between 1978-1987, 1979-1988, 1980-1989, 1981-1990, 1982-1991, 1983-1992, 1984-1993, 1985-1994, 1986-1995, 1987-1996, 1988-1997, 1989-1998, when the recorded rainfall quantities were under the multiannual average with until 200 mm/year.

From the analysis of the deviations of the average annual rainfall quantities as compared to the multiannual average, we can state that the values of the negative deviations, which generated years showing a rainfall deficit, can be integrated between -100 şi -250 mm, while that the highest values of the negative deviations recorded in the succession of the analysed years have been of -237,9 mm (1990) at Eremitu, -220 mm (2003) at Batoş, -200,9 mm (1987) at Târgu Mureş and -198,2 mm (1987) at Gurghiu.

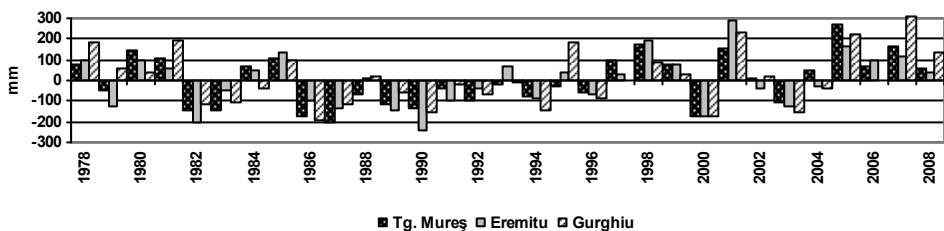


Fig. 1. The annual deviations in the rainfall quantities as compared to the normal (multiannual average).

The analysis of the frequency of the years with deviations from the multiannual average in the rainfall quantities in the succession of the analysed years, emphasises for the studied area, a higher weight of the years with pluviometric deficit. The periods with negative deviations are usually of 2-3 years, the longest periods of pluviometric deficit 11 years have been recorded at Târgu Mureş, between 1986-1996, and 8 years at Gurghiu, between 1988-1996.

### 4. THE MONTHLY VARIATION IN RAINFALL QUANTITIES AND THEIR NEGATIVE DEVIATION

The annual rainfall conditions, in the studied area, shows a main minimum in the month of February and a secondary minimum in the month of November, months in which the lowest average rainfall quantities in a year are recorded, of 23,3 mm respectively of 31,8 mm.

By analysing the frequency of the months with minimum values of rainfall it can be established that all the months of the year, except July, were considered at least once as the driest month of the year, the highest cases of minimum rainfall values being recorded between January and March. Therefore, January and March represented months with pluviometric deficit in 22,6% of the cases, February and October in 19,4% of the cases, June, November and December in 9,7% of the cases, April in 6,4% of the cases, while that May and August in 3,2% of the cases.

By calculating the frequency of the monthly rainfall deviations from the multiannual monthly average it has been ascertained that there is a higher weight of the negative deviations as compared to the positive deviations with until 20%. Generally, the values of the monthly negative deviations oscillate between  $-5$  și  $-20$  mm, but there are cases when these reach  $-30$  respectively  $-40$  de mm. The highest weight of the negative deviations from the multiannual monthly average had been recorded in the warm season of the year, in May, June, August and September (58-61,2%), when the value of the monthly negative deviations from the multiannual monthly average recorded values of until  $-70,2$  mm.

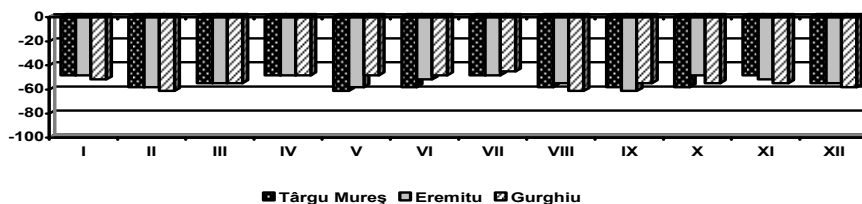


Fig. 2. The weight of the negative monthly rainfall deviations from the annual monthly average, 1978-2008.

## 5. THE ANALYSIS OF THE PLUVIOMETRIC DEFICIT WITH THE HELP OF THE ANGOT INDEX

The estimation of the Angot index for each month allows us to establish the types of monthly rainfall variations for each station submitted to analysis, and to emphasize the months with pluviometric deficit and pluviometric excess, by removing the influence of the number of days from that month.

From the analysis of the Angot index, the periods January-March and October-December show pluviometric deficit, the driest month being February, for which the Angot index shows the lowest values at all the studied stations.

By comparing the values of the Angot index and the frequency of the different quantities of rainfall characteristic to the two time periods, on the one hand it can be established that in the January-March period the pluviometric deficit is higher (IA 0,5-0,6) than in the October-December period (IA 0,7-0,8), and on the other hand, there is a lower severity of the pluviometric deficit in the sub-mountainous area ( helmann diagrams).

The analysis of the frequency of the different rainfall quantities for the two time periods with pluviometric deficit shows for the western extremity of the studied area a weight of 40-60% for the rainfall quantities between 25,1-50 mm and a weight of 25-35% for the quantities of 25,1-50 mm, while in the sub-mountainous area, the highest frequency is recorded by the rainfall quantities between 25,1-50 mm, with a weight of 40-60 % followed by quantities between 50,1-75 mm, with a weight of 13-38% and quantities of 75,1-100 mm, with a weight of 13-25% (Eremitu).



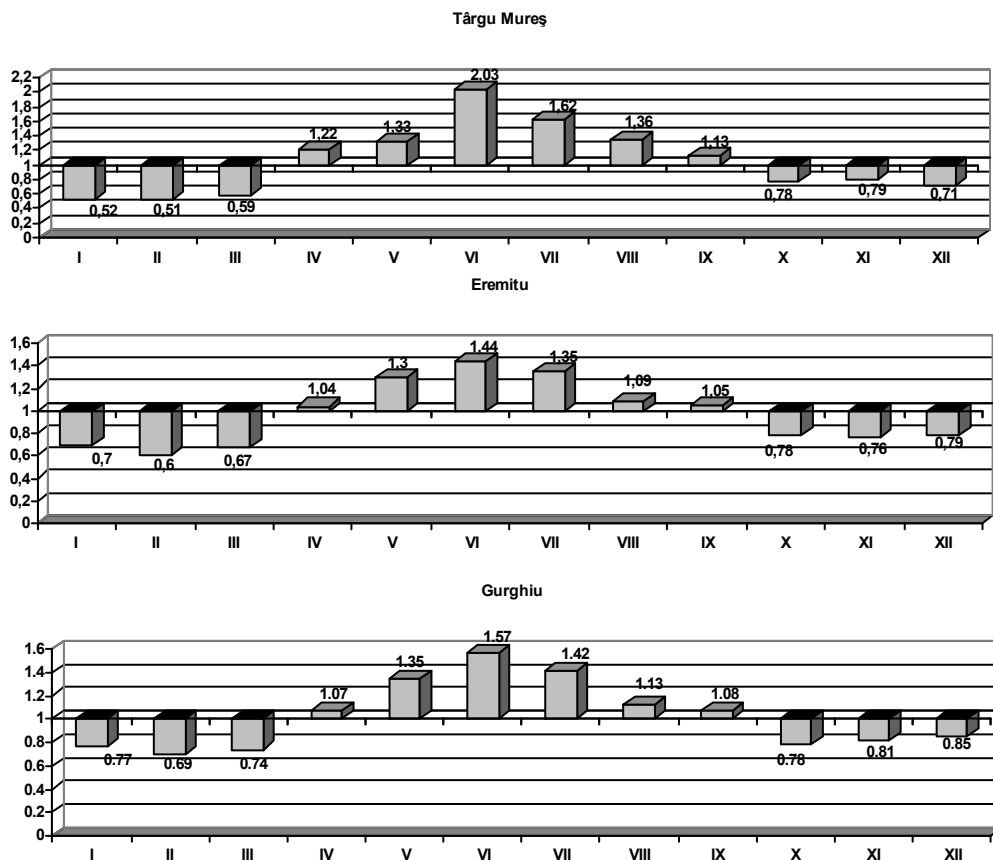


Fig. 3. The monthly variation in the Angot index, 1978-2008.

## 6. THE FREQUENCY OF THE PERIODS WITH PLUVIOMETRIC DEFICIT AFTER THE HELLMAN CRITERION

From the analysis of the negative deviations in the quantities of the annual rainfall, according to the Hellman criterion, it has been ascertained that in the Reghin Subcarpathians, the frequency of the years with pluviometric deficit is higher than that of the years with pluviometric excess, with 10% in the sub-mountainous area and 20% in the West of the studied area.

From the total of the years showing a rainfall deficit there is an emphasize on a high frequency of the extremely droughty and droughty years with a weight of 9,6-16,1%, followed by the moderately droughty years, with a frequency between 3,2-16,1% and very droughty with a frequency of 6,04-9,6%. The highets number of cases of negative deviations with over 20% from the multiannual average, considered normal, were recorded at Târgu Mureş (6 cases-19,3%) and at Gurghiu (5 cases-16,1 %), cases in which the negative deviations from the multiannual average have recorded values of until 250 mm.

By analysing the frequency of the extreme deviations from normal of the rainfall quantities, it can be ascertained that the frequency of the excessively droughty years and the excessively rainy years have an almost equal weight of 19,6%.

The analysis of the negative deviations in the quantities of the monthly rainfall from the multiannual monthly average, considered normal, highlights a higher weight of the months with pluviometric deficit (46,2-47,9%) as compared to the normal ones (10,3%-15,3).

The monthly frequency of the negative deviations during a year generally shows values between 45-55%. The months recording the highest frequency of the pluviometric deficit vary territorially. Therefore the pluviometric deficit records frequencies higher than 50% of the total number of cases in the months of January, March, August, September. In the warm semester of the year the weight of periods with pluviometric deficit are comprised between 35,5-51,6% at Târgu Mureş, 29,0-41,9% at Gurghiu, 36,4-40,9% at Batoş and between 32,2-38,7% at Eremitu.

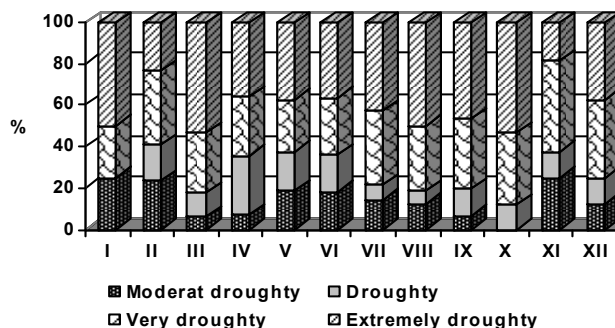
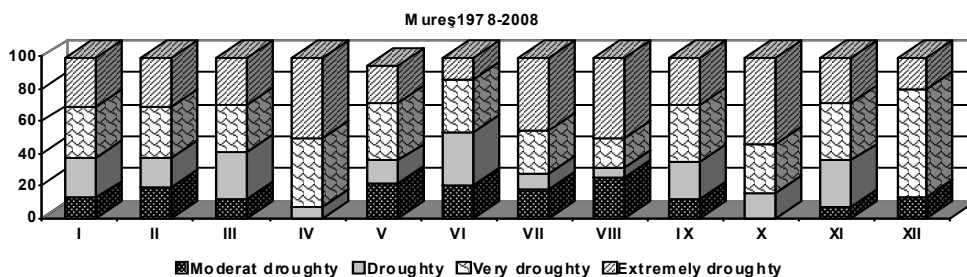
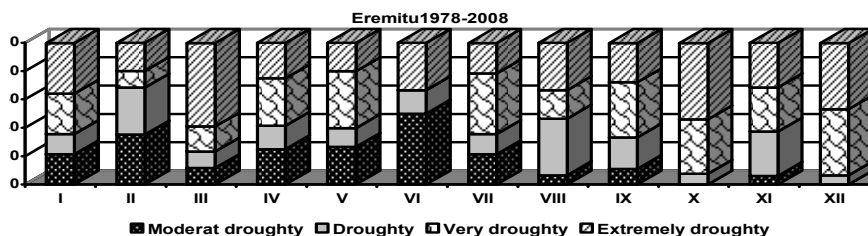


Fig. 4. The monthly frequency of the different pluviometric characteristics during a year after the Hellman criterion, Gurghiu, 1978-2008.

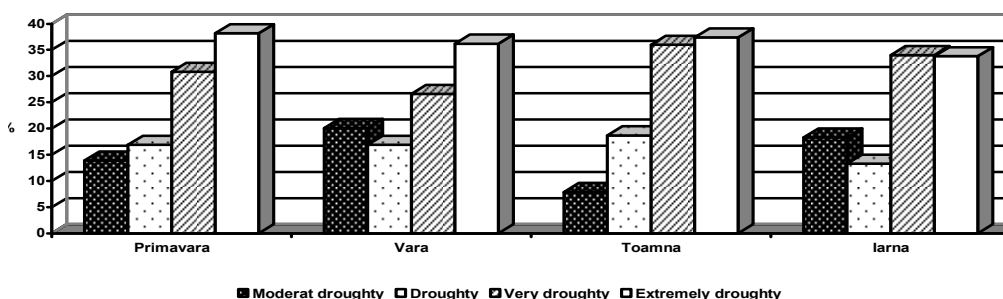


On a seasonal basis, in the 1978-2008 time period, the highest frequencies of the periods with pluviometric deficit have been recorded in the winter season with 142 (26,5%) cases, from the total of 541 cases with pluviometric deficit recorded during the entire analysed time period analysed. At the opposite end, we have the summer season with 124 (22,9%) cases, while that the transitional seasons, spring and autumn, have recorded 136 (25,1%) cases, respectively 124 (22,9%) cases.



**Fig. 5.** The monthly frequency of the different pluviometric characteristics during a year after the Hellman criterion.

By totalizing the periods with pluviometric excess showing different characteristics on a seasonal basis, after the Hellman criterion, it has been ascertained that there is a higher weight of extremely droughty periods (38,2-33,8%), in each season, followed by the very droughty periods (36,0-26,6%), the droughty and the moderately droughty having the lowest weight in all cases with 18,7-13,3% respectively 20,1-7,9% from the cases.



**Fig. 6.** The frequency of periods with pluviometric deficit showing different seasonal characteristics after the Hellman criterion, 1978-2008.

## 7. THE ANALYSIS OF THE PLUVIOMETRIC DEFICIT THROUGH THE STANDARD RAINFALL ANOMALY (SRA) METHOD

From the analysis of the variations in the values of the Standard Rainfall Anomaly it has been ascertained that the years considered normal from a pluviometric point of view (SRA 1,0...-1,0) have the highest frequency, with a weight of 67,8-74,2%, while that the years with pluviometric deficit (SRA < -1,0) have presented a frequency between 9,7-19,3%, values situated under the time periods of pluviometric excess (SRA > 1,0). A decrease in the years with pluviometric deficit from the western part of the studied area has been found as well (19,3% Târgu Mureş) towards the sub-mountainous area, where the frequency of the pluviometrically deficitary years has recorded a weight comprised between 9,7-13,7% from the total number of cases.

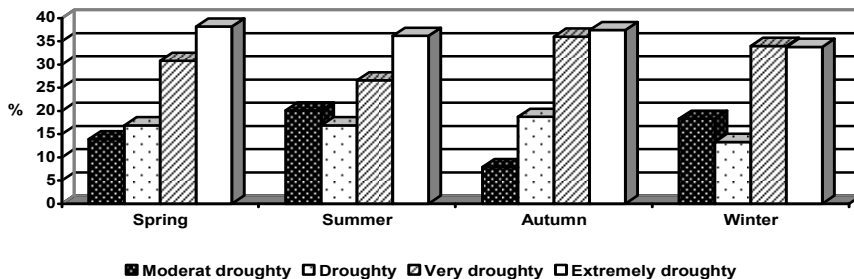
**The frequency of the years with pluviometric deficit according to the Standard Rainfall Anomaly**

**Table 1**

Qualificative	Normal		Pluviometric deficit	
	1,0...-1,0		> -1,0	
Deviation %	Nr. of case	%	Nr. of case	%
<b>TÂRGU MUREȘ</b>	21	67,8	6	19,3
<b>EREMITU</b>	23	74,2	3	9,7
<b>GURGHIU</b>	21	67,8	4	12,9
<b>BATOȘ</b>	15	68,2	3	13,7

Among the droughty years the following ones distinguish themselves: 1982, 1983, 1986, 1987, 1990, 2001 and 2003, when the pluviometric deficit recorded values reaching – 250 mm as compared to the multiannual average. By totalizing the frequency of the years showing a pluviometric deficit for the

studied time period, with different characteristics, it has been ascertained that there is a higher weight of the droughty years with 13 cases (81,25%), followed by the very droughty periods with 3 cases (18,7%).



**Fig. 7.** The frequency of the years with pluviometric deficit with different characteristics according to the Standard Rainfall Anomaly.

In the time period between 1978-2008 the highest number of months with pluviometric deficit was recorded as follows: the months of July, August and October had a frequency of 14 (11,2%) cases, followed by the months of January and April each with 13 (10,4%) cases, November with 10 (8,0%), March and June- each with 9 (7,2%) cases, February with 8 (6,4%) cases, September with 7 (5,6%) cases and December with 6 (4,8%) cases.

By calculating the frequency of the months with a pluviometric excess, with different characteristics, it has been ascertained that there is a high frequency of the droughty months (8,6-10,2%), followed by the very droughty ones (1,3-2,1%), while that the extremely droughty periods have recorded only one case, in February, which represents a weight of 0,4% from the total number of cases.

On a seasonal basis, in the 1978-2008 time period, the highest weights of the periods with pluviometric deficit have been recorded in summer and autumn with 30,4% respectively 24,8% of the total number of cases, followed by spring with 24,0% and winter with 20,8% of the cases.

By totalizing the periods with pluviometric deficit showing different characteristics on a seasonal basis, after the Standard Rainfall Anomaly, we can notice a high weight of the droughty periods (68,4-92,3%) in all the seasons, as compared to the very droughty periods which have recorded the maximum value at summer (31,6%), and it has not exceeded a higher frequency than 17,0% of the cases.

The frequency of the months with pluviometric deficit showing different characteristics according to the Standard Rainfall Anomaly

Table 2

	Normal		Droughty		Very droughty		Extremely de droughty		Exceptionally droughty	
Deviation %	1,0...-1,0		-1,1...-1,5		-1,5...-2,0		-2,0...-2,5		<2,5	
Station	Nr. case	%	Nr. case	%	Nr. case	%	Nr. case	%	Nr. case	%
TÂRGU MUREŞ	277	74,5	33	8,9	9	2,4	0	0	0	0
EREMITU	282	75,8	32	8,6	5	1,3	0	0	0	0
GURGHUIU	275	73,9	38	10,2	8	2,2	0	0	0	0

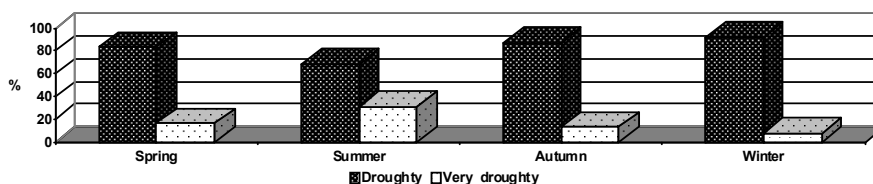


Fig. 8. The frequency of periods with pluviometric deficit showing different seasonal characteristics, 1978-2008

## 8. THE ANALYSIS OF THE PLUVIOMETRIC DEFICIT WITH THE HELP OF THE DE MARTONNE ARIDITY INDEX

In order to calculate the De Martonne aridity index on the territory of the Reghin Subcarpathians we have used the annual and monthly average values of the rainfall quantities and of the temperatures at the two meteorological stations existent in the studied area- Târgu Mureş – for the 1978-2008 period and Batoş for the 1987-2008 period.

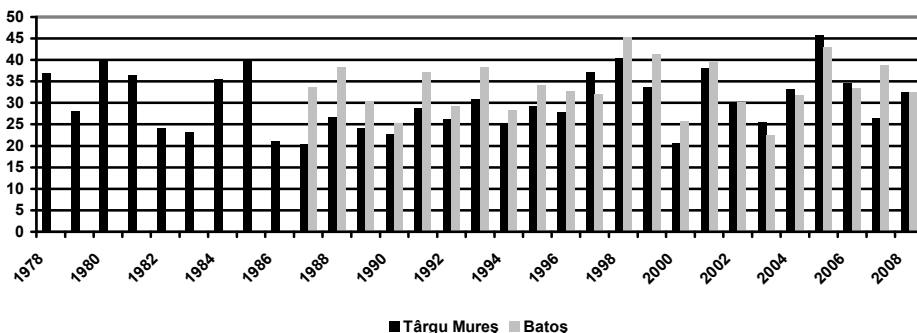


Fig. 9. The Variations in the Values of the De Martonne Aridity index, 1978-2008.

From the analysis of the De Martonne aridity index (A) for the Târgu Mureş station it has been ascertained that from the succession of the studied years, in 58,1% of the cases, the values of index A were between 20-30, which shows a higher weight of periods with semiwet character and at the Batoş station in 72,7% of the cases index A has recorded values over 30, which shows a higher weight of periods with wet character.

## 9. THE RISKS INDUCED BY THE PLUVIOMETRIC DEFICIT

Although droughts can be recorded all year long, in the studied area the largest number of droughts is registered at the end of summer and the beginning of autumn.

According to the moment of the year when they appear, droughts can be classified in: winter droughts, spring droughts, summer droughts and autumn droughts, each category having a negative impact over agriculture:

- **Winter** drought causes the decrease of the water reserve in the ground/soil necessary to the start of the vegetation process at the beginning of spring;
- **Spring** drought delays the vegetative cycle and it can be associated with other risk phenomena (powerful winds);
- **Summer** drought has negative effects conditioned by the types of crops and their phenophases;
- **Autumn** drought has major negative consequences especially for the autumn crops, which, under the conditions of a deficit of humidity in the soil, germinate slower.

Prolonged droughts have an influence over the water feeding of places. During the periods of hydrological drought, the water supplies on the interior rivers can subside almost nine times, which creates problems, especially in the areas with a high risk to this extreme meteorological phenomenon. At the same time, there is also an emphasized diminishment of the underground water reserves, which increases the water deficit in those areas, where a „hydric stress” is set up, (The National Strategy and Programme of action regarding the fighting of desertification, the degradation of fields and of drought, 2000).

## 10. CONCLUSIONS

The data analysis for the studied area evidence:

- the lowest annual rainfall quantities record values between 400-500 mm at Târgu Mureş and Batoş, 500-600 mm at Gurghiu and 600-700 mm at Eremitu;
- the annual rainfall conditions, in the studied area, shows a main minimum in February, and a secondary minimum in November, months when the lowest average rainfall quantities in a year have been recorded, of 23,3 mm respectively 31,8 mm;
- January, March represented months with pluviometric deficit in 22,6% of the cases, February and October in 19,4% of the cases, June, November and December in 9,7% of the cases, April in 6,4% of the cases, May and August in 3,2% of the cases;
- according to the Angot index, in the Reghin Subcarpathians, there are periods with pluviometric deficit between January-March (IA 0,5-0,6) and October-December (IA 0,7-0,8) while that February is recorded as the driest month;
- according to the Hellman criterion, from the total of years showing a pluviometric deficit, there is an emphasize on the higher frequency of extremely droughty and droughty years with a weight of 9,6-16,1%, followed by the moderately droughty years with a weight between

3,2-16,1%, and very droughty with a frequency of 6,04-9,6%. By totalizing the frequency of the months with different negative deviations, we ascertained, in all the studied stations, the high frequency of extremely droughty periods (15,2-20,1%) and of very droughty ones (14,0-16,6%), followed by the droughty and moderately droughty with frequencies between 6,5-9,9%, respectively 8,3%.

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## **BORȘA-VIȘEU MINING AREA. EFFECTS OF THE POLICY OF DISADVANTAGED AREAS**

**GABRIELA-ALINA MUREȘAN<sup>1</sup>, GABRIELA TIMIȘ<sup>2</sup>**

### **ABSTRACT. – Borșa-Vișeu Mining Area. Effects of the Policy of Disadvantaged Areas.**

The policy of the disadvantaged areas was a component of the regional development policy in Romania between 1998 and 2010. It aimed to delineate those areas with serious economic and social issues mainly generated by industrial restructuring in order to take specific measures to revive them. Borșa-Vișeu mining area is one of the 38 disadvantaged areas that were identified in Romania. The present article aims to emphasize the way in which the status of disadvantaged area had effects on the economic development of the two towns, part of the area. Therefore, the companies that invested in the area once it was declared a “disadvantaged area” were analyzed, along with the new jobs, the total value of investments and the way these influenced (in a positive or negative manner) the decrease of the unemployment rate and the economic revival through activities from new economic fields. The conclusion is that a relatively high number of companies invested in the area during its existence as a disadvantaged area, yet they preferred those economic branches that were traditional and had an easy access to raw material, namely towards the Manufacture of wood and wood products.

*Keywords:* disadvantaged area, economic agents, unemployment, investments, economic revival.

### **1. INTRODUCTION**

The policy of the disadvantaged areas was a component of the regional development policy in Romania between 1998 and 2010. It aimed to delineate those areas with serious economic and social issues mainly generated by industrial restructuring in order to take specific measures to revive them. Borșa-Vișeu mining area is one of the 38 disadvantaged areas that were identified in Romania and it was declared a disadvantaged area in 1999, under Government Resolution no. 204 issued on March 25, 1999. The Resolution states that Borșa-Vișeu mining area, from Maramureș county, includes Borșa and Vișeu de Sus, as territorial-administrative units, totalizing 86,718 ha (article 2). The mining area is declared a disadvantaged area for a period of 10 years (article 3).

The criteria under which Borșa-Vișeu mining area was declared a disadvantaged area were those stated in the Emergency Ordinance no. 24 of 1998 (b) and (e) on the disadvantaged areas, namely that these areas are mining areas where the labour force was made redundant, through collective layoffs, as the industrial restructuring policy was put in practice; they lack communication means and their infrastructure is poorly developed.

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The status of disadvantaged area implied giving to potential investors in such areas some facilities in order to draw investments and, in particular, to generate new jobs aiming to foster an economic revival, as all these areas had been greatly affected by economic restructuring and unemployment. The present article aims to emphasize the results of such a policy within Borșa-Vișeu mining area, the way in which their new status had effects on the economic development of the two towns, part of the disadvantaged area, and to see whether the policy reached its main goal.

In order to better understand the economic and social background of the area before its declaration as “disadvantaged”, we have to sketch some specificities of the local economy in the last half of the 20<sup>th</sup> century. The Manufacture of wood and wood products represented the main economic activity in the two towns. In Borșa and Baia Borșa, Mining and quarrying and primary manufacture of non-ferrous ores were also characteristic. The manufacture of wood and wood products was a natural continuity of the local craftworks within Maramureș Land. Here the phases of the manufacture of wood and wood products also have specific, local names, for example, wood exploitation in the forest, as a first phase before its manufacturing, was known as “butinărit” (“work in the forest”). The second phase was represented by the transportation of the logs as rafts, the occupation being named “plutărit” (“log rafting”) (Gabriela Ilieș, 2007). Other manufacturing activities had their peak during 1965-1980, for example the Manufacture of chemicals and chemical products, the Manufacture of food products, the Manufacture of textiles, Trade and Tourism. After 1990, once industrial restructuring started and the mines were closed, there was a decrease in industrial production which determined massive layoffs and a high unemployment rate. In particular, Mining and quarrying declined. Other economic activities adjusted by capitalizing local raw materials and work force, namely the Manufacture of wood and wood products with its sub-branches, the Manufacture of textiles and of food products (id. ibidem).

In order to emphasize the manner in which the number of employees in Manufacturing was affected by the restructuring process, we used the data made available by REMIN S.A. Baia Mare - National Company of Valuable and Non-ferrous Metal Ores, which controlled the mines within Baia Borșa area. There is a continuous decrease in the number of employees during 1991-2001 due to the massive layoffs (table 1, figure 1).

**The number of employees within REMIN S.A. Baia Mare during 1991-2001.  
Baia Borșa mine.**

**Table 1**

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
<b>Number of employees</b>	4512	4480	4456	4430	4476	4253	4256	2750	2730	2520	2332

**Source:** *REMIN S.A. Baia Mare - National Company of Valuable and Non-ferrous Metal Ores, Baia Borșa mine [Compania Națională a Metalelor Prețioase și Neferoase REMIN S.A. Baia Mare, Exploatarea Minieră Baia Borșa]*

Massive layoffs took place in 1997, a situation similar to other mining areas, for example Baia Mare mining area. This was triggered by the process of industrial restructuring within Mining and quarrying, as the Governmental Ordinance no. 22 of August 19, 1997 was enforced. It determined a major decline of all economic activities within all mining areas. In

Borșa-Vișeu area it triggered a decrease in the number of employees with approximately 1,500 persons. In 1998, there were only 2,750 employees as compared to the 4,256 in 1997. The decrease of the number of employees continued in the following years in a slower rhythm and in 2001, the company had with 50% less employees than in 1991.

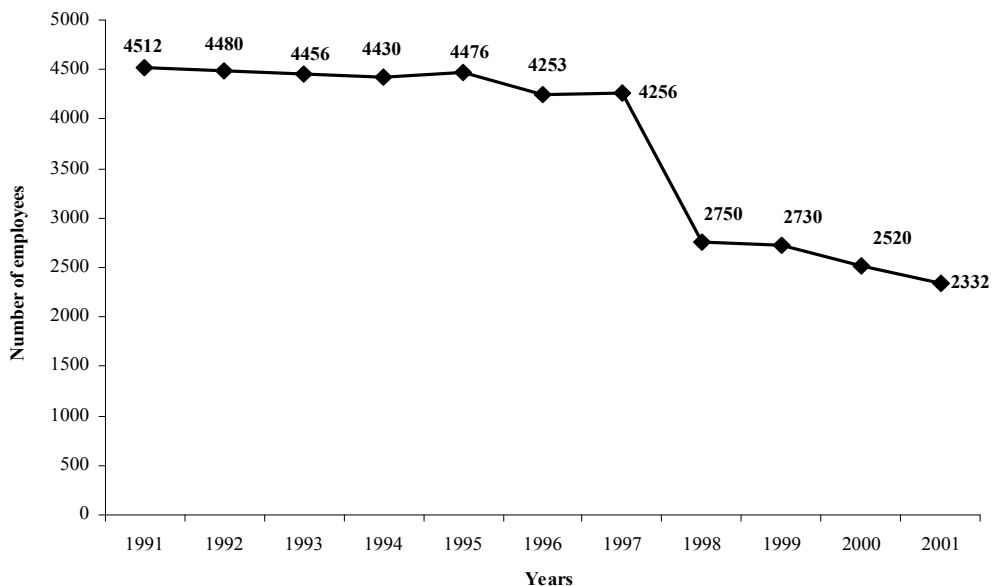


Fig. 1. Representation of the number of employees within REMIN S.A. Baia Mare, Baia Borșa mine.

The number of unemployed increased also due to the process of restructuring that affected also other economic activities. As a consequence, when Borșa-Vișeu was declared a disadvantaged area, the unemployment rate was 47.8% in Borșa and 61.24% in Vișeu de Sus.

## 2. BORȘA – VIȘEU DISADVANTAGED AREA. INDICATORS

Once the area was declared “disadvantaged area”, there were 159 investor certificates issued for economic agents before July 1, 2003. This was one of the conditions required to be exempted from the income tax pursuant to Law no. 507 of 2004 for the passing of the Governmental Ordinance no. 94 of 2004 on regulating some financial measures. Changes in the disadvantaged areas legislation included a decrease in the number of facilities the investors were to receive, which determined a decrease in the interest the economic agents had to obtain an investor certificate.

The analysis carried out for Borșa-Vișeu disadvantaged area took into account several indicators that were instrumental in determining the effects the policy of disadvantaged areas had on the economic development of this area. The following indicators were considered: *the number of economic agents* that had investor certificates, *the number of new jobs* that were to cover the labour force in the area, and *the value of investments*. The analysis was twofold: on one

hand, there was an analysis of each indicator for the localities that are part of the disadvantaged area; on the other hand, there was an analysis on the business object (on economic branches and sub-branches). In this respect, the activities from NACE were considered (NACE 1997, completed with NACE revision 1, both operational when the companies registered). The typology of the companies with investor certificates was done at first based on the sections from NACE, which were associated in the analysis with the main economic branches (Manufacturing, Trade etc.). Then Manufacturing<sup>1</sup> was considered in its sub-branches and even its divisions, groups and classes which were considered sub-branches of this economic sector. In certain cases, as for Telecommunications, it was associated with Transportation and storage (in conformity with NACE revision 1) because of the small number of economic agents that invested in it.

### 2.1. The number of economic agents

Out of the **159 economic agents** that invested in Borșa-Vișeu disadvantaged area, 88 had their registered office in Borșa town (55% out of the total number of registered companies) and 71 in Vișeu (figure 2). The figure shows that

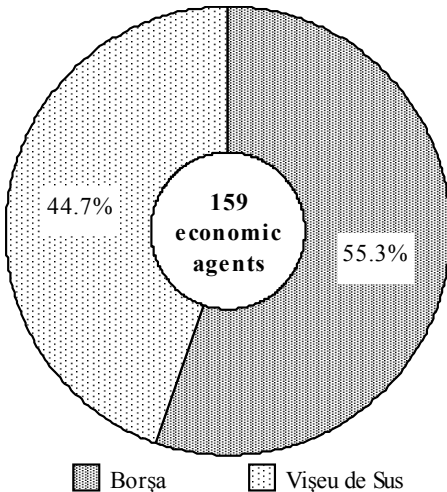


Fig. 2. Economic agents and the localities of registration.

there is a certain balance concerning the number of companies registered in each town of the disadvantaged area, with a slight prevalence for Borșa. This can be explained by the demographic size and the polarization potential of each, which are relatively similar. Yet Borșa is slightly ahead of Vișeu de Sus concerning the latter. Both administrative units have a certain tradition concerning crafts, followed by local manufacturing, and they also have markets and business infrastructure.

Even though the business objects the companies have seem to be very varied, in fact they are grouped in certain economic branches. Thus, almost a half of the registered economic agents (69, 43.4% out of the total) had businesses in *Manufacturing*, followed by the ones in *Transportation and storage*, represented by 39 economic agents, namely 24.5% out of the total

and in *Agriculture and forestry*, represented by 18 economic agents, totalizing 11.3% (table 2, figure 3). At the other end, there is *Human health and social work activities*, and the activities we called "*Other services activities*"<sup>2</sup>, each with 4 active economic agents (2.5% of the total). Not so sought by investors were *Tourism and Trade*, each with 5% out of the total number of companies, while *Construction* registered only 9 companies (5.7% of the total).

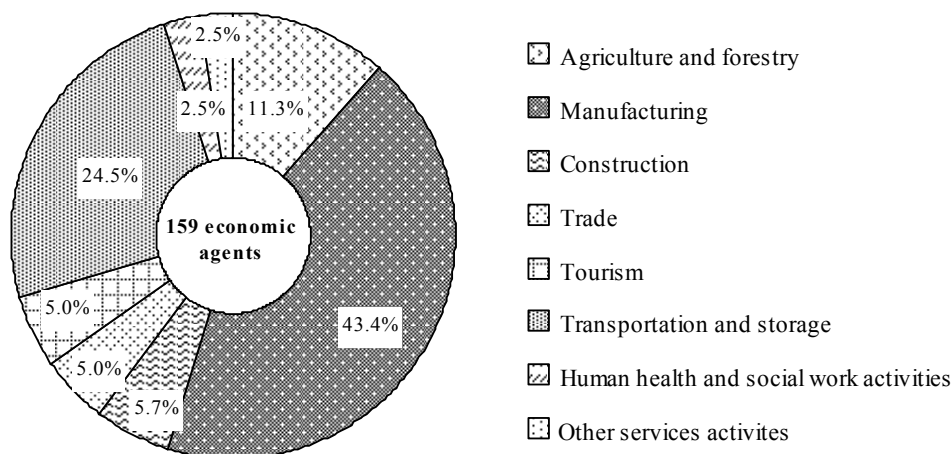
<sup>1</sup> Section E, in conformity with NACE 1997, and D, in conformity with NACE revision 1, 2005

<sup>2</sup> *Other services activities* includes NACE section named **Real estate activities, rental and leasing activities, business support activities** (real estate activities, rental and leasing of machines and equipment, information service activities, accounting, advertising, architectural and engineering activities, photographic, secretarial activities).

**Number of economic agents on their business object.**

**Table 2**

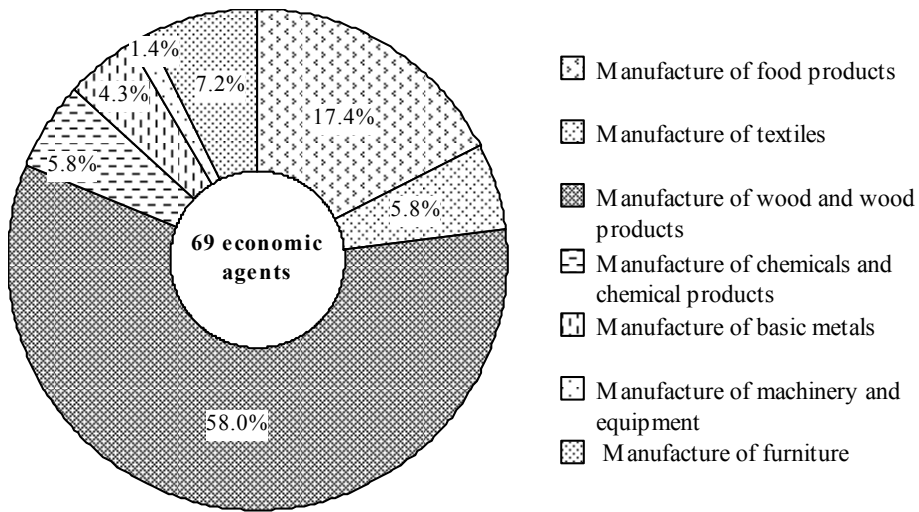
Economic activity	Agriculture and forestry	Manufacturing	Construction	Trade	Tourism	Transportation and storage	Human health and social work activities	Other services activities	Total
Number of economic agents	18	69	9	8	8	39	4	4	159



**Fig. 3.** Representation of economic agents on the business object.

Due to the large number of companies that invested in economic activities that are specific to various sub-branches of Manufacturing, and because of the varied activities that are part of this sector, the analysis was extended in order to analyse in more detail the sub-branches of Manufacturing. Thus, the more in-depth analysis revealed that the highest percentage, 58.0% of the total number of companies activating in the field of Manufacturing, belonged to the *Manufacture of wood and wood products* (NACE revision 1) where there were 40 economic agents. With significantly lower number (12 economic agents, totalizing 17.1%) there comes the *Manufacture of food products* and then the *Manufacture of furniture*, with 5 economic agents, representing 7.1% (figure 4). With less than 5 economic agents, there comes: the Manufacture of textiles, the Manufacture of chemicals and chemical products, the Manufacture of basic metals and Manufacture of machinery and equipment.

More interesting seems to be the analysis of the number of economic agents considering both major economic branches and the sub-branches of Manufacturing and uniting then in a distinct analysis. In conformity with Table 2 and Figure 4, the most numerous companies carried out businesses in the *Manufacture of wood and wood products*, closely followed by *Transportation and storage*, then by *Agriculture and forestry*, then by a branch of Manufacturing, the *Manufacture of food and food products* and then by *Construction, Trade and Tourism*.



**Fig. 4.** Representation of the economic agents carrying out activities within the sub-branches of Manufacturing.

The economic agents that invested in *Agriculture and forestry* in fact invested mainly in forestry (90%), namely in activities related to the *Manufacture of wood and wood products*. Many of these economic agents have as secondary business object wood processing (wood manufacturing). Therefore, the greatest attraction in the area was in the activities related to wood exploitation and manufacturing. This can be explained by the natural background, which abounds in qualitative raw material for the manufacture of wood and wood products, and the tradition of wood processing in the area. There was also an interest in economic activities that were flourishing after 1990, such as *Transportation and storage*, supported also by a powerful flow of international and regional migration. There was less interest in *Construction, Trade, and Tourism*.

One of the major aims of the policy of disadvantaged areas was to draw investors to invest in the area and to set up new jobs. Thus, the unemployment rate would decrease and the area would experience an economic revival, as the disadvantaged area was lagging behind from an economic and social point of view.

Therefore, two other indicators were considered relevant for the study: the new jobs and the value of investments in the disadvantaged area.

## 2. 2. New jobs

In conformity with the data made available to us, there were **2,826 new jobs** in Borşa-Vişeu disadvantaged area that were unevenly distributed among the localities and the economic branches and sub-branches. As compared to the distribution of economic agents, more than 2/3 of the total number of new jobs have been set up in Vişeu de Sus, namely 1,955 (70% from the total). Borşa benefited from a lower number of new jobs, namely 871. Many active companies preferred Vişeu de Sus, maybe due to its accessibility, as there is the necessary transport infrastructure. The three economic agents that have more than 200 employees and invested in the area preferred Vişeu de Sus for their registered office.

Analyzing figure 5, the distribution of new jobs on main economic branches is relatively similar to the distribution of Small and Medium-sized Enterprises that had investor certificates, at least for the first part of the list. The highest number of new jobs (1,687 – 60%) is registered in *Manufacturing*, where most of the Small and Medium-sized Enterprises activate. It is followed by *Transportation and storage*, 12.6% (357 new jobs), and *Trade* with approximately 11% (313 new jobs). Except for *Tourism*, with 8.5%, and *Agriculture and forestry*, with 5.1%, all the other economic branches had few new jobs created, accounting

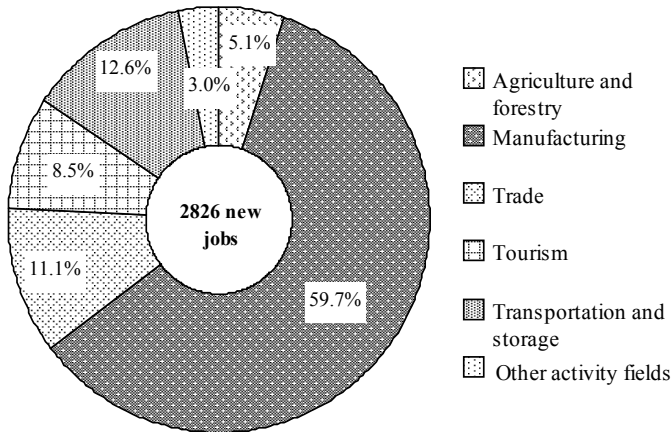


Fig. 5. Representation of new jobs on main economic branches.

for less than 3%. The number of active companies in Agriculture and forestry (18) was higher than those companies activating in Trade and Tourism (8). Yet, the companies activating in Agriculture and forestry had fewer employees (for example, 14 companies had less than 10 employees, therefore the companies are considered small-sized companies). On the other hand, Trade registers an opposite situation, namely one of the active companies activating in Trade had 248 employees, thus determining a higher place in the hierarchy.

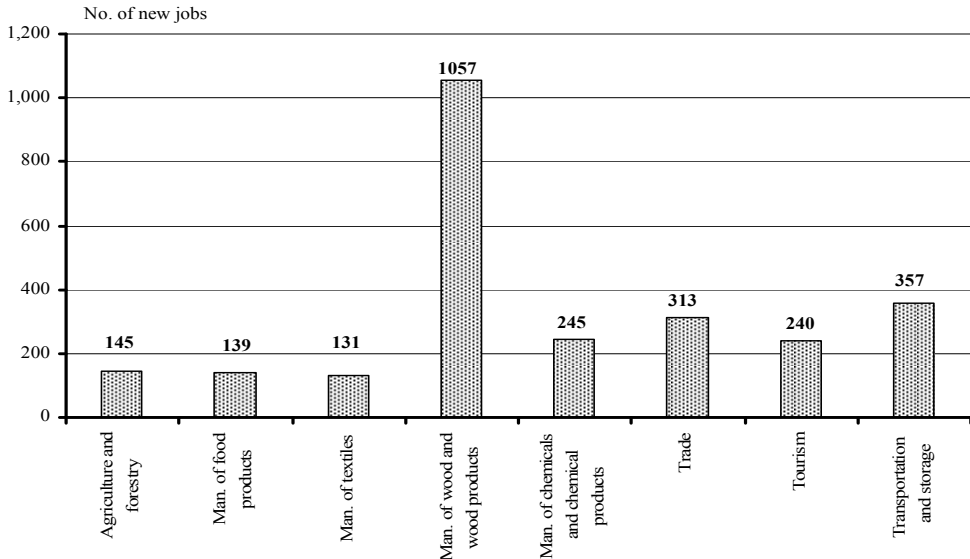
Within Manufacturing the situation is different. The first place is occupied by the *Manufacture of wood and wood products*, with 1,057 new jobs (approximately 63% of the new jobs created in Manufacturing), it is followed by the *Manufacture of chemicals and chemical products*, the number of new jobs being lower in this case (245, representing 14.5%). In this sub-branch, one of the 4 economic agents that invested in the area created 201 new jobs. This is the explanation of the position the sub-branch occupies in the hierarchy (table 4).

**Number of new jobs within manufacturing sub-branches**

**Table 4**

Economic activity	Manufacture of food products	Manufacture of textiles	Manufacture of wood and wood products	Manufacture of chemicals	Manufacture of basic metals	Machineries and equipment	Manufacture of furniture
<b>Number of new jobs</b>	139	131	1057	245	24	7	84

Combining the two above analyses on the new jobs created and considering all economic activities, we can emphasize the fact that *Manufacture of wood and wood products* occupies the first place in the hierarchy along with *Transportation and storage*. The rest of the hierarchy is different as compared to the one done on the various types of economic agents due to the reasons that have been explained above. The hierarchy continues with *Trade*, then the *Manufacture of chemicals and chemical products* (part of Manufacturing), *Tourism* and *Agriculture and forestry*. The hierarchy also contains *Manufacture of food products* and *Manufacture of textiles* (also part of Manufacturing) and all of them created more than 100 new jobs for the population in the disadvantaged area (fig. 6).



**Fig. 6.** Main economic branches and sub-branches with more than 100 new jobs (Man. = Manufacture).

At the other end, the least new jobs were created in the *Manufacture of basic metals* (24), in economic branches as *Human health and social work activities* (24), *Other services activities* (just 8) and in a Manufacturing sub-branch, the *Manufacture of machinery and equipment* (7).

### 2. 3. Investments

The economic agents with investor certificates that carried out their businesses in the disadvantaged area receiving facilities from the state made *investments* in the area that totalize approximately 19,274,882 RON (over 19 billions old lei). The investments cover land purchases, constructing buildings and sheds, equipment, machines and tools purchases needed for their activities in the area. The major part of investments (over 67%) was grouped in Vișeu de Sus, the rest (almost 1/3), in Borșa.

Considering the business object of the companies that invested in the area, 46% of the investments made are in *Manufacturing*, 20.6% in *Trade* and then follows *Transportation and storage*, with 18.2% (figure 7). *Tourism* contributes with 6.5%, while *Agriculture and forestry* with 4.6%.

The least investments were made in *Construction, Human health and social work activities* and *Other services activities*; they were under 400,000 RON, namely less than 2% in each of these economic branches. The high value of investments in *Trade* is not due to an intensification of this type of economic activity, but to high values of investments done by one of the economic agents that

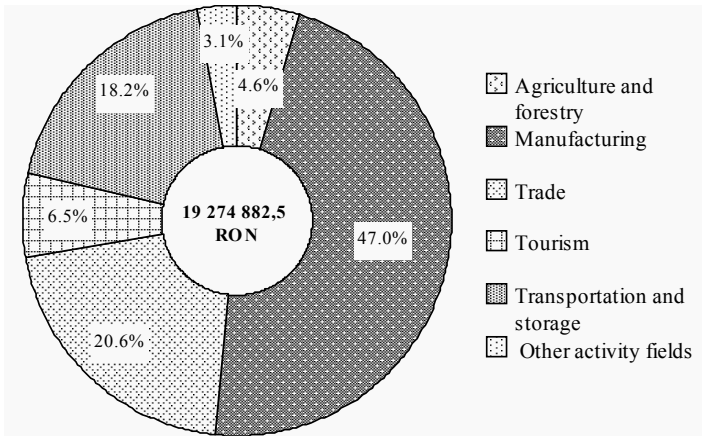


Fig. 7. Value of investments (%) on main economic branches.

invested in the area. It had the highest value of investments from all the companies with investor certificates. The company is doing trade activities with machines and equipment for metal and wood manufacturing as it is also doing business in the *Manufacture of wood and wood products*.

Concerning the investments in *Manufacturing*, the situation is different from the case of the economic agents distribution and the new jobs distribution. The hierarchy has at its top the *Manufacture of wood and wood products*. The greatest investments were made in this sub-branch, namely 64% out of all investments in *Manufacturing*. Then it follows the *Manufacture of textiles*, with 19.2%, the *Manufacture of food products*, with 9.5% and the *Manufacture of chemicals and chemical products*, with 3.5% out of the total investments in *Manufacturing*. All the other sub-branches benefited from little investments, less than 300,000 RON (under 3.5% of the total) each.



Making a hierarchy of all economic activities, we can notice a correlation between the number of economic agents that invested and their investments. Yet, there are also exceptions, particularities that we want to emphasize (figure 8). The *Manufacture of wood and wood products* benefited from the highest value of investments, namely almost 1/3 out of the total investments in the disadvantaged area, representing 30%. As it was concluded above, this is also the sub-branch that has the highest number of active economic agents and it created the highest number of new jobs. It is followed by *Trade*, with 20.6%, and *Transportation and storage*, with 18.2%. The last occupies the second place as it concerns the economic agents and the new jobs set up. The place occupied by *Trade* in the hierarchy, despite the low number of economic agents being active in this activity, was explained above.

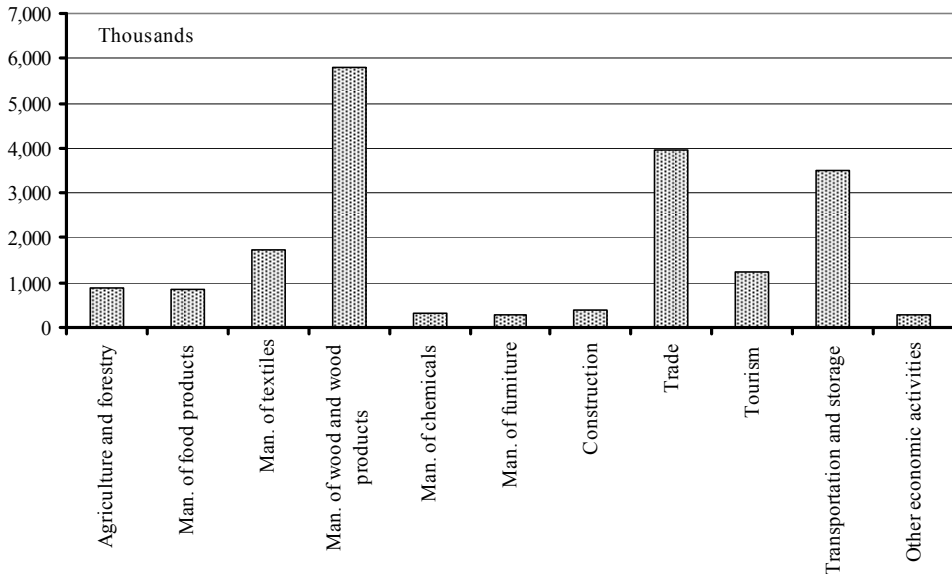


Fig. 8. Value of investments (RON) on economic branches and sub-branches (Man. = Manufacture).

The *Manufacture of textiles*, with only 4 companies that invested in this sub-branch, occupies the fourth place concerning the investments made (9%). This is explained by the fact that one of the companies activating in the field made investments that go over 1,000,000 RON. It is the fourth economic agent, out of the 159, considering the investments made. *Tourism* follows in the hierarchy with only 8 economic agents, yet with a high number of investments, which represent 6.5% of the total. *Agriculture and forestry* account for 4.6% and the *Manufacture of food products* 4.5%. The other economic activities account for less than 2% each.

### 3. CONCLUSIONS

The policy of the disadvantaged areas was implemented in Borșa-Vișeu mining area, having direct effects on the economic revival of the area. The facilities given by the Government to those that invested in this area were a pull factor for a relatively high number of investors

(159 economic agents). They carried out businesses in approximately 14 economic branches and sub-branches which brought in a variety of economic activities. Approximately 3,000 new jobs were created. The number seems to be sufficient if we consider the number of unemployed persons within Mining and quarrying (2,200 persons were made redundant during 1991-2001). Yet, the unemployed persons came also from other economic branches and sub-branches, therefore their number was far bigger and the number of new jobs was insufficient. Nevertheless, from the data obtained from the North-West Regional Development Agency, the immediate effect of the declaration of the area as disadvantaged was a decrease in the unemployment rate. When the disadvantaged area was set up, Borșa had an unemployment rate of 47.8% and Vișeu de Sus of 61.24%. After a few months, on October 31, 1999, the unemployment rate decreased to 7.17% and 19%, respectively. With no other data to study, we can conclude that this tendency of decrease maintained during the existence of the disadvantaged area.

Even if we can draw a similarity with Baia Mare mining area case – where there was a certain economic revival due to the investments made and the activities of the economic agents, a more detailed analysis of the Borșa-Vișeu case reveals a grouping in specific economic branches and sub-branches. The majority of economic agents, the highest number of new jobs and the greatest investments were made in **Manufacturing**, followed by **Transportation and storage** and others branches, among which we enumerate **Trade, Tourism, Agriculture and forestry**. The last ones are at great distance in the hierarchy though. Even though Manufacturing offers great variety in the area, the first place is occupied for all indicators by the **Manufacture of wood and wood products**. The following places are disputed by the **Manufacture of food products** (with the highest number of economic agents that invested in the area), the **Manufacture of chemicals and chemical products** (with the highest number of new jobs), the **Manufacture of textiles** (with the greatest investments). Considering all economic branches and their sub-branches taken as a whole for the *economic agents* that invested in the area and the number of *new jobs*, the **Manufacture of wood and wood products** and **Transportation and storage** are at the top of the hierarchy. In the case of the indicator *investments*, the second place of the hierarchy is occupied by **Trade, Tourism, Agriculture and forestry** and some sub-branches of Manufacturing, the **Manufacture of food products**, the **Manufacture of textiles** and the **Manufacture of chemicals and chemical products** occupy various places in the hierarchy, depending on the indicator considered.

The least sought by investors were *Human health and social work activities* and *Other services*, as well as some sub-branches of Manufacturing, the *Manufacture of furniture*, the *Manufacture of basic metals*, and the *Manufacture of machines and equipment*. Yet, there are also economic branches and sub-branches (in conformity with NACE) that were not attractive at all for investors, thus the investments totally lack in Mining and quarrying, Public administration, Education, the Manufacture of pulp and paper, pre-press services and printing of newspapers, the Manufacture of building materials, the Manufacture of electrical and optical equipment, the Manufacture of means of transport and in economic activities related to electricity, heating, and water etc.

Taking into account the values of the indicators analyzed, we can conclude that there is a clear specialization of the economic activities in Borșa-Vișeu disadvantaged area, as the companies that invested have preferred the Manufacture of wood and wood products and related activities. This came as a continuation of the tradition in this field in the area. (Within Agriculture and forestry, 90% of the economic agents worked in Forestry and many companies registered in the area had the Manufacture of wood and wood products as secondary activity, no matter their

main NACE code). The list is completed by those economic branches that flourished during the period of economic transition in Romania, as Transportation and storage (also supported by an intense regional and international migration) and Trade, as well as Tourism, considering the natural and cultural potential of the two towns that make up the disadvantaged area.

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## NUMERICAL EVOLUTION OF AMLAŞ LAND POPULATION

I. H. PAVEL<sup>1</sup>, I. DANCI<sup>2</sup>

**ABSTRACT.** – **Numerical Evolution of Amlaş Land Population.** The conditions offered by the support component, by the suitability of the climate framework led to an ancient and permanent habitation of the area situated between the limits of Amlaş Land. The decrease of the population of the region, from its peak of 26 856 inhabitants, reached in 1857 to 17,350 inhabitants, in 2010, had many causes, including the decline of grazing, the migration over the Carpathians, the negative natural growth, the rural exodus. This decrease of 35.4% is a feature of Amlaş Land that emphasizes the difficult conditions in which this region developed, the lands being recognized for their characteristic of keeping the population. The only localities where the population has increased over the past 160 years are Jina (1846 inhabitants in 1850 and 4075 in 2010), Orlat (1846 in 1850 and 3206 in 2010) due to their militarization, accompanied by social and territorial advantages and Mag, where growth is attenuated (401-439), and is due to high natural increase generated by the majority of Roma population.

**Keywords:** *region, land, Amlaş, population, demographical decrease, evolution.*

### 1. INTRODUCTION

Located in southern Transylvania, right between the Carpathian mountain area and the Transylvanian Hollow, the Amlaş Land had an early evolution similar to other lands from Romania, by the fragmentation of Romanian mental together with the infiltration of allochthonous populations: Hungarians (from the tenth century) and Saxons (in southern Transylvania, from twelfth century). The colonization of the German population by the Hungarian Kings, accompanied by a series of privileges, was made in order to strengthen the border territories of the kingdom and had a decisive role in formation and then disappearance of Amlaş Land. Thus, this region has deviated from its natural course, followed by the other 17 lands of Romania, metamorphosing its space and functional structure into another entity. This transformation occurred at the turn of the fifteenth and sixteenth centuries, and it meant changing the old space and functional system, including the reference center, the *capital*" (between Săliște and Amlaş), but preserving the core of six localities (Galeş, Cacova, Sibiel, Vale, Săliște and Tilişca) that could not be divided until now, when, along with other localities around, similar by a multitude of issues, form Mărginimea Sibiului.

Conditions offered by the support system component, and the suitability of the climate framework led to an ancient and permanent habitation in the area of Amlaş Land of predacians, Dacian-Roman and then Romanian populations. Even the mountain area, which holds an important position in this region, was not an insurmountable obstacle in the way of human expansion, being an area with a significant population, because they are *by far the most inhabited of all the mountains deployed from Caransebeş to the Intorsura Buzău* (Conea, Badea, 2004).

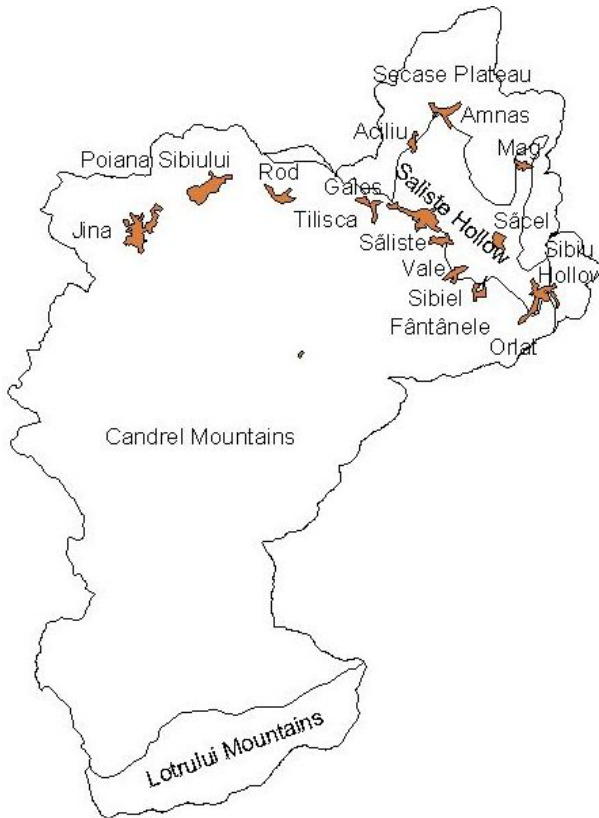
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## 2. NUMERICAL EVOLUTION OF AMLAȘ LAND POPULATION

Numerical evolution of the population is an essential indicator of deciphering the trends in terms of quantity of a population. The analysis of numerical evolution of the population, ethnic and religious structure was based on demographic informations obtained from the eighteenth century statistics, and continued by the censuses of the nineteenth and twentieth century, of 2002 and those offered by DJS Sibiu.



**Fig. 1.** The Amlaș Land. Settlements and relief units.

the occupations or moving to other areas (to Dobrogea or other more remote regions) due to customs restrictions, relocation as farmers south of the Carpathians, or as craftsmen or merchants in other parts of Transylvania, Walachia, or Moldavia. Another important reason was the political, social and religious pressures exercised by the foreign rule. It is noted in this period a decrease of population of predominantly pastoral village (between 20 and 30%) and those in lower areas, except Jina, where it was a population growth.

It is a very difficult task to obtain the appropriate demographical data of Amlaș Land, and of any other region in the Middle Ages, the informations being based on assumptions and analogies, because of the lack of sources regarding this topic. The first generalized data obtained by modern methods, were from 1850, when the population of the region counted 26317 inhabitants.

Following the numerical changes in population over the next 152 years, eight distinct periods could be distinguished. The first is between 1850-1857, when there is an increase in population of 2.05%, to 26,856 inhabitants, a maximum official record for this region. Significant differences occurred in this period, from important growths of almost 20% in Mag, over 10% in Orlat and decreases in Tilișca, Gales, Săliște and Săcel.

The second period, between 1857-1880 was marked by a strong decrease of almost 4,000 people (14.43%), caused in particular by the decline of grazing, many people abandoning

NUMERICAL EVOLUTION OF AMLAŞ LAND POPULATION

**Numerical evolution of the population of Amlaş Land, by locality,  
(the censuses between 1850-2002)**

**Table 1**

	1850	1857	1869	1880	1900	1910	1930	1941	1956	1966	1977	1992	2002
Săliște	5335	5171	4005	4048	3572	3467	3767	3087	2454	2619	2809	2871	2830
Aciliu	786	828	965	933	1062	999	1160	1046	943	802	647	374	268
Amnaș	1303	1328	1575	1443	1695	1865	1991	1882	1386	1241	888	389	369
Cacova	1136	1187	938	845	696	896	725	727	559	575	448	321	331
Galeș	1041	1035	801	733	715	617	614	402	324	316	330	346	252
Mag	401	479	497	475	626	636	746	745	589	533	426	393	439
Săcel	1138	1129	1144	902	772	776	762	743	647	615	647	534	520
Sibiel	1628	1610	1325	1093	1005	1003	1008	936	764	689	588	447	402
Vale	1729	1761	1323	1361	1167	1119	980	873	563	547	524	428	384
Tilișca	2852	2810	2424	2114	2011	1992	1824	1910	1695	1428	1529	1337	1197
Rod	1550	1621	1292	1287	1227	1274	1187	1146	915	733	627	562	465
Poiana Sb.	4076	4288	3740	3431	3956	4204	4678	4463	4084	3248	3585	3178	2799
Jina	1846	1960	2424	2658	3177	3471	3728	4211	4173	4009	4425	4348	4073
Orlat	1496	1649	1788	1658	1770	1836	2229	2489	2702	2953	3270	3363	3271
<b>Total</b>	<b>26317</b>	<b>26856</b>	<b>24241</b>	<b>22981</b>	<b>23451</b>	<b>24155</b>	<b>25399</b>	<b>24660</b>	<b>21798</b>	<b>20308</b>	<b>20743</b>	<b>18891</b>	<b>17600</b>

The period between 1880 and 1930 is a new period of growth, more consistent than the first one, of 10.52%, which however failed to compensate for loss of 1857-1880 period. The cause of this was the high natural growth (9-10 ‰) specific for the end of the first stage of demographic transition from the early twentieth century, resulted from the difference between the very high birth rate (39-40 ‰) and the mortality (30 ‰).

An important role was played by the Great Union of 1918 that freed the Romanian population from the political, social and religious constraints and determined the return in the region of many families who took exile before.

## Numerical evolution of the population of Amlaş Land, by increase/decrease intervals

Table 2

	Increase/Decrease (%)								
	1850-1857	1857-1880	1880-1930	1930-1941	1941-1956	1956-1977	1977-1992	1992-2002	1850-2002
Săliște	-3,1	-21,8	-6,9	-28,1	-20,5	+12,6	+2,2	-1,4	-46,9
Aciliu	+5,3	+12,7	+24,3	-9,8	-9,8	-31,4	-42,2	-28,3	-65,9
Amnaș	+1,9	+8,7	+38,0	-5,5	-26,3	-35,9	-56,2	-5,1	-71,7
Cacova	+4,5	-28,8	-14,2	+0,3	-23,1	-19,9	-28,3	+3,0	-70,9
Galeș	-0,6	-29,2	-16,2	-34,5	-19,4	+1,8	+4,6	-27,2	-75,8
Mag	+19,4	-0,8	+57,0	-0,1	-20,9	-27,7	-7,7	+10,5	+9,5
Săcel	-0,8	-20,1	-15,5	-2,5	-12,9	0	-17,5	-2,6	-54,3
Sibiel	+1,1	-32,1	-7,8	-7,1	-18,4	-23,0	-24,0	-10,1	-75,3
Vale	+1,8	-22,7	-28,0	-10,9	-35,5	-6,9	-18,3	-10,3	-77,8
Tilișca	-1,5	-24,8	-13,8	+4,7	-11,3	-9,8	-12,6	-10,5	-58,0
Rod	+4,6	-20,6	-7,8	-3,4	-20,2	-31,5	-10,4	-17,3	-70,0
P. Sib.	+5,2	-20,0	+36,3	-4,6	-8,5	-12,2	-11,3	-11,9	-31,3
Jina	+5,8	+35,6	+40,3	+13,0	-0,9	+5,7	-1,7	-6,3	+120,6
Orlat	+10,2	+0,5	+34,4	-11,7	+8,6	+17,4	+2,8	-2,7	+118,6
<b>TOTAL</b>	<b>+2,0</b>	<b>-14,0</b>	<b>+10,5</b>	<b>-2,9</b>	<b>-11,6</b>	<b>-4,8</b>	<b>-10,1</b>	<b>-6,8</b>	<b>-33,1</b>

P. Sib. = Poiana Sibiului.

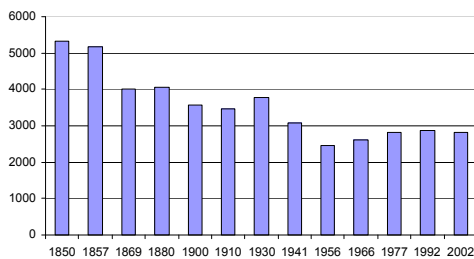


Fig. 2. The population evolution between 1850-2002 in Săliște.

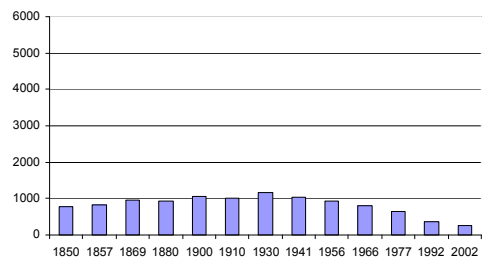
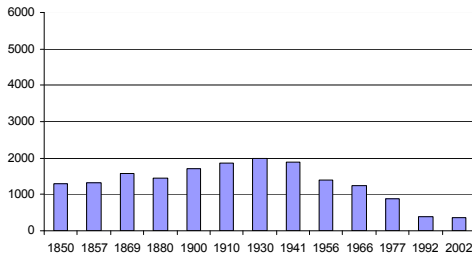


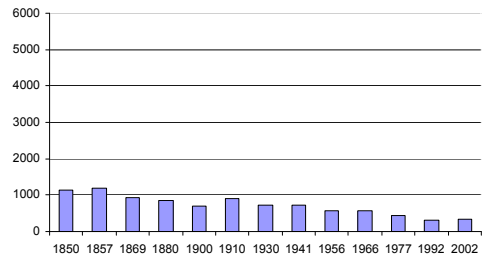
Fig. 3. The population evolution between 1850-2002 in Aciliu.

After 1930 there was a decrease in population of the region until 1966, with 2.91% between 1930 and 1941 and 11.61% between 1941 and 1956, during the Second World War.

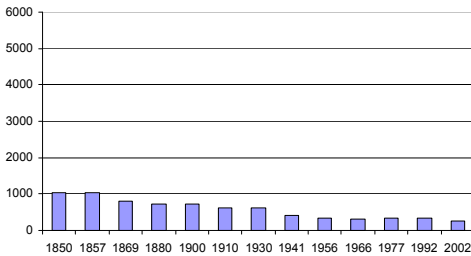
## NUMERICAL EVOLUTION OF AMLAŞ LAND POPULATION



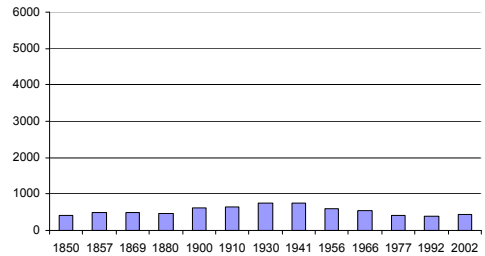
**Fig. 4.** The population evolution between 1850-2002 in Amnaş.



**Fig. 5.** The population evolution between 1850-2002 in Fântânele.

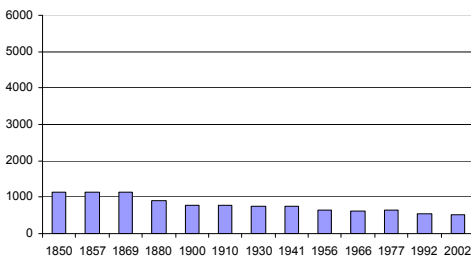


**Fig. 6.** The population evolution between 1850-2002 in Galeş.

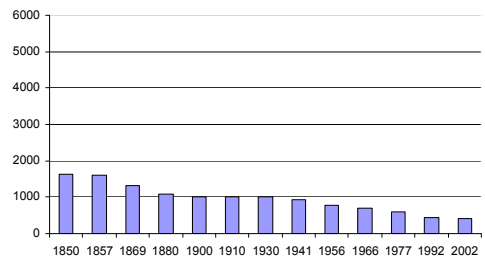


**Fig. 7.** The population evolution between 1850-2002 in Mag.

At the end of the fourth decade and the beginning of the fifth decade of the century we occurred a rebound of natural growth after the World War, reaching 11 ‰, due to a birth rate of 25 ‰ and a mortality of 14 ‰, but the population continues to drop until 1966.

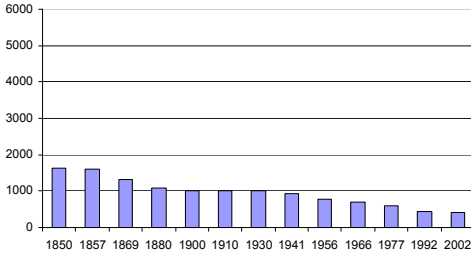


**Fig. 8.** The population evolution between 1850-2002 in Săcel.

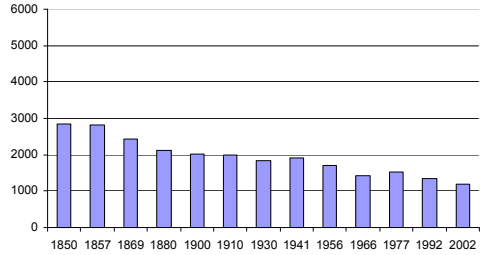


**Fig. 9.** The population evolution between 1850-2002 in Sibiel.

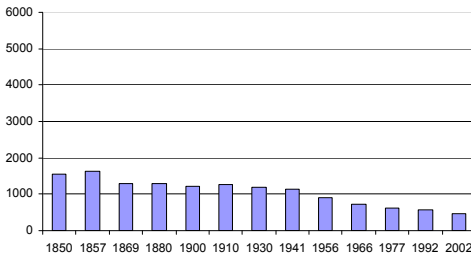




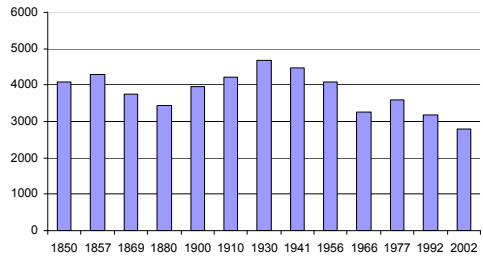
**Fig. 10.** The population evolution between 1850-2002 in Vale.



**Fig. 11.** The population evolution between 1850-2002 in Tilișca.

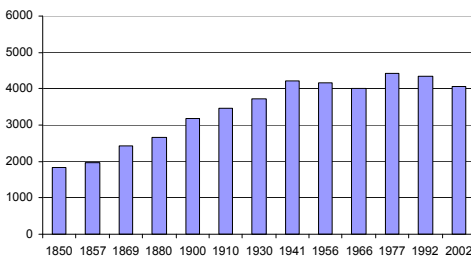


**Fig. 12.** The population evolution between 1850-2002 in Rod.

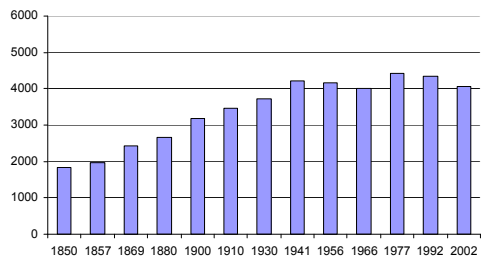


**Fig. 13.** The population evolution between 1850-2002 in Poiana Sibiului.

The measures taken by the communist regime to the end of the seventh decade in order to increase Romania's population have paid off in Amlaș regions too, so that we are witnessing an increase in population at 1977 census. Thus, between 1966 and 1977 it was recorded a slight increase in population, of 3.41%, the only period of growth since the interwar period.



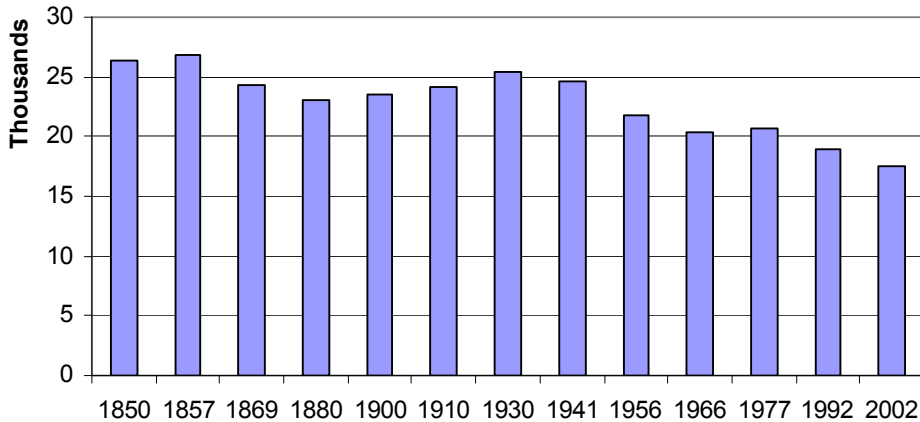
**Fig. 14.** The population evolution between 1850-2002 in Jina.



**Fig. 15.** The population evolution between 1850-2002 in Orlat.

## NUMERICAL EVOLUTION OF AMLAȘ LAND POPULATION

Following intervals, marked by the 1992 and 2002 censuses, recorded significant declines of the region's population, negative values of demographic evolution being recorded in almost every locality. The exceptions are Mag, where the presence of Gypsies as the majority population, with their known demographic behavior, determined a population increase of over 11% between 1992 and 2002 and Fântânele were unemployed people returned from the city.



**Fig. 16.** The Amlaș Land. Population evolution between 1850-2010.

Currently (January 1st, 2010), the localities that made up Amlaș Land count 17,350 inhabitants in five administrative units (4 communes and one town).

### Amlaș Land Population (by commune, 1st January 2010)

**Table 3**

Commune	Inhabitants	Men	Women
Săliște	5839	2862	2977
Poiana Sibiului	2628	1172	1456
Jina	4075	2022	2053
Tilișca	1602	773	829
Orlat	3206	1550	1656
<b>Total</b>	<b>17350</b>	<b>8379</b>	<b>8971</b>

### 3. CONCLUSIONS

Following the evolution of Amlaș population since the first official data transmitted to us from the nineteenth century and continuing with the censuses of the twentieth century and the twenty-first century, we deduce one of the peculiarities of this region compared to other similar land formations, almost the permanent reduction in the

number of people as an expression of difficult conditions in which it evolved. The decrease of the population of the region, from its peak of 26 856 inhabitants, reached in 1857 to 17,350 inhabitants, in 2010 had many causes, including the decline of grazing, the migration over the Carpathians, the negative natural growth, the rural exodus. At local level there are exceptions of villages whose population has increased during this period of 160 years: Jina (1846 inhabitants

in 1850 and 4075 in 2010), Orlat (1846 inhabitants in 1850 and 3206 in 2010) due to their militarization, with social and territorial advantage and Mag, where growth is weak (401-4 39), and is due to natural increase of population registered by the Gypsies, the majority ethnic group of the village.

The numerical evolution of Amlas Land population recorded, in addition to the overall decreasing trend, several increases in certain periods, which allowed the drawing of four distinct stages of evolution, closely related to economic, social, domestic and especially external political conditions.

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## AN EVALUATION OF THE CHARACTERISTICS AND FUTURE DEVELOPMENT OF THE SETTLEMENTS IN SOMEȘANĂ PLAIN (NORTHERN TRANSYLVANIAN PLAIN)

RAMONA FLAVIA RAȚIU<sup>1</sup>

**ABSTRACT.** – **An Evaluation of the Characteristics of and Future Development of the Settlements in Someșană Plain (northern Transylvanian Plain).** There are 141 rural settlements on the surface of 1846.7 sq km of the Someșană Plain. The density of the rural settlements, which is on an average of 7.6 villages/100sq km, is above the average value registered at the level of the whole Transylvanian Plain. The average population density of a rural settlement is of 510 inhabitants, much lower than the average density of the Romanian villages. Most settlements are situated along valleys on the glacia between floodplains and slopes (due to the water resources and the fertility of the soil), in small basins of origin, or on slopes, where they occupy the areas of interfluvies. Rarely are they situated on the structural areas of the slopes profile. The average density of the population in the villages of the Someșană Plain is of 5.6 inhabitants/ hectare. The quality and quantity indicators that reflect the geo-demographic, the endowment and the localization potential were used in order to estimate the natural and the socio-economic potential. There are four categories, most villages (52 out of 141) being part of that category of settlements with a low potential. Summing up the values of partial vulnerability expressed through classifying index values characteristic to spatial, physical, demographic, social and economic vulnerability in the 141 rural settlements (in the territory under analysis) show that most settlements are vulnerable from social, economic and demographic point of view (45.62%). The development of the villages in the Plain depends on the improvement of the infrastructure and the means of communication as well as on the creation of better connections between the relatively remote villages and the urban centres from the adjacent corridor areas. Another problem to be solved, besides this aspect, is the water problem, which is unsatisfactory both from the quantity and quality point of view; in addition, facilities of social interest should be provided on a proper and functional level (educational, health, communication institutions etc.)

**Keywords:** *agrarian region, index of renewal, natural, social and economic potential physical and demographic vulnerability*

### 1. INTRODUCTION

The Someșană Plain, situated in the central northern part of the Transylvanian Plain, covers the whole sector crossed by the tributaries of the river Someșul Mic (Zăpodie, Murătoiu, Gădălin, Fizeș and Bandău) and Someșul Mare (Meleș and Șieu through its tributary Dișșa). Its individuality, from a geo-demographic point of view, is the result of a long evolution of its communities under the definite influence of physical, geographical, social and historical factors.

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## **1. 1. Geographical and physical premises of the population and settlements distribution**

The geographic conditions specific to the region had an important role in the geographical distribution of the population and settlements in the area. The relatively uniform relief as well as the relatively large valleys with rather extended terraces facilitated a fast economic development. Consequently early settlement was favoured. In the Someșană Plain the cuesta relief is predominant due to the distribution of arable lands: cereals alternating with vineyards on cuesta fronts. The distribution of the valleys and their accessibility influenced the overall outlook of the settlements. Besides the monoclinial relief, which is characteristic to this region, there are frequent landslides and extensive floodplains independent of the river flow.

The quality of the phreatic waters is inadequate from the viewpoint of mineralogy, hardness of water, bacteriological and biological properties; therefore it affects the quality of life in this area. The quantity and quality of the water resources in the Someșană Plain influenced the settlement and the development of rural habitats and determined the maintenance of natural lakes.

The natural resources also influence the settlements in the Someșană Plain from an economic point of view. The most significant resources are the methane gas and the salt. Salt mining has stopped since the middle of the 19<sup>th</sup> century yet it greatly marked the economic development of Cojocna and Sic, which are now two of the largest rural settlements with a complex economic development. The methane gas is now the only natural resource being exploited in the domes in Mociu, Puini, Țaga, Buza and Strugureni.

A series of social and historical factors have shaped the specificities of the population and settlements in time. The remains discovered in Fizeșu Gherlii and Dișșa show that this region has been inhabited since the early Iron Age (7<sup>th</sup> and 5<sup>th</sup> century BC). During the Roman rule in Dacia the salt resources were greatly exploited in Sic and Cojocna, which led to an early development of these settlements. The first foreign population that influenced the local one was that of the Celts (before the formation of the Dacian state), followed by the Slaves (after emperor Aurelius' withdrawal in 271), the Hungarians, who settled in the main valleys, and the Germans who were colonized by the Hungarian kings in order to guard their borders and greatly exploit the conquered territories.

The social-economic development of the Plain was marked by its outlying, given the distribution of the settlements in the peripheral administrative and territorial units as compared to the local coordinating centres. Thus, ever since the appearance of the first administrative and territorial organizational forms – the royal counties – in the 12<sup>th</sup> -13<sup>th</sup> century, there have been three such sectors in the Someșană Plain: Solnocul Dinlăuntru, in the north, Dăbâca in the centre and Cluj in the south. This distribution has slightly changed. In the 20<sup>th</sup> century, between the World Wars, the Someșană Plain covered the peripheral area of four counties: Cluj, Mureș, Someș and Năsăud. At present it covers the counties of Cluj and Bistrița-Năsăud. Its outlying character is also marked by the towns, polarizing centres situated in the outlying corridors of the Plain. This determined the migration of the population and resources predominantly towards them.

## **2. CHARACTERISTICS OF SETTLEMENTS**

In the modern and contemporary period the evolution of the geo-demographic elements presents a series of features that place the Someșană Plain in the general phenomenon that characterizes Romania. Yet they stand out through the intensity and special orientation they had.

**2. 1. The distribution of settlements**

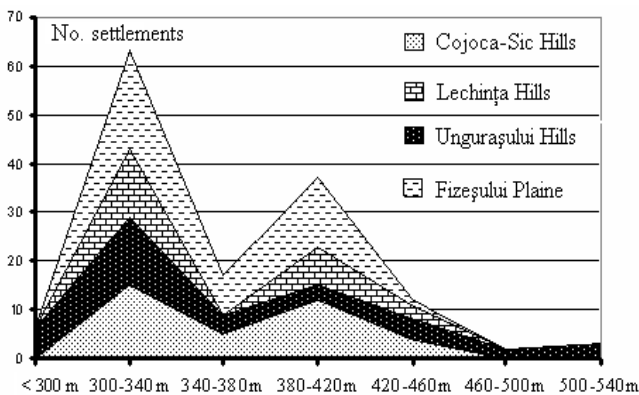
There are 141 rural settlements on the surface of 1846.7 km<sup>2</sup> of the Someșană Plain. The density of the rural settlements, which is on an average of 7.6 villages/100 km<sup>2</sup>, is above the average value registered at the level of the whole Transylvanian Plain. The highest rural settlement density (8.5 villages/100km<sup>2</sup>) is registered in the Ungurașului Hills, followed by the Fizeșului Plain (8.4 villages/100km<sup>2</sup>), both characterized by a strong fragmentation and a high number of small settlements. The average population density of a rural settlement is of 510 inhabitants, much lower than the average density of the Romanian villages.

In the Someșană Plain, most villages have a low (28%) and a medium (19%) dispersion index, the highest values being characteristic to the villages in the central division of the Plain, with a high number of component villages. Depending on the polarization potential, the village centres are placed at intervals from 0 (the commune of Sic) up to 6.14 (the commune of Lechința). The polarization potential in most village centres is medium and above average at Plain level (38% and 33%, respectively).

In time, the population has adapted its habitat forms to the physical and geographical conditions, especially to the forms of relief and the water sources.

Depending on the characteristics of the relief and the morphological elements of valleys and slopes, several different types of localization of dwelling places can be identified. Most settlements are situated along valleys on the glacis between floodplains and slopes (due to the water resources and the fertility of the soil), in small basins of origin, or on slopes, where they occupy the areas of interfluves. Rarely are they situated on the structural areas of the slopes' profile.

Due to the altitude of the Someșană Plain and the peculiarities concerning water supply, most settlements- 80 representing 57% of the total- are situated at altitudes lower than 340m, especially between 300-400m. According to the share, the following category of settlements has an average altitude of 380 - 420m, representing almost a third of the settlements. There is no village situated above 540m, only three villages, Ceaba, Cutca and Sicfa (Ungurașului Hills), being situated over the altitude of 500 m (fig.1).



**Fig. 1.** The Someșană Plain. The distribution of settlements according to altitude.

The average density of the population in villages of the Someșană Plain is of 5.6 inhabitants /hectare. In the area of Cojocna Sic Hills, the density is close to the above-mentioned value, that of 5.4 inhabitants/sq km. In the area of Lechinței Hills and Ungurașului Hills, the population density has higher values, such as 6.3 and 7.1 inhabitants/hectare while in Fizeșului Plain it is much lower (4.5 inhabitants /hectare). In the first part of the 20<sup>th</sup> century the households with two nuclear

families were predominant. In 1910 the average number of household persons was 4.8, with little variation in the territorial profile. The number of households has risen considerably, from 20.127 in 1910 to 47 066, simultaneously with the decreasing number of inhabitants. Therefore, the average number of persons per household is of 1.5.

The proper adaptation of the settlements to the natural conditions, in a certain social, political and economic context, has generated a great variety of rural settlements. The most common are the settlements with a linear-tentacle-like texture, with an irregular form and a collective-spread structure.

The aspect of the rural settlements is also determined by the age of the buildings reflected by the index of renewal calculated according to the following formula:

$$Ir = H * 100 / P, (\%), \text{ where:}$$

Ir –index of renewal; H, number of houses built during a certain period of time; P– population in the locality at present.

Studying the evolution in the number of houses between 1971 and 2002, the index of urban renewal has a medium value of 4.5% at the level of the Someșană Plain. However, on a settlements level the values vary between 0 and 19.8%. At the level of physical and geographic subunits (fig.2), the highest index of urban renewal of 5.7% was registered in 2002 in the eastern part of the Plain – Lechintei Hills, while the lowest value of 3.5% characterizes the north-eastern part of the Plain – Ungurasului Hills.

The way of using the terrains reflects the agricultural function of the area in discussion. The statistics highlight the fact that the agricultural areas, which include 75.4% of all the terrains in the whole region, are predominant. The forest represents only a small part of the Someșană Plain (14.8%), however this value is above the average value of the Transylvanian Plain (approx. 9%).

## 2. 2. The geo-demographic size of the settlements

The geodemographic size of the settlements is influenced by the high number of small settlements (65% of the total), that include only 27,8% of the total population, the highest number being registered in the Fizeșului Plain (33% of the total of small settlements) while the lowest one is in the Ungurașului Hills (only 18%).

The medium-sized rural settlements (500-1500 inhabitants). There were 41 at the census in March 2002 (29% of the total settlements in the unit as compared to 45.7% registered in 1966), inhabited by 47% of the population in the Someșană Plain.

The number of large settlements has evolved together with the numerical evolution of the population in the Someșană Plain (fig.3).

At the census in March 2002, the large rural settlements were concentrating 24.3% of the unit population. These settlements benefit from a favourable position, in contact areas, on the border with the corridor area of Someșul Mic river: Bonțida, Jucu de Sus, Someșul Mare-Cireșoiaia, or on important road axes: Mociu (on DN16), Lechința (normal railroad and district road), Unguraș. However, the others benefit from the extractive industry: Cojocna, Sic. The majority of the large rural settlements are to be found in Cojocna Sic Hills (4), while in the rest of the units they are spread as following: two settlements on the Ungurașului Hills, one settlement on Lechintei Hills and one on Fizeșului Plain.

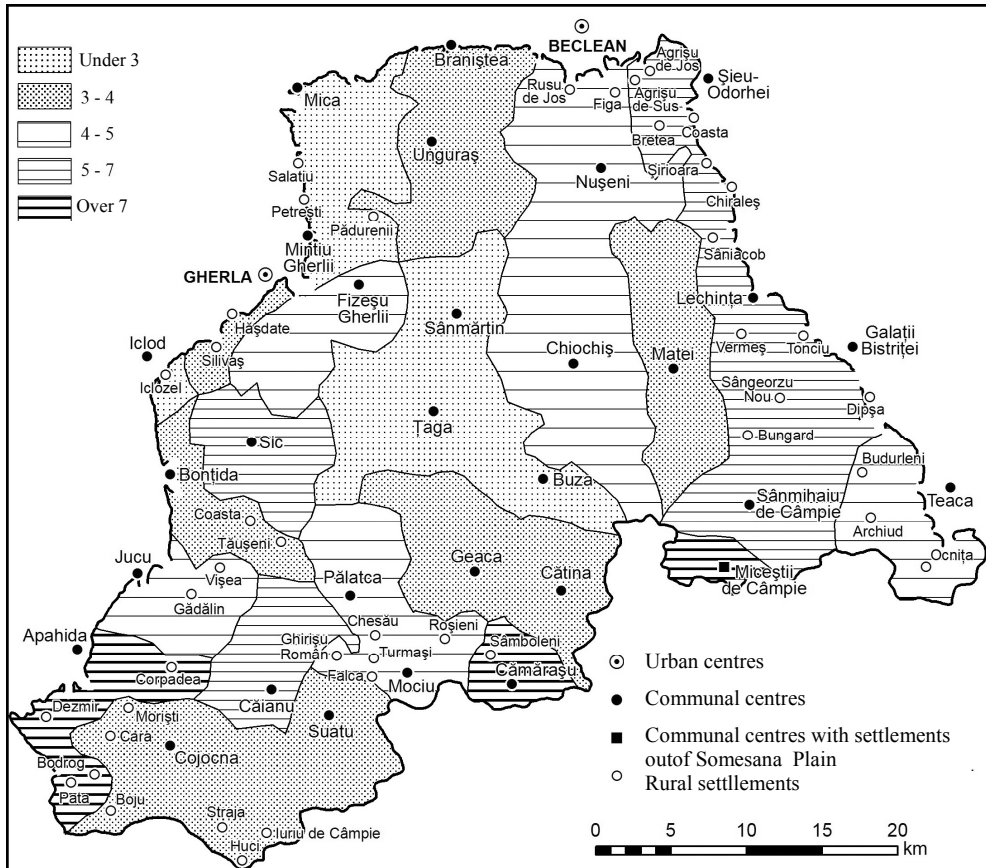


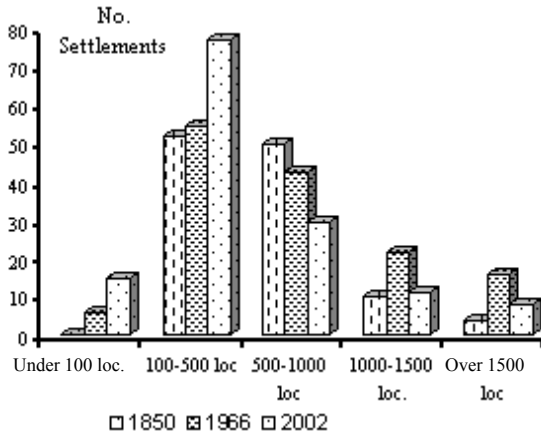
Fig. 2. Someșană Plain. The index of urban renewal (1981-2002).

### 2. 3. Economic activities

The main economic activities of the villages in the Someșană Plain are still the same since ancient times. The exploitation of underground resources, of the salt and of the methane gas up until the second part of the 19<sup>th</sup> century and the beginning of the 20<sup>th</sup> century, did not change the economic profile of the Plain. It has not been considered as a potential region for investments, these being concentrated especially in the surrounding areas. Therefore, the Plain continues to evolve according to the traditional agricultural economy patterns. The larger villages on the territory of this division (Cojoacna, Bonțida, Jucu de Sus, Sic, Cireșoia, Unguraș, Lechința) have developed non-agricultural activities, generating a functional diversity.



The extent to which agriculture contributes to the economic development of the households can be determined due to some indicators that reveal not only the available financial resources



**Fig. 3.** The geodemographic size of the settlements in 1850, 1966, 2002.

per number of people, but also its level of development. Thus, the amount of arable land per inhabitant was of 0.92 hectares in 2005, which means that it was above the national value of 0.47 hectares/inhabitant. The highest values, above 1.5 hectares/ inhabitant, were registered in the villages of Geaca (1.56 hectares/ inhabitant), (1.6hectares/ inhabitant). They reveal a significant potential for the development of these villages, insufficiently enhanced, however, because of the advanced level of ageing population (the ageing population represents over 30%, except in the village of Geaca).

The main crops on the Plain's territory are the cereals (41.7% of the arable land in 2004), the potatoes (4.9% of the arable land), the sunflower (2.5%) and, on small parts, the sugar beet and the vegetables. The most often grown plant is the corn, which represents around 30% of the arable land. Concerning the *corn production per inhabitant*, in the Someșană Plain, the value of this indicator (772.5 kg/inhabitant) is way above the one registered at a national level (440.7 kg/inhabitant, according to the Statistics Year Book, 2009).

In 2002, the labour force participating to industrial activities accounted for 6186 persons, which meant 23% of the total participating labour force. The processing industry is present, at the level of the Someșană Plain, in some large rural settlements, especially in rural centres. The units exploit mostly the local raw material: agricultural products (cereals, milk), wood. Another characteristic of the industrial units on the territory of the Someșană Plain that needs mentioning is the reduced number of employees.

In 2002, 4034 of the participating workers (15% of the participating labour force) were employed in the domain of services. The majority of the population working in this domain is to be found in rural centres, (larger rural settlements) having therefore an administrative function.

The category of rural settlements, with agricultural functions as the most common (fig.4), contains the largest number of households-103, which means 73.5% of the villages in the Someșană Plain. According to the number of population participating in agriculture and also according to the complementary functions they have, the localities can be divided into agricultural settlements and mixed settlements, the latter including the majority of communal centres.

The Someșană Plain is characterized by a growth in the number of economic units that are generally specialized in trade, particularly in public food services. In the localities of the plain such units exist in a large number, most of them being Family Associations or Companies, with a high number of employees. Tourism in the Someșană Plain is rather weak even though the

natural and the artificial potential have much to offer for exploitation. For example: the natural reservations of Săcălaia, Suatu and Valea Legii, the ponds used for sport fishing, the watering places, the churches, and the monuments belonging to the national patrimony.

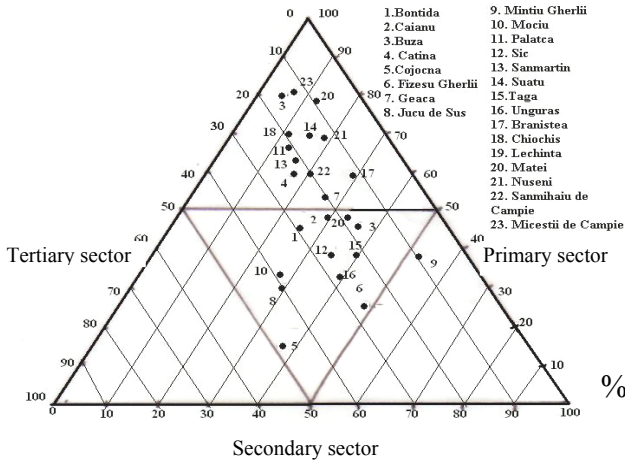


Fig. 4. Someșană Plain. Function of communal centres.

four categories, most villages (52 out of 141) being part of the category of settlements with a low potential.

According to the quality assessment values obtained, there are four major categories:

**a) the class of settlements with a very high potential (50-60)** formed of 13 communal centres. Several different categories of potential contribute to the inclusion in this category, in some cases the demographic category being the basic one;

**b) the class of rural settlements with a generally high potential (30-50)** includes 25.5% of the total settlements in the Plain's area. The quality assessment value of 11 rural settlements is between 40 and 50. While 7 of them are communal centres, the rest are settlements with a higher social and economic potential;

**c) the class of settlements with a general medium potential (20-30)** includes 36 rural settlements (which means 25.5% of the total). This position is obtained from the contribution of almost all categories of potential. The settlements belonging to this category have a medium demographic potential, the small localities being the most common;

**d) the rural settings with a generally low potential, lower than 20,** are the most spread in the Someșană Plain, representing 36.8%. In this category there are 52 villages with a low demographic potential, these belonging to the small and very small category, relatively isolated, situated at large distances from the urban centres and the communication axes.

## 2. 5. Vulnerability of rural settlements

The geographical condition, permanent social and economic premises – or rather the territorial reality as a whole with all its structures represents a basic requirement in the genesis and evolution of any village or, generally, of any habitat. From this basic element – location- the other elements derive which actually constitute the functions, structures and feasibility of a settlement.

## 2. 4. The natural, social and economic potential

Quality and quantity indicators that reflect the geo-demographic potential, the localization potential and the endowment potential were used in order to estimate the natural as well as the social and economic potential. Relying on this complex criterion, the rural settlements in the Someșană Plain are placed at quite limited intervals, from 7.1 (Falca) to 75.9 (Lechința), the result being an average quality assessment value of 27.8% at the level of the entire unit. There are

Summing up the values of partial vulnerability expressed through classifying index values characteristic to space, physical, demographic, social and economic vulnerability in the 141 rural settlements in the analyzed territory, it can be said that most settlements are vulnerable from social, economic and demographic point of view (45.62%).

Physical vulnerability affects 31% of rural settlements while 23.38% of the settlements are characterized by considerate space vulnerability as they are centrally situated in the unit, at great distances from the polarizing centres in the adjacent corridors.

According to the classifying index values obtained, there are four major classes (fig.5):

a) the class of rural settlements with a much reduced vulnerability comprises 13 communal centres. They are rural settlements of significant demographic potential, administrative centres provided with diverse quality equipment. They are settlements where both human and natural resources have caused a high resilience;

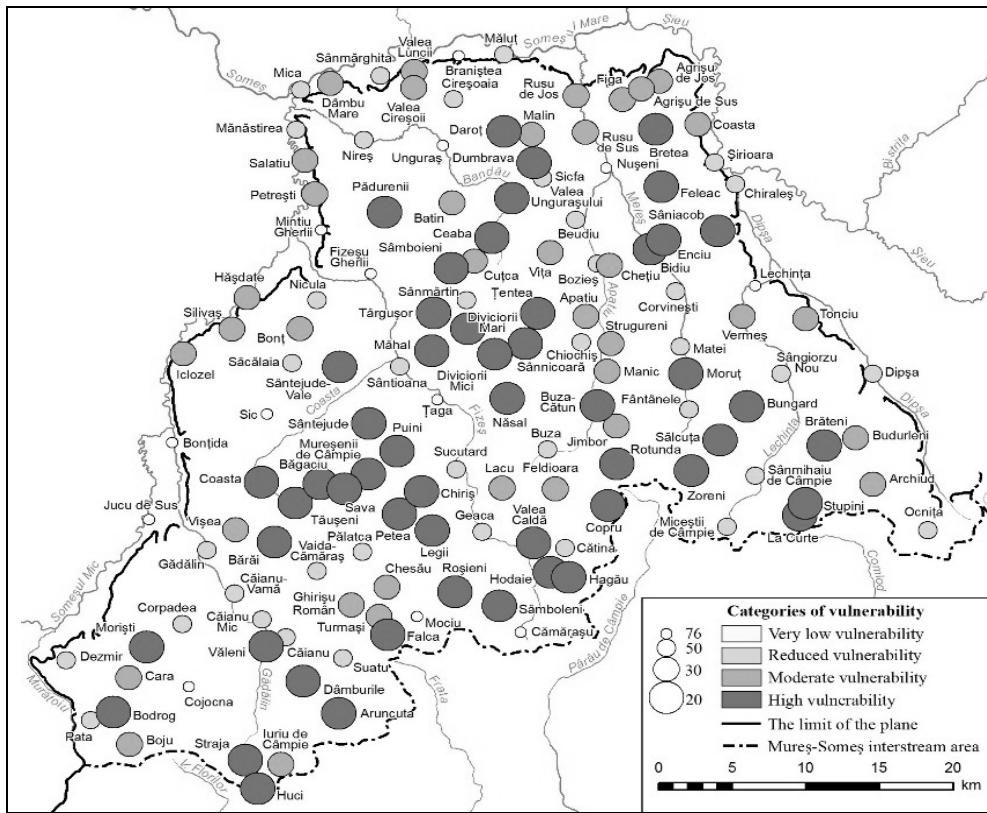


Fig. 5. Vulnerability of rural settlements in the Someșană Plain.

b) the class of rural settlements with a reduced vulnerability comprises 38 villages representing 25.5% of the total number of population in the Plain. Most of them are communal centres with a higher social, economic and natural potential provided with appropriate infrastructure and more types of services for the population;

c) the class of rural settlements with a medium vulnerability comprises 25.5% of the total number of population. The settlements in this class are characterized by a more significant demographic vulnerability, most of them having a reduced number of inhabitants and a demographic structure with a predominantly aging female population;

d) the rural settlements with a high vulnerability are the most numerous (36.8% of the total number of population) with a generally reduced potential.

This category comprises 52 villages with a high demographic vulnerability; all villages are small and very small, relatively isolated, situated at great distances from urban centres and communication roads. The rural settlements in this category are very likely to disappear as in most of them the population is growing thin.

### **3. EVALUATION OF THE DEVELOPMENT PROSPECTS OF THE SETTLEMENTS IN THE SOMEȘANĂ PLAIN**

In the evaluation of the prospects for the development of the Someșană Plain, as well as those for straightening out the complex geo-demographic situation, the SWOT method was used. Using the results obtained from the analyses of details and the method this type of analysis consisted of, the strong and the weak points of the Someșană Plain were established.

#### **3. 1. Strengths**

In the Someșană Plain the strong points, which were identified, are:

a) the relatively uniform relief and the low relief energy (except for the north-western sector); the relatively large valleys, with rather large terraces offered the possibility of a faster revenue rate therefore favoured an early population process;

b) the density of the rural settlements, on an average of 7.6 villages/100sq km, is above the average value registered at the level of the entire Transylvanian Plain;

c) the amount of arable land per inhabitant was of 0.92 hectares in 2002, above the national value of 0.47 hectares/inhabitant;

d) the industrial potential is considerable due to the methane gas resources. In comparison with other exploitation areas, the methane gas in the Someșană Plain has the advantage of being situated at lower depths;

e) the agricultural potential is considerable, due to the soil fertility and the share of agricultural land. The statistics highlight the fact that the agricultural areas, which include 75.4% of the total terrains in the whole region, are predominant;

f) the Someșană Plain is characterized by an important tourist potential, both natural and artificial: the natural reservations of Săcălaia, Suatu and Valea Legii, the ponds used for sport fishing, the watering places, the churches, and the monuments belonging to the national patrimony.

#### **3. 2. Weak points**

The social-economic evolution of the Plain has been marked by its marginal character, due to the integration of the localities in the administrative-territorial outlying units as compared to the coordinating local centres. Weak points, identified in Someșană Plain, are:

a) the quality of the phreatic water is unsatisfactory from the mineralogical point of view, as well as from that of hardness, biological and bacteriological properties; this has repercussions on the quality of life in this region;

b) the excessive degradation of the agricultural property and the interwar way of exploiting the soil represent a disadvantage in the growth of labour productivity. Moreover, there is a noticeable resistance to the modern ways of association;

c) the physiological density (0,42 inhabitants/hectare), which is much lower as compared to the national average (1,46 inhabitants/hectare), reflects a low potential of cultivation, maintenance and agricultural endowment;

d) rural settlements, with agricultural functions as the most common, contain the largest number of households-103, which means 73.5% of the villages existing in the Someșană Plain. Another aspect to be noticed is the high number of small settlements (65% of the total settlements), that include only 27.8% of the total population;

e) the participating labour force is characterized by a reduced share of 37.4% (in 2002). There is a growth of the labour force participating in agriculture from 55% registered at the 1992 population census, to 61.4% in 2002;

f) infrastructure is another weak point characteristic to the Someșană Plain. The roads, belonging to district roads category, are in poor condition, the water distribution system is critical, the methane gas pipe-line network does not meet the current demands and a lot of localities are not connected to the network.

### **3. 3. Opportunities**

The Agency of Development of the North-Western region and its contribution to the acquisition of European funds and consultancy activities might facilitate the development of certain projects that aim to develop the infrastructure, the small and middle-sized industrial units (IMM) in order for these to exploit the local resources (methane gas and agricultural products), the agricultural potential and the tourist potential.

Proximity to the big commodity markets of agricultural products is of great importance to the agriculture of the Someșană Plain. In this respect, the most representative are the urban centres of Cluj-Napoca, Dej, Beclean, situated in the corridor areas of the rivers Someșul Mic and Someșul Mare.

The development of the REGIO programme looks upon the improvement of the lakes and the salted waters in this region and takes into consideration the Cojocna Watering Place in the county of Cluj and the Figa Watering Place in Bistrița-Năsăud County. It will ensure the changing of these locations into spa resorts at European standards.

### **3. 4. Risks**

One of the risks is the generally high poverty rate caused by the excessive degradation generated by exploitations and the use of subsistence farming. Such methods cause soil erosion and loss of soil fertility. There is also the continuous depopulation generated by the negative natural growth, which is not compensated by the migration growth.

The inclusion in development programmes only of the regions with a high demographic, industrial or tourist potential will deepen the discrepancy between them and the units which benefit only from the agricultural potential exploited by an ageing population.

#### 4. CONCLUSIONS

The Someșană Plain represents, from the point of view of the settlements, a rural area with a high ageing rate, caused by the demographic export that has characterized the region. The development of the villages in the Plain depends on the improvement of the infrastructure and the means of communication and on the creation of better connections between the relatively remote villages and the urban centres from the adjacent corridor areas. Another problem to be solved, besides this aspect, is the water problem, which is unsatisfactory both from the quantity and quality point of view; in addition, there is the building of facilities of social interest at a proper and functional level (educational, health, communication institutions etc.)

The modernization of agriculture - the main economic support of economy - might determine the creation of more jobs. The exploitation, at a local scale, of the raw material resources in agriculture, through the building of small industrial units, might contribute to the diversification of services and to the further development of the villages. Another source of development might be represented by tourism, especially cultural and religious, which might become the engine of the economic development, as well as sport tourism and rural tourism. The entertainment tourism has a lot of potential, especially in the former areas of salt exploitation.

The future evolution of the Someșană Plain will be determined by the way in which action is taken in order to stimulate the activities in the region. The Agency of Development of the North-western region and its contribution to the acquisition of European funds might be considered an advantage for the future development of the region. The development of the REGIO programmes, which aim to improve the lakes and the salted waters in this region, considering the Cojocna Watering Place in Cluj county and the Figa Watering Place in Bistrița-Năsăud County, as well as the measure of inclusion of the administrative-territorial units from the south-east of the Plain in the metropolitan area of Cluj-Napoca, might lead to a flourishing future development of the localities in the Plain.

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## THE MORPHOLOGIC COMPONENT AS A DEVELOPMENT PREMISE FOR SMALL TOWNS. CASE STUDY: TOWN OF VAȘCĂU (BIHOR COUNTY, ROMANIA)

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**ABSTRACT.** – **The Morphologic Component as a Development Premise for Small Towns. Case Study: Town of Vașcău (Bihor County, Romania).** In the post-communist Romanian urban landscape, small towns are a special category through some common features mainly regarding the difficulty of self-sustainability and self-management in the market economy and under the circumstances of losing the financial support of the State. In this context, it is mandatory to reassess the development potential of these localities and, firstly, the natural component as support for any human activity. A locality whose development was closely linked to the iron resources and their exploitation-related activities, Vașcău falls into the category of small towns, monoindustrial and economically fragile, whose evolution was marked by a progressive decline, triggered at the same time with the cessation of the exploitation. In 1956, following the process of forced urbanization and industrialization, Vașcău became a town, lacking a sufficiently diversified economy to support a future development. After 1989, like most of the small towns in Romania, Vașcău went through a period of progressive decline due to economic difficulties. At present, without certain perspectives of economic revival, facing the youth migration and a precarious urban life, the town must reassess its development potential and recompose its part in the adjacent territory. Under these circumstances, we take into account the reassessment of the part played by the natural potential, firstly the morphologic one, in the town's ascending evolution. The answer to the question: *Can the high capitalization of the morphologic component support the economic revival of the town?* can be the starting point in the working out of an efficient and sustainable development strategy.

**Keywords:** *small towns, morphologic component, development potential, economic revival, Vașcău.*

### 1. INTRODUCTION

Vașcău is part of the category of very small, monoindustrial towns whose development was exclusively based on the exploitation of some subsoil resources, facing a progressive decline after its cessation. Along with the loss of its basic industrial function, as a result of the exhaustion of the iron resources which had supported the town's economy for centuries, it also lost a part of its urban function, thus facing a repositioning in the national urban hierarchy.

The town has a low demography as well. According to the 2011 census, the total population, together with the component localities, has dropped to only 2291 inhabitants, from 3000 in 2002. The present situation is questioning the very status of the town itself, by moving towards ruralization.

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Administratively, the town comprises the villages of: Câmp, Colești, Câmp-Moți, Vărzari de Sus and Vărzari de Jos. Their location relatively distant from the town itself has triggered the outlining of a large administrative territory, overlapping a passage relief, hilly and mountainous, which might constitute, after a proper capitalization, the support for varied and complementary activities.

In this regard, the present study aims at highlighting the support part played by the morphologic component in the revival of the town of Vașcău, in order to show the newly appeared aspects of the market economy where the small towns are in competition for dominance in the nearby territory.

In the absence of an integrated strategy of sustainable development, the results of the present study can constitute the basic elements for the setup of the best ratio between the natural potential as base of support and its sustainable capitalization.

## **2. RESEARCH METHODOLOGY**

The study is analyzing the morphologic component, including the subsoil resources, as a premise to support the local economy, in the context of a functional diversification, necessary to a development strategy which should ensure the economic revival.

The setup of the role played by the relief in the structural and functional configuration of the Administrative Territorial Unit (ATU) Vașcău and, especially, the identification of the best ways to capitalize the morphologic component for an ascending economic evolution, is part of the complex process of assessing the development potential of the locality. Brunsten (2003) stated that in order to implement a project of fitting it is important to have a good knowledge of the geomorphologic context on which the respective project can rely.

The research is based on the analysis of the morphologic component and the assessment of the morphodynamic status by aid of the quantity and quality coefficients, in order to facilitate a punctual reassessment of the natural resources of the territory which can ensure support for the town's development (Rădoane, Maria, Rădoane, I., 2007). Based on field research, topographic maps, existent geologic drillings, data retrieved from the town hall, we have worked out a set of maps (the hypsometric map, the relief energy map, the slope map, the fragmentation density map, the slope exposure map etc.) by using the GIS technique, in order to highlight elements of impact on the future development of the town. The assessment of the landforms has been made by starting from the premise that a series of its features are the effects of the morphogenetic environment and its characteristic processes and, as a result, there should be a direct connection between its morphogenetic conditioning and its predisposition to a certain direction. The establishment of this connection should be at the foundation of the best capitalization of the morphologic potential of the administrative territory of the town of Vașcău.

## **3. SPATIAL FARMING**

Vașcău is located in the south-eastern part of Bihor county, along the European road E79 which crosses Beiuș Land, linking Oradea and continuing in the South in the localities of Arad county, respectively Hunedoara. Its location in the southern extremity of the county, at a relatively long distance from Oradea (86 km) and the presence of the neighboring towns Ștei (7 km) and Nucet (15 km), that along with the cessation of the industrial activity, overtook a part of the area of influence of Vașcău, these two aspects are regarded as drawbacks in the future

development of the town. Found at the foot of the urban pyramid of Romania, Vaşcău falls into the 8<sup>th</sup> category (towns with local influence II, with visible economic decline and a very weak or absent polarization potential) together with Nucet (Cocean et al., 2004). At regional level, the town is a component part of Beiuş Land (fig. 1), an original geographic region, an area whose regional coherence is given by the objective reality, both territorially and mentally (Cocean, P., 1997).

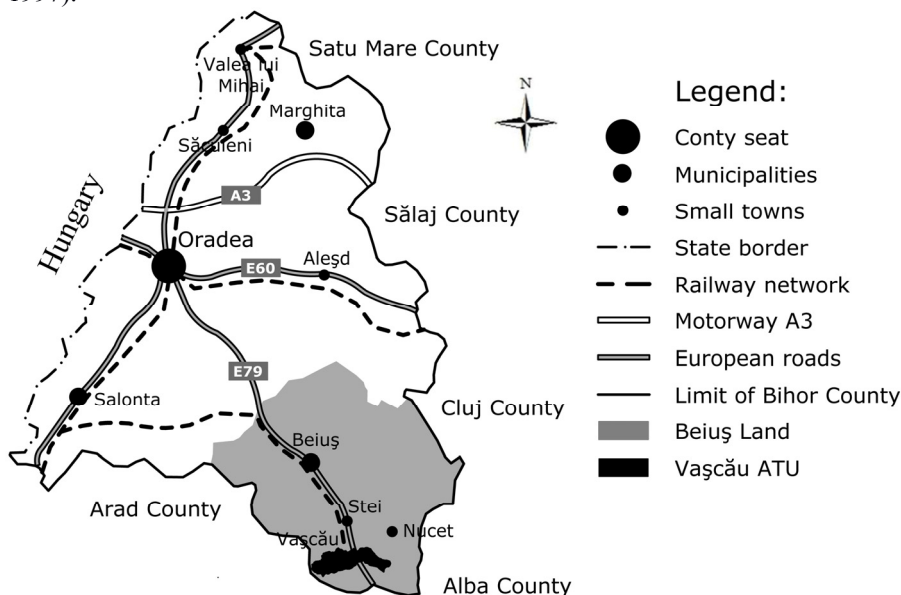


Fig. 1. Vaşcău. Territorial context within Bihor County.

The communication network within the analysed area has an overall convergent character, the same as for the entire Beiuş Land where the natural features triggered the development of a system of means of communications whose main axis is road E79 from where the county and communal roads separate to the right and to the left (Filimon, Luminiţa et al., 2011). In this context, the town itself is well serviced when it comes to road access, together with the component localities where the connection with the town is possible through some communal roads. As for the railway transportation, Vaşcău is a terminus stop. The railway access is via a detour due to the landslides which compromised an important sector of the direct route.

#### 4. HISTORICAL ASPECTS WITH IMPACT ON THE ESTABLISHMENT AND DEVELOPMENT OF THE TOWN

The natural components represented elements favourable to the early development of the settlements within Vaşcău area, the first archeological evidence dating back to the Paleolithic. The town itself developed in the Early Middle Ages, based on the iron resources, the oldest document mentioning it being written in 1552. The town's name *Vaskoh*, illustrated its main richness and its inhabitants' main activity, *being* formed of the Hungarian words *vas*=iron and *koho*=smelter (Ilea, Ana, 1987).

The town development was mainly due to the local resources, iron, marble and wood, in the town evolution one could mention three stages: the early (development) stage, based on the exploitation and manufacture of the iron resources traded up to the World War II; the communist (development) stage, based on the exploitation of marble and wood when it became a town; the post-communist stage when the subsoil resources diminished, leading to the cessation of the main industrial activity and its decline.

Although mainly renowned for the iron manufacturing, Vașcău gradually became a centre of marble manufacturing and chalking (chalking is mainly performed in Câmp-Moți, on the karstic plateau of Vașcău), pottery, skin coat manufacturing, cobblery, wood carving, masonry, carpentry, milling, plum brandy fabrication. Thus, the favourable natural elements and the subsoil resources constituted the premises for the establishment and development of Vașcău.

## 5. THE GEOLOGIC UNDESLAYER AND THE MORPHOLOGIC POTENTIAL

The territory of Vașcău is located at the contact of the Apuseni Mountains with the Neogene basin of Beiuș. The tectonic limit is marked by the petrographic contact between the Neogene sedimentary and the massive Triassic limestone with Mesozoic and Permian magmatic rocks (Petrea, Rodica, 1998). To the west, the administrative surface of the town overlaps the Codru-Moma Mountains and the Moma Hills (Vașcăului Karst), in the middle, the Crișul Negru Corridor, and in the East, the Bihorului Hills (Lazuri) and the western part of the Bihor Mountains (Fig. 2).

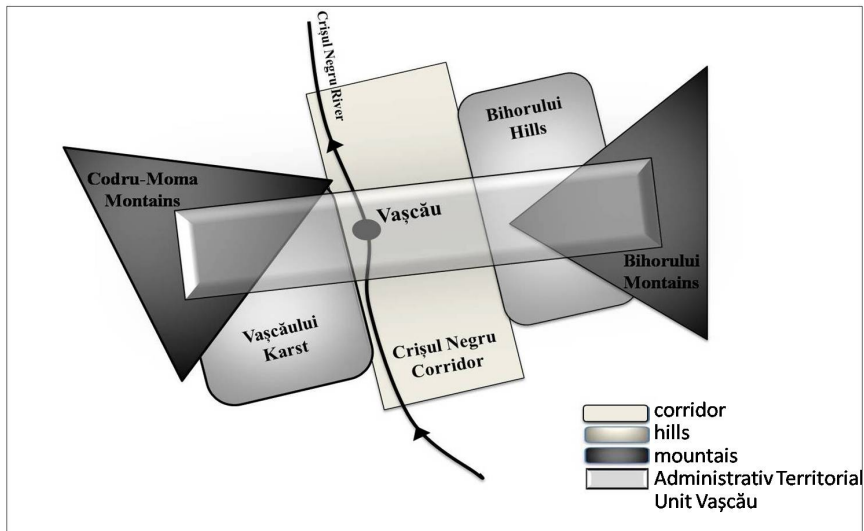
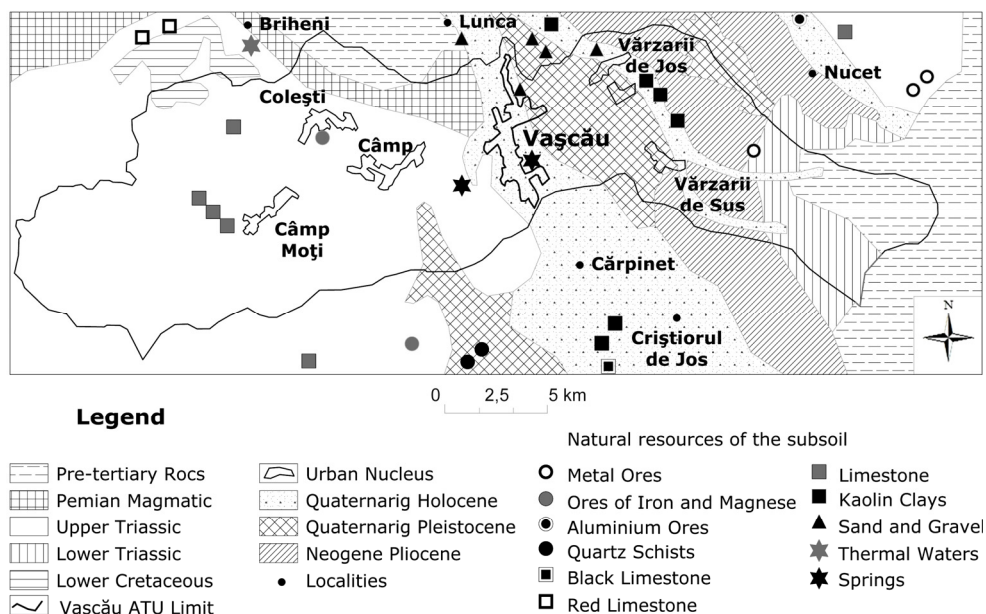


Fig. 2. The chorematic mapping of Vașcău positioning.

The karstic relief that almost entirely covers the western part of the administrative territory of Vașcău, is represented by the „Vașcăului Karst” 1-2 km in length and 500-550 m in altitude and the Codru-Moma Mountains with a maximum height of 918 m.

In the eastern part of the ATU Vașcău, the Bihor piedmont Hills have narrow crests which slowly descend from 500 m, at the contact with the mountains, up to 300 m, towards the depression axis. To the west, they come in contact with the arches of the upper terraces of Crișul Negru, well developed on the right side of the river due to its movement to the left. The Pannonian formations (marl clays, sands, gravel), deposited transgressively and assnant, appear to the East of the margin that links Vărzarii de Sus with Vărzarii de Jos, and gradually wedges out to the east. The Pleistocene forms terraces on the right bank of Crișul Negru (Berindei, I., O., 1977).

The area of the town itself mainly overlaps the alluvium formations and the Pleistocene ones to the North-eastern extremity. The hearths of the component localities located in the western ATU Vașcău, correspond entirely to the higher Triassic formations (massive limestone), while the localities developed to the East overlap the alluvium and Pleistocene formations.



**Fig. 3.** ATU Vașcău. The relation between the geologic structure and the subsoil resources. (adaptation of the geologic Map 1:200.000, Sheet 17).

The geologic component triggered the presence of a varied range of *subsoil resources* (fig. 3). The polychromatic red limestones are amongst the most important resources in the area, being located in the north-western side of the town, at a distance of 20 km. The Jurassic limestones in the north-western side of the Massif Bihor and the Triassic ones in the Codru-Moma Mountains represent an excellent material for chalk processing. These limestones are used in other industrial branches (constructions, sugar and glass industry etc.). On the territory of Cărpinet, based on this resource, there is a quarry belonging to the marble factory in Vașcău. Large deposits are to be found in the close vicinity of Vașcău, the medium stream of Briheți Valley and on the slopes of Sighiștel Valley (7 km from the town itself), as well as in the vicinity of Cămp-Moți village. The

performed research confirms a high quality of this resource and important reserves. The Kaolin clays are located in the Pannonian and Pleistocene formations, being exploited by the marble factory quarry of Vașcău, situated in Murgești Hill to the Criștiorel Valley. The clay reserves are also found within Vașcău area and Vărzarii de Sus and Vărzarii de Jos. The sands represent an ore resource found on large areas. Other resources found in the ATU Vașcău (metal ores, bauxite and coal) are not worth the exploitation.

As regards the *relief units*, most of the administrative territory of Vașcău (41%) belongs to the Crișul Negru Corridor, 34% mountainous relief (Codru-Moma and Bihor Mountains) and 25% hilly relief (Bihor and Moma Hills). The relief characteristics have played an important part in the establishment, management and development of the component localities. Within Crișul Negru Corridor, there developed three localities: Vașcău and two of his component localities, while the other component localities established themselves in the karstic area at a long distance from the town itself (Fig. 4).

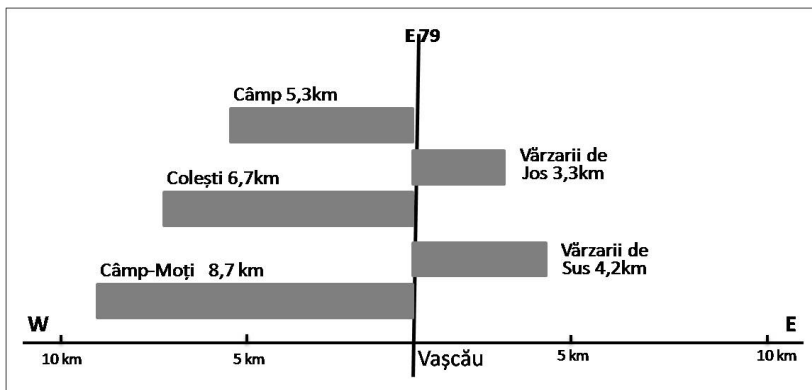


Fig. 4. Positioning of the component localities towards Vașcău.

The quantity coefficients of the morphometric features and the morphodynamic analysis represent the preliminary investigations performed on the relief in the studied area, in order to identify the best ways to capitalize the ATU Vașcău and the assessment of their applicability.

*The altitude of the localities' hearths* varies between 321 and 643 m, triggering a variation of 322 m. The localities in the Crișul Negru Corridor are situated between 321 and 333 m. (Fig. 5)

In Vașcăului Karst there is the locality of Cămp, at an altitude of 540 m, and in the neighbouring mountainous area (Codru-Moma Mountains) there are Colești and Cămp-Moți, the latter being situated at the highest altitude, 643 m. These altitudes mainly determine the land use.

The rates of relief energy within the analysed area are under 50 m in the Corridor, reaching 300 m in few sectors of the mountainous area. The areas with relief energy under 50 m are specific to the Crișul Negru Corridor, the Karstic Plateau of Vașcău and some interfluves with a low potential of morphodynamic processes. The areas with the highest morphodynamic potential are situated in some sectors of Vașcăului Karst and the mountainous area. The delimitation of the various area categories was done in order assess their morphodynamic potential.

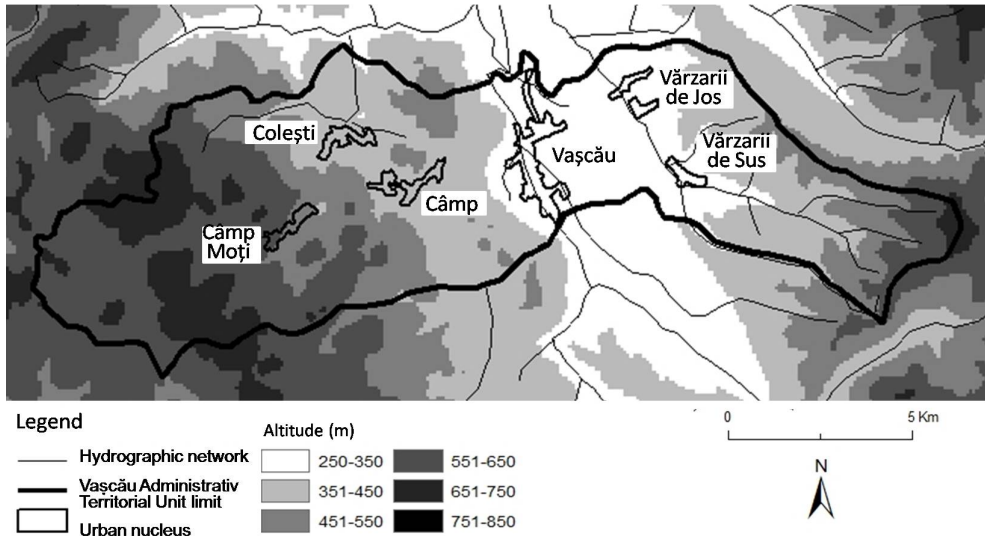


Fig. 5. Hypsometric map of ATU Vașcău.

The present *declivity* of the studied area is due both to the petrographic structure, the degree of relief evolution, and to the anthropic intervention. Thus, the terraces show 3-8° slopes, but are partially mellowed by erosion and anthropic intervention.

The quasi-horizontal areas (under 2°) are to be found in the water meadows of the rivers, the terrace arches and some interfluves. The areas with declivity between 2-8° are specific to some sectors in the upper stream of Boiu and Crișu Nou valleys and sectors of interfluves. Approximately 65% of the studied area belongs to these two rate groups. Declivities between 8-10° are specific to the piedmont slopes and some terraces representing 20% of the ATU Vașcău. The slopes with a declivity of over 10°, are spread in the sectors in the karstic and mountainous area, take 15% of the area (Fig. 6).

By analyzing the weight of the declivity classes at ATU level, one should notice that most of the landforms (60%) are characterized by rates under 8°, which indicates the advantage of agricultural exploitation and capitalization of land, mainly East of the ATU.

The highest rates of *the horizontal fragmentation*, over 3 km/km<sup>2</sup>, are recorded in the mountainous area of the ATU. To the West of the ATU, corresponding to Vașcăului Karst, the horizontal fragmentation has an average rate of 1,5 km/km<sup>2</sup>, and in Bihorulul Hills the average is around 2,5 km/km<sup>2</sup>.

*The slope exposure* is a factor which determines the land use. In the area of Crișul Negru terraces, the most advantageous to the agricultural exploitation and capitalization, the semi-shaded slopes (NW) are 60%. The semi-shaded slopes are 30% in Bihor Mountains. Within the studied area, one should notice that the semi-sunny slopes (western) are predominant in the Bihorulul Hills (65%) and in the karstic area of western ATU (40%).

*The geomorphic processes* are determined by all the analysed parameters. Thus, in the Crișul Negru water meadow and terraces there are mostly land subsidence processes. On high floods, part of the meadow undergoes recurrent alluviaions. In the lower meadow there are numerous sectors with extra humidity and the concave banks of Crișul Negru are facing a lateral erosion (Petrea, Rodica, 1998).



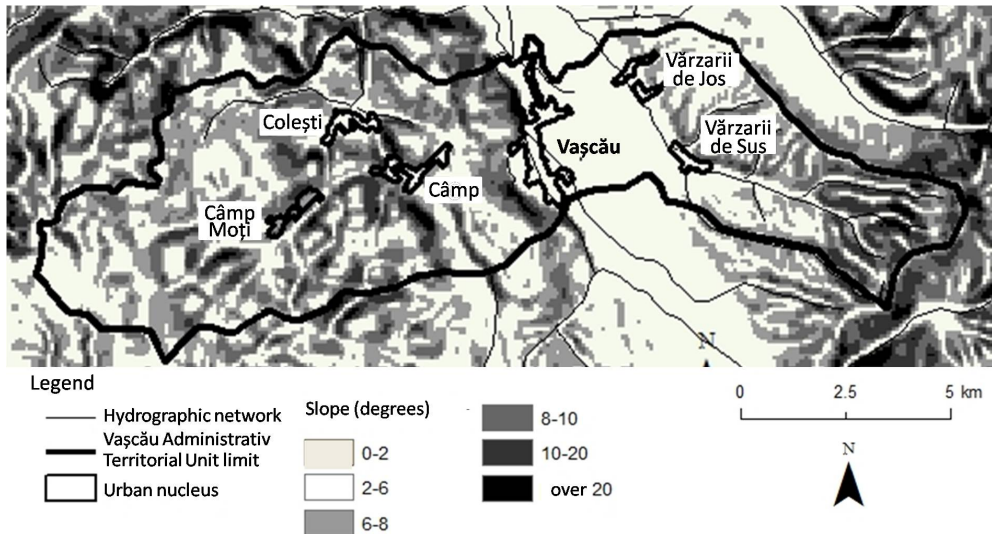


Fig. 6. ATU Vașcău. Slope map.

On the less sloped areas (1-3°) of the lower and medium terrace arches dominate processes of eluviation, coverture and, in some areas, land subsidence. One can notice a certain area restraint of the terraces due to slitting by regressive expansion of the cloughs.

The terraces with slopes between 3 and 10° maintain a mild morphodynamics, except for the area affected by over-grazing where cloughs appeared. At the base of the terraces there appeared large collovium trails.

The secondary valleys and the cloughs oftenly have steep slopes, over 15-20°, which triggers an intense morphodynamics, including landslides.

The highest erosion potential is specific to the mountainous relief where morphometry and the anthropic interventions triggered an intense morphodynamics on large areas. The declivitous slopes, with southern and eastern exposure are the most affected ones. Surface drainage and erosion manifest themselves especially in the springtime when the snows melt briskly. Torrential processes, failures and landfalls occur frequently. The performed analysis has intended to assess the territory predisposition to the geomorphic processes and the morphologic susceptibility to the best exploitation and capitalization of the ATU Vașcău.

The large expanse of the administrative territory from East to West triggered the overlapping of various landforms, thus determining diverse but complementary uses, according to their characteristic (Fig. 7).

To the west of ATU Vașcău there developed three component localities, the karstic relief formed on the Triassic limestone is dominant. Limestones, with multiple uses, are amongst the most important resources in the area. The relief is characterized by higher rates of fragmentation depth (150-300 m), horizontal fragmentation (1,5-2,5 km/km<sup>2</sup>) and declivity (over 10°). Additionally, the altitude over 550 m and the dominant exposure of the semi-shaded slopes show predisposition to forestry and partially fruit farming. The areas with the highest morphodynamic potential are found in some sectors in Vașcăului Karst and the mountainous area. Due to its morphologic features, the karstic relief west of ATU Vașcău represents an attractive tourist resource that can be extremely well capitalized.

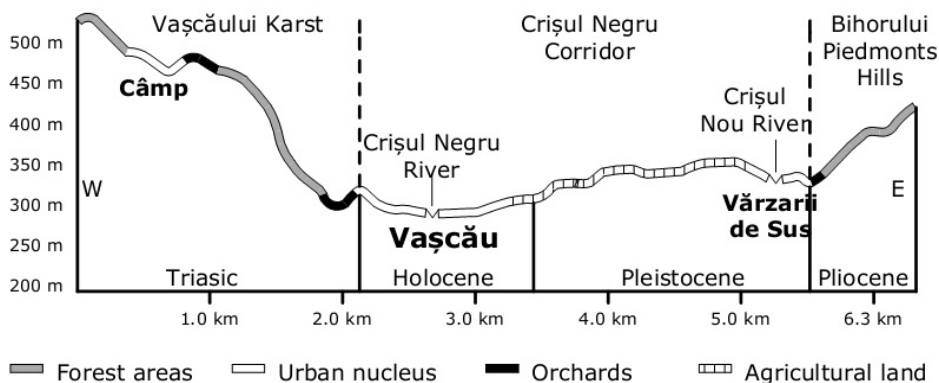


Fig. 7. Transversal profile through Vașcău. Land use.

The eastern side of ATU Vașcău, mostly taken by the Crișul Negru Corridor, with altitudes around 300 m, is composed of Quaternary formations. The medium horizontal fragmentation is  $1,5 \text{ km/km}^2$ , and the medium relief energy is under 50 m. For the most part, the areas are quasi-horizontal, only the terraces have slopes of over  $3^0$ . The terrace arches under  $3^0$  constitute the main agricultural land. The reduced expansion of the agricultural land in the area makes them even more suitable for agriculture. Most of the lands overlapping these landforms are agricultural and many of them are arable land.

East of Vărzarii de Sus and Vărzarii de Jos are the piedmont hills of Bihor, with altitudes between 300-500 m, carved in Neogene formations. In these formations are found kaolin clays. The relief energy between 100-150 m, the medium fragmentation density of  $2,5 \text{ km/km}^2$ , the declivity over  $8^0$  and a high percentage (65%) of the semi-sunny slopes ensure a mild morphodynamics, with a predisposition to fruit farming.

## 6. CONCLUSIONS

By assessing the potentiality of the morphologic component in the support of the local development, we can assert that, although its overall manifestation is discrete, the varied morphology of the administrative territory of the town of Vașcău shows still uncaptured opportunities.

By representing an area where, beside marble, there are no longer significant mineral resources, the local economy must be properly oriented, the high relief capitalization being one of the alternatives of supporting the revival of Vașcău. Although modest, the other natural resources can support a certain type of economic development through the setting up of small units, with local characteristic, capable of ensuring an economic stability and, especially, a life quality that should justify the continuity of the town itself. The significant local elements, not best capitalized, that assert tourism as a long-range economic activity, are mainly represented by the attractive karstic landscape and the traditional activities. Complementary, the eco agriculture, the sustainable exploitation of the existing mineral resources, the sustainable capitalization of the surface resources, the preservation of the handicrafts and ethno-folkloric traditions, can ensure a diversification of the functional profile. In conclusion, we think that the development potential



which can be best capitalized for the local economy revival is given by three main directions: the development of a small industry and handicrafts, development of the eco agriculture and development of responsible tourism.

Obviously, by its relatively modest development potential, Vașcău will not become a pole for south Bihor county. Along with the cessation of its basic industrial function, the influence area of Vașcău is limited to its component localities and neighboring villages, the town being shadowed by Ștei and ancillary to Beiuș, the polarizing nucleus of Beiuș Land. Under the present circumstances, without a development strategy, facing population decrease and degradation of life quality, we forshadow an evolution to ruralization. Although it has a varied natural landscape, as a result of its administrative territorial expansion from west to east and overlapping landforms that triggered the presence of diverse resources, lacking a sustainable local strategy of development, they remain uncapitalized.

## 7. ACKNOWLEDGEMENTS

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## THE INDUSTRY OF SOMEȘUL MIC CORRIDOR

GR. P. POP<sup>1</sup>

**ABSTRACT.** – **The Industry of Someșul Mic Corridor.** The envisaged work completes, in the most natural way, a developed and recently published study (Gr. P. Pop, Adela Mîrza, 2012), which has analysed the overall features of the four industrial parks of the Someșul Mic Corridor, i.e. TETAROM I and TETAROM II from Cluj-Napoca, TETAROM III from Jucu and Arc Park Dej. For an overall perspective on the analysed geographical area, it must be noted that this starts from Gilău (the exit from Gilău Mountains, at almost 400 meters altitude) and it continues up to the confluence with Someșul Mare (upstream Dej, Mica commune, at 232 meters altitude), having a cross section of 1-3 km width on the meadow level and 4-5 km width on the upper terrace level (140m); in the eastern and southern part it is bordered by Câmpia Transilvaniei and Masivul Feleacului and in the western part by Dealurile Clujului and Dejului. If we pursued the entire industrial picture of the Someșul Mic Corridor, the issue would acquire a more pronounced in-depth complexity determined by the presence of a great number of industrial units and by their diversity. To keep to the necessary scientific level of such an investigation, it should be noted, however, that the study seeks to highlight the major aspects of the industry existing in the corridor. The study would involve the presence and the repartition of industry at communes and industries level according to the number of employees in 2010, where the survey recorded the industrial units with more than 20 employees. Regarding the first problem, it should be observed that the greatest number of employees in the field of industry is located in Cluj-Napoca with 12 437 (79,3%) from the total of 15 689 employees working in the 77 industrial units in the Someșul Mic Corridor, followed by Gherla, with 1 399 employees (8,9%), then Florești, with 792 employees (5,1%), Fundătura, with 289 employees (1,8%), in the other 6 units operating only 772 persons (4,9%) (table 1, fig.2). Regarding the second issue, i.e. the structure of the corridor industry, it can be noted that there are 2 dominant industries: on the one hand, mechanical engineering and metallic constructions (32,30% from the total number of employees are employed in the industry of Someșul Mic Corridor) and, on the other, the light industry (30,12% of the total number of employees); other three industries share reduced percentage values of 10,0 % (wood and paper processing, food and chemical industry) and are followed by the values of the other industries with significantly lower shares (table 2 and fig.3).

**Keywords:** *Someșul Mic Corridor, industry, employees, Cluj-Napoca, light industry.*

### 1. INTRODUCTION

Various concerns, carried out throughout longstanding teaching and scientific research activities, have turned our attention to one of the Transylvanian Depression corridors, approached here, that of Someșul Mic, to which some references are made in specialized geographical literature, in some cases the unit under considered being given special attention, especially in works written and published by the author of the present study in 2001 (Transylvanian Depression), and 2007 (Romanian counties. county Cluj), and more recently the study "Industrial parks in the Someșul Mic Corridor" (Gr. P. Pop, Adela Mîrza); the last analyzes, with an appropriate level of

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detail, the four parks located along the Someșul Mic Corridor, respectively TETATOM I and TETAROM II from Cluj-Napoca, TETAROM III from Jucu, (TETAROM = Transylvania Equipments and Advanced Technologies manufactured in **Romania**) and Arc Parc from Dej.

Pursuing the above mentioned concerns, especially those related to the industrial parks along the Someșul Mic Valley, from its spring in the Gilău Mountains and down to the confluence with Someșul Mare (Gilău-Mica), the authors considered it appropriate to tackle the issue of the industrial development alongside the Someșul Mic Corridor, specifically, since, for this purpose, all necessary data, were available or made available by the specialized institution from Cluj<sup>2</sup>

The overall geographical presentation is inductive of the fact that the analyzed unit, i.e. Someșul Mic Corridor starts from Gilău (the exit from the Gilău Mountains at an altitude of about 400 m, the altitude in Cluj-Napoca is 346 m) and continues up to the confluence with Someșul Mare (upstream the town of Dej, the Mica locality at an altitude of 232 m), with a length of about 75 km. The transversal profile of the corridor recorded 1-3 km meadow widths and up to 4-5 km on the upper terrace (140 m); the corridor is bordered to the east and south by the Transylvanian Plain and Feleac Massif and to the West by the hills of Cluj and Dej.

Following the entire industrial picture of the Someșul Mic Corridor, the tackled issues become part of a relatively complex situation which results from both the presence of a large number of industrial units and from their diversification with a view to achieving the appropriate products. In order to remain loyal to an appropriate scientific level required by such an enterprise, is noteworthy to point out that the present study aims to highlight the major aspects of the industry along the corridor, i.e. the presence and distribution of the industry at the level of localities and industry structure according to the number of employees in 2010, a purpose for which only industrial units with over 20 employees have been selected.

## 2. INDUSTRY DISTRIBUTION ALONG THE CORRIDOR

Without aiming at bringing into discussion the territorial distribution of industry along the Someșul Mic Corridor, it is noteworthy to point out, as a generalization, that corridors have always provided a favourable site which was reinforced by an appropriate geographic position and by the beneficial presence of natural resources; the industry benefited fully from the above mentioned factors to which adequate strategies of managing the communication network were added.

In what the Someșul Mic Corridor is concerned, among the elements which favoured the consolidation and development of its industry the following can be mentioned: the *geographic position*: the corridor has its up-stream course in the north-eastern 'lap' of Apuseni Mountains, where it gets some of its most important resources from (wood, construction materials, the water stored in the hydropower reservoirs on Someșul Cald and Someșul Rece rivers as well as upriver on Someșul Mic, etc.) and to the east it borders the Transylvanian Plane, where from the resources of methane gas got to the corridor starting with the end of the first half of the 20<sup>th</sup> century(1947); the broad links of the corridor with almost all areas: to the west across the Căpuș and Nadăș corridors and across the Clujului and Dejului Hills, to the north (downriver) it meets the Someșul Mare and Someșul Mic corridors and to the east across the Transylvanian Plane, and to the eastern part of Feleac Massif links with other two important corridors (those of Mureș and Arieșul Inferior rivers) are established.

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<sup>2</sup> Direcția Regională de Statistică Cluj.

In order to observe the geographic position of industry in the analysed territory, we looked at its distribution along the corridor from its superior part to its inferior one, i.e. from Gilău to Dej; along this corridor 81 industrial units with more than 20 employees have been recorded,

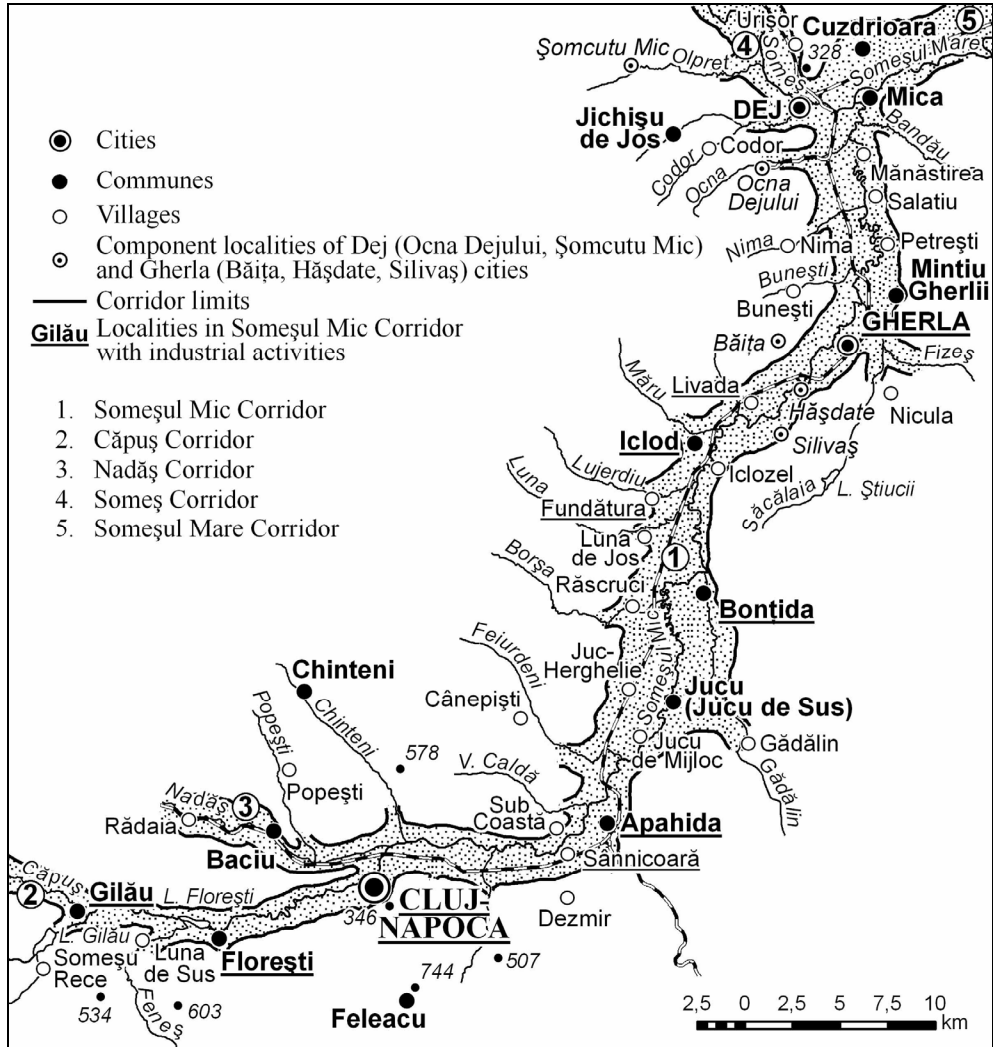


Fig. 1. The geographic localisation of industry in the Someșul Mic Corridor, in 2010.

four of which (TETAROM I, TETAROM II, TETAROM III and Arc Parc Dej) were analysed in a survey made public previously (Gr. P. Pop, Adela Mîrza, 2012, p. 53-64)<sup>3</sup>, while the other 77 are discussed in the present survey.

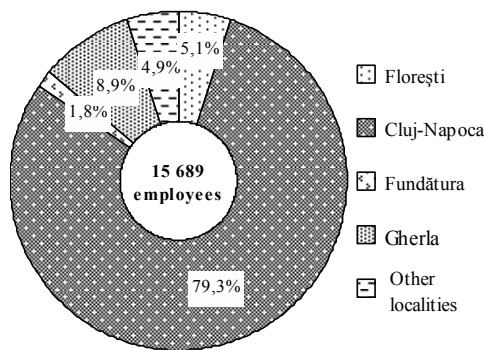
<sup>3</sup> Arc Parc is the only industrial unit from Dej situated in the Channel of Someșul Mic.

From its spring down to its mouth, the 77 industrial units present in the Someșul Mic Corridor are located in: Gilău, Florești, Cluj-Napoca, Sannicoara, Apahida, Bonțida, Fundătura, Iclod, Livada and Gherla; among them there are significant differences as to the number of the employees and their industrial units.

**The number of employees in the industrial units of the localities situated in the Channel of Someșul Mic, in 2010**

Table 1

Crt. no.	Localities	Number employees	%
1	Gilău	162	1,0
2	Florești	792	5,1
3	Cluj-Napoca	12 437	79,3
4	Sânnicoară	180	1,2
5	Apahida	179	1,1
6	Bonțida	195	1,3
7	Fundătura	289	1,8
8	Iclod	21	0,1
9	Livada	35	0,2
10	Gherla	1399	8,9
	<b>Total</b>	<b>15 689</b>	<b>100,0</b>



**Fig. 2.** Employees frequency at district level in 2010.

As a consequence, in the following 7 localities situated downstream of Cluj-Napoca, the number of industrial units is only 15 (19.5% of 77); value wise, the situation looks like this: 2 units (2.6%) in Sânnicoară, 3 (3.9%) in Apahida, 3 (3.9%) in Bonțida, 1 (1.3%) in Fundătura, Iclod and Livada and 4 (5.2%) in Gherla.

Thus, regarding the number of employees some more peculiar aspects are emphasized (table 1, fig.2):

- the first place is occupied by far by the Cluj-Napoca municipality, which employs 79,3% (12 437 persons) of the total of 15 689 active employees of the corridor;

- the second place is held by Gherla, which employs 8.9% (1399 persons) of all employees of the analyzed geographic area;

- A slightly higher number of employees, i.e. 5.1% (792 persons), are working in industrial units in Florești, whose economy has boosted almost entirely after 1990;

- to the category of settlements with a slightly higher number of employees, i.e. 289 individuals (1.8% of those of the entire corridor), belongs the village Fundătura (Iclod locality) followed by other six localities which hold only 4.9% (772 employees out of 15,689), in geographical order, from upstream to downstream the values are: 1.0% (162 persons) in Gilău, 1.2% (180 persons) in Sânnicoară, 1.1% (179 persons) in Apahida, 1.3% (195 persons) in Bonțida, only 0.1% (21 persons) in Iclod and 0.2% (35 persons) in Livada.

The analysis of the number of industrial units at the level of localities reveals a maximum concentration in the upper part of the Someșul Mic Corridor, where the 3 settlements, Gilău, Florești and Cluj-Napoca, own 80,5% (62 industrial units) of the total of 77 which are operational over the analyzed territory: 4 units in Gilău (5,2%), 14 in Florești (18,2%) and 44 in Cluj-

### 3. THE INDUSTRY STRUCTURE IN THE SOMEȘUL MIC CORRIDOR

The 77 industrial units analyzed in the present study presented along the corridor in ten localities: Gilău, Florești, Cluj-Napoca, Sânnicoară, Apahida Bonțida, Fundătura, Iclod, Livada and Gherla, belong to eight industrial branches (categories of activities): industry of electrical energy, construction materials and handicraft, chemical industry, building materials and crafts industry, industry of wood and paper, light industry, food industry and other industrial activities.

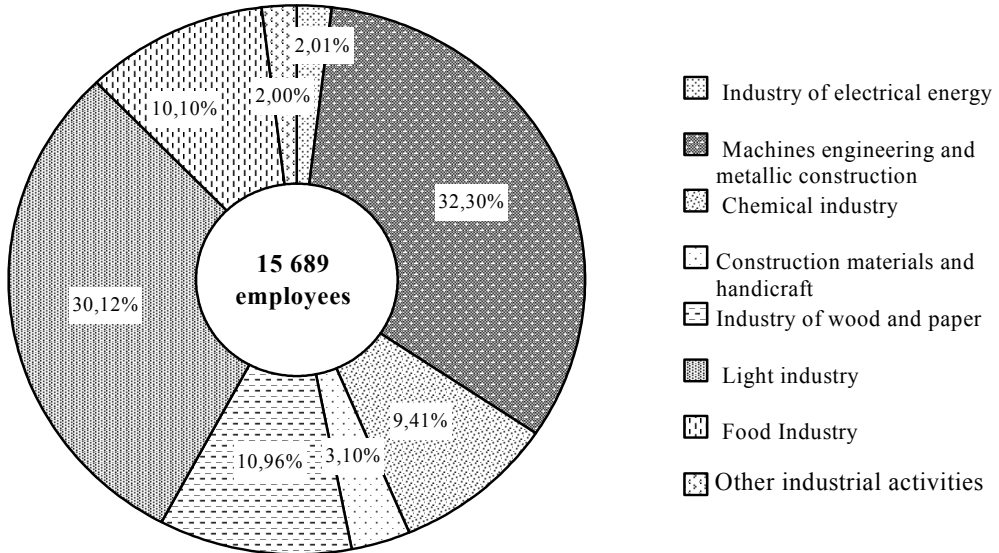


Fig. 3. The industry structure the Someș Mic corridor, in 2010.

In what regards the hierarchical ranking of the industrial branches, the construction materials and handicraft branch has acquired primacy (32,30% of all employees in the corridor industry), the light industry (30,12%) takes the second place followed by three branches with a percentage of about 10% respectively: the wood and paper industry (10,96%), food industry (10,10%) and chemical industry (9,41%); the following positions are held successively by the industry of construction materials and handicraft (3,10%), the industry of electrical energy (1,01%) and other industrial activities (2,00%) (table 2 and fig. 3).

#### 3. 1. Industry of electrical energy

This industry, with 2.01% (315 persons) of the total number of corridor employees (table 2, fig. 3), concentrated in the Cluj-Napoca-based Electricity Company, comprise the hydro-electric units from the Someșul Mic-Mărișel Fântânele (220 MW), Tarnița (45 MW), Someșul Cald (12 MW), Gilău I (6.3 MW), Gilău II (6.9 MW), Florești I (6.9 MW), Florești II (5 MW) and Cluj-Napoca (0.94 MW), the first three hydropower plants being located in the Gilău Mountains' area and the next five in the Someșul Mic corridor (Gr. P. Pop, 1996, p 136-151).

## Industry Companies from Someșul Mic Corridor, in 2010

Table 2

Crt. no.	Locality	Industrial products	Company	No. empls.	%
1	C-N	Electric power	SC DE PROD. A ENERG. ELECTR.	315	2,01
		<b>Industry of electrical energy</b>		<b>315</b>	<b>2,01</b>
2	Gilău	Lightening equipment	KLAUSEN EXIM	47	0,30
3	Gilău	Metallic structures and metallic structure components	DECOLIGHTS IMPEX SRL	25	0,16
4	Gilău	Road vehicles	SC DLOUHY SRL	22	0,14
5	Florești	Equipment for the production of food, beverage and tobacco	SC A M SERVICES SRL	70	0,45
6	Florești	Metallic items resulting from plastic processing; powder metallurgy.	SC NAPOSINT PRODCOM SRL	51	0,33
7	Florești	Products resulting from metallic threads; fitters and bows	SC SARIMATEC SRL	30	0,19
8	C-N	Electric and electronic equipment for vehicles and engines	FUJIKURA AUTOMOTIVE ROMANIA SRL	1765	11,25
9	C-N	Electric and electronic equipment for vehicles and engines	ECKERLE AUTOMOTIVE SRL	617	3,93
10	C-N	Rolling stock	REMARUL 16 FEBRUARIE SA	557	3,55
11	C-N	Equipment and tools for the processing of metals	NAPOMAR SA	246	1,57
12	C-N	Metal items obtained from plastic processing; powder metallurgy	SINTEROM SA	220	1,40
13	C-N	Cocks and other products	ARMĂTURA SA	195	1,24
14	C-N	Metallic structures and metallic structure components	FIMARO SA	160	1,02
15	C-N	Repairing and maintenance of other transport equipments i.n.c.e.	SC REPARAȚII LOCOMOTIVE C.F.	157	1,00
16	C-N	Metallic structures and metallic structure components	ROMVAL SA	144	0,92
17	C-N	Metallic structures and metallic structure components	CSI ROMANIA SRL.	134	0,85
18	Sâmbicoară	Various electronic components	TEHNOLOGISTIC	35	0,22
19	Apahida	General mechanic operations	SC TECSA MECCANISME SRL	89	0,57
20	Apahida	Maintenance and vehicle repairing	WILLY & CO	57	0,36

THE INDUSTRY OF SOMEȘUL MIC CORRIDOR

21	Bonița	Ventilation and cooling equipment, including household items	SONDEX ROMANIA	80	0,51
22	Bonița	Machinery and equipment for agriculture and forestry	SC TEHNOFAVORIT SA	78	0,50
23	Fundătura	Heaters and boilers for central heating	SC IRROM INDUSTRIE, SRL	289	1,84
		<b>Machines engineering and metallic construction</b>		<b>5068</b>	<b>32,30</b>
24	Florești	Essential oils	SC EXTRACTE NATURALE NATEX	52	0,33
25	Florești	Slates, sheets and plastic profiles	ABRISO ROMANIA SRL	37	0,24
26	Florești	Slates, sheets and plastic profiles	SC AIRPACK SRL	25	0,16
27	C-N	Pharmaceutical drugs	TERAPIA SA	611	3,89
28	C-N	Abrasive products	CARBOCHIM SA	225	1,43
29	C-N	Perfumes and cosmetic products	FARMEC SA	359	2,29
30	C-N	Plastic products	NAPOCHIM SA	131	0,83
31	Bonița	Plastic materials in primary shapes	SC HIRSCH POREZELL	37	0,24
		<b>Chemical industry</b>		<b>1477</b>	<b>9,41</b>
32	C-N	Boards and ceramics slabs	SANEX SA	454	2,89
33	Apahida	Household glass ware (for Christmas holiday)	S.C. CLUJ COLLECTION SRL	33	0,21
		<b>Construction materials and handicraft</b>		<b>487</b>	<b>3,10</b>
34	Florești	Office and store furniture	SC TERMINUS PROD SRL	38	0,24
35	C-N	Furniture i.n.c.e.	INDUSTRIE.S ELITE SA	236	1,50
36	C-N	Carpetery and wood items for constructions	FONTANOT RO SRL	173	1,10
37	Sănnicoară	Paper, wavy cartoon and paper and cartoon packaging	RONDOCARTON CLUJ	145	0,92
38	Livada	Office and store furniture	SC APOLLO SEDIU CLUJ	35	0,22
39	Gherla	Furniture i.n.c.e.	SORTILEMN SA	798	5,09
40	Gherla	Furniture i.n.c.e.	BECKER ROMANIA	294	1,87



		Industry of wood and paper		1719	10,96
41	Florești	Underware	ONDA VERDE PROD SRL	120	0,76
42	Florești	Textile clothes (except underwear)	SC FLOROTEX SRL	65	0,41
43	Florești	Travel accessories, bags and harness	SC BANINI IMPEX	46	0,29
44	Florești	Other clothes items (except underwear)	SC C N FASHION SRL	29	0,18
45	Florești	Underclothes	GERMA FASHION	24	0,15
46	C-N	Underclothes	JOLIDON IMPORT EXPORT SRL	790	5,04
47	C-N	Other clothes items (except underwear)	MAGREB KNITWEAR EAST SRL	399	2,54
48	C-N	Underclothes	ARGOS SA	313	2,00
49	C-N	Other clothes items (except underwear)	FLACARA SA	304	1,94
50	C-N	Other clothes items and accessories i.n.c.e.	EST COMPANY ROM IMPEX SRL	267	1,70
51	C-N	Other clothes items (except underwear) i.n.c.e.	LAURA MODEL SRL	152	0,97
52	C-N	Other clothes items (except underwear)	HELD FASHION SRL	136	0,87
53	C-N	Fiber preparation and spinning	CARPAT-FIL INDUSTRY SRL	133	0,85
54	C-N	Other clothes items (except underwear)	MODA S. COOP. MEȘTEȘUGĂREASCĂ	129	0,82
55	C-N	Other clothes items (except underwear)	SUPERCONF S. COOPMEȘTEȘUGĂR.	123	0,78
56	C-N	Sports ware	HIGH TECH TECNOSKY SRL	119	0,76
57	C-N	Footwear	CLUJANA SA	365	2,33
58	C-N	Footwear	AIDA INTERNATIONAL SRL	248	1,58
59	C-N	Footwear	CD BONS SRL	218	1,39
60	C-N	Footwear	AKU EST SRL	181	1,15
61	C-N	Footwear	CLASS SHOE SRL	180	1,115
62	C-N	Footwear	BLUEY SHOES SRL	143	0,91

THE INDUSTRY OF SOMEȘUL MIC CORRIDOR

63	C-N	Footwear		BOOTS VANIA SRL	112	0,71
64	Gherla	Footwear		MESERIAȘUL S. COOP. MEȘTEȘUGĂ.	129	0,82
			<b>Light industry</b>		<b>4725</b>	<b>30,12</b>
65	Florești	Poultry preparation and conservation		ONCOS SA	139	0,89
66	Florești	Bread, cookery and fresh pastry		ONCOS SA	66	0,42
67	C-N	Milk and cheese products		NAPOLACT SA	397	2,53
68	C-N	Beer		URSUS BREWERIE S SA	317	2,02
69	C-N	Bread, cookery and fresh pastry		MOTILOR SRL	132	0,84
70	C-N	Bread, cookery and fresh pastry		VEL PITAR SA	123	0,78
71	C-N	Meat (including poultry)		COSM FAN CARMANGERI SRL	106	0,68
72	C-N	Spirits distillation, purification and mixing		PRODVINALCO SA	105	0,67
73	Iclod	Milk and dairy products		PICOLACT PRODCOM	21	0,13
74	Gherla	Bread, cookery and fresh pastry		SC AGROPAN PRODCOM SRL	178	1,13
			<b>Food industry</b>		<b>1584</b>	<b>10,10</b>
75	Gițlau	Abstraction and distribution of drinking water		COMPANIA DE APĂ	68	0,43
76	C-N	Paperware		GPV ROMANIA PRODCOM SERV SRL	127	0,81
77	C-N	Other printing activities i.n.c.e.		ROTTAPRINT SRL	119	0,76
			<b>Other industrial activities</b>		<b>314</b>	<b>2,00</b>
			<b>Total</b>		<b>15 689</b>	<b>100,00</b>

C-N = Cluj-Napoca; No. Empls. = Number employees; i.n.c.e. = items not classified elsewhere.

### **3. 2. Machines engineering and metallic construction**

This is the most developed industrial branch within the examined geographic unit and it comprises the largest number of employees from the Someșul Mic corridor, respectively 32,30 (5068 employees) from a total of 15 689 persons employed in the industry of the territory. The industrial units belonging to this domain, namely 22 in number, deploy their activity in Gilău (3), Florești (3), Cluj-Napoca (10), Sannicoară (1), Apahida (2), Bonțida (2) and Fundătura (1). Among them the most important are the following companies: Fujikura Automotive Romania (the largest of the corridor with 1 765 employees) specialized in the production of electronic equipment for motor vehicles, Eckerle Automotive (617 employees, same products as the previous company), Remarul 16 Februarie. (557 employees, rolling material), Napomar (216 employees, equipment and machine tools used in metal works), Sinterom (220 employees, metal products obtained through plastic deformation; powder metallurgy); all of the mentioned units are Cluj-Napoca-based plants, to which the units Armătura (195 employees, plumbing items), Fimaro (160 employees, metallic structures or integral parts of metallic structures) and the Fundătura-based company (Irom Industries., 289 employees, production of radiators and central heating boilers), should be added. (table 2)

### **3. 3. Chemical industry**

The chemical industry deploys its activity in eight industrial units situated along the Someșul Mic corridor, representing 10,4% (1 477 persons) from the total of the analyzed units. Without trying to carry out a more indepth analysis of this branch, it is important to note that four of the units, categorized as small businesses, operate in Florești (essential oils and different plastic products) and Bonțida (plastic products), and three of the four Cluj Napoca-based plants, are nationally ranked units: Terapia Rambaxy (611 employees, pharmaceutical products for human and veterinary usage), Carbochim (225 employees, abrasive products) and Farnec (359 employees, fabrication of perfumes and cosmetics).

### **3. 4. Construction materials and handicraft**

This industry is characterised by a scarce presence along the corridor due to the fact that it registers only 3.10% (485 employees) of the total of 15 689 employees who are active throughout the analysed territory. This branch is represented only by two industrial units, where a particular importance is held by the Cluj-Napoca- based company Sanex. Here the 454 employees manufacture ceramic tiles, while the second unit based in Apahida with only 33 employees, produces household glass ware (for Christmas holiday), which are very popular and sought for on the international market.

### **3. 5. Industry of wood and paper**

This branch comprises seven industrial units, where 10.91% (1719 employees) of the work force located along the Someșul Mic are working. Form these, two (Florești and Livada) are specialized in manufacturing office and shop furniture, another three (one located in Cluj-Napoca and two in Gherla) produce furniture (not elsewhere classified). From the same industry,

another Cluj-Napoca-based company has joined the ranks of furniture manufacturers, the latter being specialised in making house carpentry and joinery. Another Sânnicoară-based factory *Rondocarton* has as main activity the paper and corrugate board production, followed by paper and corrugate board packaging (table 2).

### 3. 6. Light industry

With a share of 30.12% (4725 employees, out of 15 689 of the existing work force), this industry holds the second place after engineering and metal constructions (table 2, fig. 3). The 24 industrial units of this branch are concentrated in 3 of the 10 industrial localities along the corridor (table 1, fig. 2), namely Florești (5 units with 284 employees, 6.0% of those employed in light industry), Cluj-Napoca (18 units with a weight of 91.3%) and Gherla (a sole unit with a share of 2.7%).

Regarding the products delivered by this branch, Cluj-Napoca is the first to be mentioned, this is where the following items are produced: underwear items (2 units), various clothing items (exclusively underwear) (5 units), clothes and accessories i.n.c.e (2), sportware (1), preparation and spinning of textile fibers (1) and footwear (7 of the 18 existing units in Cluj-Napoca). The Florești-based units have joined the category with underwear production and ready-made textile items (different from clothing and underwear), travel articles, handbags and harness ware) and the Gherla-based unity unit with footwear.

### 3. 7. Food industry

The food industry is not as developed as it should be in the analysed geographical unity, as it is represented only by 10,10% (1 584 from the total of 15 689 employees of the corridor work force). It is represented by 10 subsidies (13% from a total of 77), most of which are Cluj-Napoca-based, i.e. 6 with 1 180 employees (74,5% from those operating in the food industry); the goods produced in these factories are: dairy products, beer, bread, cookies and fresh pastry products as well as meat products (chicken included); the processes of distilling, rectifying and blending of spirits take place in the same factories.

The other 3 locations for food industry operations are: Florești (205 employees), with 2 subsidies, where the activities of processing and preservation of poultry meat and bread production, cookies and fresh pastry products, Iclod (21 employees) with a subsidy for dairy and cheese products, and Gherla (178 employees)

### 3. 8. Other industrial activities

With a share of 2% (314 employees from a total of 15 589), this category of activities is present only in three cities, namely Gilău, where the hydroelectric industry has developed on the river called Someșul Cald (Beliș-Fântânele, Târnița, Someșul Cald) and Someșul Mic (Gilău); this industry represented by The Station of water capture, treatment and distribution, assures high quality water for all regions from Gilău to Dej, as well as those for the right side of the Someșul Mic (Transylvanian Plain) and its left side (Cluj-Napoca and Dej hills) and Cluj-Napoca.

#### 4. CONCLUSIONS

##### Dimensional classes of industrial units from the Corridor Someșul Mic

Table 3

Classes of employees	No of units	No. of employees	%
21-100	25	1 160	7,4
101-200	28	3 925	25,0
201-300	9	2 243	14,3
301-400	8	2 769	17,6
401-500	1	454	2,9
Peste 500	6	5 138	32,8
<b>Total</b>	<b>77</b>	<b>15 689</b>	<b>100.0</b>

The current study, which is a sequence to the one focused on the Industrial Park of the Someșul Mic Corridor, and approaches a relatively small number of operating factories and the complexity of their activities along the Someșul Mic Corridor, is only a general survey which leaves open the possibility of a broad and in-depth analysis in the future.

Consequently, it tackles only the issues concerning the size of the 77 industrial units along the corridor, where a number of 15 589 employees are currently operating; in view of this, proper classes are pointed out according to their size, the unity with the smallest number of employees – 21 – the Iclod-based Picolat Prodcom (dairy and cheese products) and the one with the greatest number of employees – 1 765 – the Cluj-Napoca-based Fujikura Automotive România (electrical and electronic equipments for motor vehicles and engines). (table 2)

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## ROADS, FORTRESSES, SETTLEMENTS AND LANDSCAPE. THE ARCHAEOLOGICAL PATRIMONY AND THE TWENTY FIRST CENTURY

FL. FODOREAN<sup>1</sup>

**ABSTRACT.** – *Roads, Fortresses, Settlements and Landscape. The Archaeological Patrimony and the Twenty First Century.* “Schätze der Welt - Erbe der Menschheit”. It sounds great. The European Convention for the protection of the archaeological patrimony from La Valetta, adopted at La Valetta on 16<sup>th</sup> of January 1992 and ratified by Romania by the law no.150 from 24 July 1997, outlines, at the beginning, the following: “...it is important to institute, where they do not yet exist, appropriate administrative and scientific supervision procedures...” In 2000, the government adopted the GO 43/2000 concerning the protection of the archaeological repository. Starting from these general assessments, we will present the most important Roman remain from the central part of Roman Dacia, trying to propose an accurate analysis concerning the relationship between geographical space, roads, settlements, transport and travel in Roman times. And all these are presented in close relations with possibilities of capitalize them today. As we explore today a territory, so the Romans did. Dacia was a province quite hard to organize. The geographical space and also the geographical knowledge, present in different cartographic documents, show us today a linear perception of that space. Strategy, quick organization, rapid administrative measurements, all of these have as consequence a perfect implementation of the Roman civilization within the territories north of the Danube.

**Keywords:** *Roman roads, Dacia, fortresses, tourism, archaeology, patrimony.*

### 1. A EUROPEAN INHERITANCE: THE ROMAN EMPIRE

“Schätze der Welt - Erbe der Menschheit”. It sounds great and it fits perfectly well with what I will try to discuss in the following lines. Next year, in 2012, we will celebrate two decades since Europe established a perfectly applied legislative frame to protect its archaeological patrimony. On 16<sup>th</sup> of January 1992, at La Valetta, within the third European Conference of the ministers in charge with the management of the cultural patrimony, was signed the most important document which protects the archaeological patrimony of Europe. Its official name is “European Convention on the Protection of the Archaeological Heritage (Revised) / Convention européenne pour la protection du patrimoine archéologique (révisée). Valletta/La Valetta, 16.1.1992<sup>2</sup> .

Of course, this convention was not the first official document elaborated for the protection of the archaeological patrimony. After the Second World War, Europe began to heal its wounds. But in the fifties and sixties was obvious that few of the European countries had protective legislation for the archaeological patrimony. As a result of this legislative deficiency, a group of experts from the Council of Europe prepared a Convention and this document was adopted and

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<sup>2</sup> <http://www.cimec.ro/Arheologie/arh-preventiva/04-conventialavaletta.pdf>.

signed in November 1970 by 22 of the member states of the Council of Europe. Adopted in London, this document, unfortunately, did not provide sufficient energy to apply what it states. According to Gustaf Trotzig<sup>3</sup>, “the Convention starts off in a declamatory style, talking of the archaeological heritage as essential to the knowledge of the history of civilizations. It also mentions that this heritage is seriously threatened with destruction. Unfortunately, the document begins to gradually lose its focus, and ends up discussing mainly excavations and finds”. So, after that moment, despite the fact that other documents were adopted, because of the rapid economic development of the European countries, a new document was adopted in 1992. The Convention of la Valetta was signed by 39 countries and ratified by 27. These are: Andorra, Azerbaijan, Bulgaria, Cyprus, Czech Republic, Switzerland, Estonia, Finland, France, Georgia, Hungary, Ireland, Liechtenstein, Lithuania, Malta, Moldova, Norway, Poland, Portugal, Great Britain, Slovakia, Slovenia, Sweden, Turkey, Vatican and Monaco.

This document has as main purpose the protection of the archaeological heritage: “Definition of the archaeological heritage. Article 1. 1. The aim of this (revised) Convention is to protect the archaeological heritage as a source of the European collective memory and as an instrument for historical and scientific study; 2. To this end shall be considered to be elements of the archaeological heritage all remains and objects and any other traces of mankind from past epochs: a. the preservation and study of which help to retrace the history of mankind and its relation with the natural environment; b. for which excavations or discoveries and other methods of research into mankind and the related environment are the main sources of information; and c. which are located in any area within the jurisdiction of the Parties. 3 The archaeological heritage shall include structures, constructions, groups of buildings, developed sites, moveable objects, monuments of other kinds as well as their context, whether situated on land or under water.”

Right from the preamble this need of protecting, promoting and conserving the archaeological patrimony is strongly outlined. It is a clear text which provides all the means necessary to protect and to conserve all the sites important for every country. From this point of view, this preamble is a message which strongly sustains these concepts<sup>4</sup>: “The member States of the Council of Europe and the other States party to the European Cultural Convention signatory hereto; Considering that the aim of the Council of Europe is to achieve a greater unity between its members for the purpose, in particular, of safeguarding and realizing the ideals and principles which are their common heritage; Having regard to the European Cultural Convention signed in Paris on 19 December 1954, in particular Articles 1 and 5 thereof; Having regard to the Convention for the Protection of the Architectural Heritage of Europe signed in Granada on 3 October 1985; Having regard to the European Convention on Offences relating to Cultural Property signed in Delphi on 23 June 1985; Having regard to the recommendations of the Parliamentary Assembly relating to archaeology and in particular Recommendations 848 (1978), 921 (1981) and 1072 (1988); Having regard to Recommendation No. R (89) 5 concerning the protection and enhancement of the archaeological heritage in the context of town and country planning operations; Recalling that the archaeological heritage is essential to a knowledge of the history of mankind; Acknowledging that the European archaeological heritage, which provides evidence of ancient history, is seriously threatened with deterioration because of the increasing number of major planning schemes, natural risks, clandestine or unscientific excavations and insufficient public awareness; Affirming that it is important to institute, where they do not yet exist, appropriate

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<sup>3</sup> Trotzig G. 2001, 1.

<sup>4</sup> European Convention on the Protection of the Archaeological Heritage (Revised), available at: [http://www.seecorridors.eu/filebank/file\\_65.pdf](http://www.seecorridors.eu/filebank/file_65.pdf).

administrative and scientific supervision procedures, and that the need to protect the archaeological heritage should be reflected in town and country planning and cultural development policies; Stressing that responsibility for the protection of the archaeological heritage should rest not only with the State directly concerned but with all European countries, the aim being to reduce the risk of deterioration and promote conservation by encouraging exchanges of experts and the comparison of experiences; Noting the necessity to complete the principles set forth in the European Convention for the Protection of the Archaeological Heritage signed in London on 6 May 1969, as a result of evolution of planning policies in European countries, / Have agreed as follows...”.

The next article provides the legislative frame regarding the identification of the heritage and measures for its protection: “Article 2. Each Party undertakes to institute, by means appropriate to the State in question, a legal system for the protection of the archaeological heritage, making provision for: a. the maintenance of an inventory of its archaeological heritage and the designation of protected monuments and areas; b. the creation of archaeological reserves, even where there are no visible remains on the ground or under water, for the preservation of material evidence to be studied by later generations; c. the mandatory reporting to the competent authorities by a finder of the chance discovery of elements of the archaeological heritage and making them available for examination.”

Then, article 3 makes reference to the preservation of this archaeological heritage: “Article 3. To preserve the archaeological heritage and guarantee the scientific significance of archaeological research work, each Party undertakes: 1. to apply procedures for the authorization and supervision of excavation and other archaeological activities in such a way as: a. to prevent any illicit excavation or removal of elements of the archaeological heritage; b. to ensure that archaeological excavations and prospecting are undertaken in a scientific manner and provided that: non-destructive methods of investigation are applied wherever possible; the elements of the archaeological heritage are not uncovered or left exposed during or after excavation without provision being made for their proper preservation, conservation and management; 2. to ensure that excavations and other potentially destructive techniques are carried out only by qualified, specially authorized persons; 3. to subject to specific prior authorization, whenever foreseen by the domestic law of the State, the use of metal detectors and any other detection equipment or process for archaeological investigation.”

A very important article is article 9, which refers to the promotion of public awareness: “Article 9. Each Party undertakes: 1. to conduct educational actions with a view to rousing and developing awareness in public opinion of the value of the archaeological heritage for understanding the past and of the threats to this heritage; 2. to promote public access to important elements of its archaeological heritage, especially sites, and encourage the display to the public of suitable selections of archaeological objects.”

This convention obviously refers to the archaeological sites no matter the period. In Europe, many of these discoveries belong to the Roman period.

## **2. RESPONSES, PROJECTS: PROTECTING THE ARCHAEOLOGICAL PATRIMONY**

In the UNESCO World Heritage Sites we can consult the list of the entire patrimony from Europe.<sup>5</sup> Here is a statistic, by country, showing the number of sites from each country of Europe: Albania – 2; Andorra – 1; Armenia – 3; Austria – 9; Azerbaijan – 2; Belarus – 4;

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<sup>5</sup> <http://whc.unesco.org/en/list>.



Belgium – 10; Bosnia and Herzegovina – 2; Bulgaria – 9; Croatia – 7; Cyprus – 3; Czech Republic – 12; Denmark – 3; Estonia – 2; Finland – 7; France – 37; Georgia – 3; Germany – 36; Greece – 17; Holy See – 2; Hungary – 8; Iceland – 2; Ireland – 2; Italy – 47; Latvia – 2; Lithuania – 4; Luxembourg – 1; Macedonia – 1; Malta – 3; Moldova – 1; Montenegro – 2; Netherlands – 9; Norway – 7; Poland – 13; Portugal – 13; Romania – 7; Russia – 24; San Marino – 1; Serbia – 4; Slovakia – 7; Slovenia – 1; Spain – 43; Sweden – 14; Switzerland – 11; Turkey – 10; Ukraine – 6; United Kingdom – 28.

Of these, a large group is represented by protected sites from the Roman period. The sites with monuments belonging to the Roman period are: 1. Croatia - historic complex of Split with the Palace of Diocletian - 1979; 2. France - Arles, Roman and Romanesque Monuments - 1981; Roman Theatre and its Surroundings and the “Triumphal Arch” of Orange - 1981; Pont du Gard, Roman Aqueduct - 1985; 3. Germany - Roman monuments in Trier - 1986; Frontiers of the Roman Empire: Upper German & Rhaetian Limes transboundary property, shared with the United Kingdom: Hadrian’s Wall - 2005; 4. Italy - Archaeological Areas of Pompeii, Herculaneum and Torre Annunziata - 1997; Villa Adriana (Tivoli) - 1999; 5. Spain - Old Town of Segovia and its Aqueduct - 1985; Archaeological Ensemble of Mérida - 1993; Las Médulas - 1997; Archaeological Ensemble of Tarraco in Tarragona - 2000; Roman Walls of Lugo - 2000; Tower of Hercules, in A Coruña - 2009; 6. United Kingdom - City of Bath - 1987; Frontiers of the Roman Empire: Hadrian's Wall - 1987.

Among these sites, there is a special one, a transboundary one. It is entitled “Frontiers of the Roman Empire: Upper German & Rhaetian Limes, Hadrian's Wall and the Antonine Wall” - shared between Germany and the United Kingdom - 2005. And, pay attention, this group of monuments, including Roman fortresses, roads, and watchtowers, are part of a list which includes, among others, the “Historic Centre of Rome, the Properties of the Holy See in that City Enjoying Extraterritorial Rights and Basilica of Saint Paul Outside the Walls - shared between the Holy See and Italy - 1980, 1990”.

As we saw above, one of the most important sites is formed by the limes of the Roman Empire. The *limes Germanicus* bounded *Germania Inferior*, *Germania Superior* and *Raetia*. At its height, the limes stretched from the North Sea outlet of the Rhine to near Regensburg on the Danube. Those two major rivers afforded natural protection from mass incursions into imperial territory, with the exception of a gap stretching roughly from *Mogontiacum* (Mainz) on the Rhine to *Castra Regina* (Regensburg) on the Danube. The total length was 568 km (341 miles). It included at least 60 forts and 900 watchtowers. Through systematic excavations financed by Germany, and, very important, through other common projects involving specialists from different countries, in 2005 these monuments were inscribed on the list of UNESCO World Heritage Sites as *Frontiers of the Roman Empire*. Of all fortresses, Saalburg is the most spectacular. Located on the Taunus ridge northwest of Bad Homburg, Hesse, Germany, it was almost entirely reconstructed in 1897, under the reign of the emperor Wilhelm II. Since then, Saalburg became the most completely reconstructed fort on the entire *limes*.

Hadrian’s Wall and the Antonine Wall had the same fate. They became so known in the world and receive annually a great number of tourists.

### 3. MODELS OF PROJECTS: CAPITALIZING ROMAN ROADS

In a recent number (343, Jan.-Febr. 2011) of the journal *Dossiers d'archéologie*, dedicated to the Roman roads around the Mediterranean Sea, an article signed by Pierre Guérin and Angelika Sauermost, entitled *Les voies romaines à travers le prisme de la coopération*

*européenne* presents the most successful projects financed with European funds and in cooperation with the local authorities. One of these programs was the so-called INTERREG, which financed the project *Les voies romaines en Méditerranée*.

The purpose of this project is defined by the authors (p. 79): “Depuis 1994, les règlements successifs d’INTERREG ont tous ménagé un espace à la thématique du patrimoine historique; la proposition des voies romaines comme argument de mise en valeur et ressource touristique d’un patrimoine européen commun a été très bien acceptée par les différents comités de programmation. Les espaces MEDOCC (Méditerranée occidentale, Portugal et Grèce), CADSES (Europe centrale, Adriatique, Danube et Sud-Ouest de l’Europe) et ALPIN (ouest de la France, Suisse, nord de l’Italie, sud de l’Allemagne, Slovénie, Tchéquie, Slovaquie), ont tour à tour accordé des subventions importantes à quatre projets de mise en valeur touristique des voies romaines, remédiant partiellement à l’inconvénient d’un découpage géographique du programme, incompatible avec la cohérence territoriale de l’Antiquité romaine”.

The INTERREG project began in 1998 and finished in 2004. It reunited 17 partners from France, Spain, Italy, Portugal and Greece. What is more important beyond that is another aspect. This project generated a dynamic chain of actions for the preservation, and cultural and touristic capitalization in numerous regions.

For example, in France, in the area Languedoc-Rousillon, local authorities developed a larger project in *via Domitia*, called “*Chemins de l’Histoire*”. Another example: in Spain, at Algarve, the local authorities from S. Brás de Alportel opened a center on research dedicated to a Roman road.

At Valencia, the local authorities launched in 2009, on its own financial resources, a plan to capitalize the touristic value of *via Augusta*. The budget for this project is over passing the budget of the whole INTERREG project.

These examples show, all, one important matter: if local authorities, together with archaeologists, are really concerned about their patrimony, things develop and projects such as those above mentioned have as consequence the capitalization of something priceless: the archaeological patrimony, which is the most important aspect of all the landscapes in Europe.

Only this way all the elements of this patrimony will be included in the most important category, the one which allow people to visit, describe and appreciate them at their real value.<sup>6</sup>

#### 4. ROADS AND FORTRESSES OF ROMAN DACIA. RESEARCH, PROMOTION, TOURISTIC CAPITALIZATION

To create, develop and maintain a project of such type, one does not need, necessarily, a spectacular site as Saalburg.<sup>7</sup> These things can be achieved with patience, and, of course, with financial resources. The Antonine Wall in northern Great Britain is, today, a simple *vallum*, detectable in the terrain. In Romania, the most important Roman sites from the former Roman

<sup>6</sup> Masson V. M. 1989, 195-206; Abrahams G. 1989, 207-220; Laidlaw R. 1989, 232-235; Golding F. N. 1989, 256-264; Addyman P. V. 1989, 265-274; Davis H. A. 1989, 275-279; Stanley Price N. P. 1989, 292-301; Addyman P. V. 1989a, 302-304; Rowan Y., Baram U. 2004; Skeates R. 2009; Cowley C. 2011; Stapp D. C., Longnecker J. 2009.

<sup>7</sup> [http://www.saalburgmuseum.de/english/home\\_engl.htm](http://www.saalburgmuseum.de/english/home_engl.htm).

Dacia can be divided in several categories: 1. Roman legionary fortresses: Potaissa,<sup>8</sup> Apulum;<sup>9</sup> 2. Roman roads: Germisara,<sup>10</sup> Porolissum,<sup>11</sup> Ulpia Traiana Sarmizegetusa;<sup>12</sup> 3. the archaeological complex from Porolissum.

#### 4. 1. Legionary fortresses

In the Roman Empire there are around 33 Roman legionary fortresses. Among these, two important are in Dacia, at Potaissa (*legio V Macedonica*) and Apulum (*legio XIII Gemina*). The fortress from Potaissa is positioned on the Cetate Hill, west of the current city. The terrain is today free of modern building, because of its status, of archaeological park. At Apulum, the Roman fortress is overlapped by the modern Vauban fortress. Still, archaeologists were able to realize archaeological researches within the Roman fortress.

#### 4. 2. Porolissum

With two auxiliary fortresses, an amphitheatre, temples, a road, and many other discoveries, Porolissum is one of the most important points on the map of Roman Dacia. Its main touristic attraction is the reconstructed *porta praetoria* of the Roman fortress positioned on Pomot Hill. The discoveries from here are kept in the Museum from Zalău. Porolissum is also attractive because of its unique landscape. Recent investigations had as consequence the discovery of the Roman city and of an aerial aqueduct.

#### 4. 3. Roman roads of Dacia

From North to South, from East to West, Dacia was studded with roads, as the other provinces of the Roman Empire. The first road constructed in Dacia was the one starting from the Danube, going up in North and finishing at Porolissum. Within the Banat region two branches of the road were constructed. The western one starts at Lederata (Ram, Serbia) and through Apus flumen, Arcidava, Centum Putea, Bersobis, Aizis and Caput Bubali reaches Tibiscum.<sup>13</sup> The eastern road starts at Dierna and continues northwards, along the valley of the Timiș River through Praetorium, Ad Mediam, Ad Pannonios, Gaganis, Masclianis and reaches the same Tibiscum. These were the roads first constructed by the Roman army when they advanced into the territories north of the Danube. From Tibiscum the road continues through the Iron Gates of Transylvania (Tapae), Sarmizegetusa (Ulpia Traiana) and Apulum, Potaissa, Napoca and ends in north, at Porolissum. Along its route, in several points, its superstructure was preserved and can be distinguished in the terrain. The best preserved sector is at the entrance in Porolissum.

Another sector of road well preserved is the one connecting the thermal place from Germisara with the main imperial road. On a length of ca. 4 km the superstructure is amazingly preserved.

<sup>8</sup> Bărbulescu M. 1987; Bărbulescu M. 1994.

<sup>9</sup> Moga V. 1998.

<sup>10</sup> Fodorean F., Ursuț D. 2001, 202-230.

<sup>11</sup> Fodorean F. 2006, 146-147.

<sup>12</sup> Fodorean F. 2007, 365-384.

<sup>13</sup> Nemeth E., Fodorean F., Mate D., Blaga D. 2011.

## 5. CONCLUSIONS

Efforts should be made to preserve, conserve and capitalize these monuments. The first thing to do is their inclusion into touristic flyers, touristic programs. Put simply, if one do not know/or see these objectives, he can not visit them. So, first, we need to create an elementary thing, called access to information.

Second, it is imperative to create a competitive tourism branch, focused on these monuments. Romania is so famous (and this already became almost a *clichée*) for its monasteries from Moldavia, the Danube Delta etc. Using a good promotion, these monuments too can become well known.

Third: the local authorities must be trained regarding the importance and value of these monuments. Even small communities/settlements can capitalize their archaeological objectives. Ca. 20 km south-east of Cluj is the village of Aiton. During Roman times, this settlement was positioned along the main road of the province. Traces of the Roman road are preserved nowadays. In 1758, a Roman milestone was found here. Its inscription mentions the construction of the road sector from Potaissa to Napoca, during Trajan's reign, in 108 A.D. In the seventies, even a local museum was found here, grace to an intensive activity of Tiberiu Cerghi, professor of history in the local school. This village, today, has the chance to get out of the anonymity by using, conserving and promoting this Roman inheritance.

Fourth: as I already presented above, programs should be created, to promote these objectives.

But, of course, and this is my final observation, we should keep in mind what article 9 from the La Valetta convention states: "developing awareness in public opinion of the value of the archaeological heritage for understanding the past...". Let's hope that, during time, some of these projects will eventually start. Because, as Ovidius states in his *Metamorphosis: Seris venit usus ab annis*.

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## THE SITUATION OF THE WORKFORCE MARKET IN THE SOUTHERN PART OF THE ROMANIAN – HUNGARIAN BORDER

E. NAGY<sup>1</sup>

**ABSTRACT.** – **The Situation of the Workforce Market in the Southern Part of the Romanian-Hungarian Border.** This paper is a concise presentation of the present workforce market on the southern part of the Hungarian-Romanian border region, focusing on four neighboring counties: Timiș and Arad on the Romanian side, respectively Békés and Csongrád on the Hungarian side. As far as the activity and unemployment rate is concerned, there is a rampant difference between the Romanian and Hungarian side in favor of Romanian one, due to its relative high competitiveness, the industrial culture and thus the higher ability to attract investments. In the same time the Hungarian side preserved a more pronounced agricultural feature with a lower grade of reindustrialization. In this case the positional periphery, namely the border strip, overlaps with the disadvantageous conditions regarding the workforce market, emphasizing even more its social periphery status. According to the economic expectations, in the future is very likely to occur a commuting of the Hungarian workforce and job seekers toward the neighboring Romanian regions, as a consequence of the asymmetric development tendencies of the job-market on the two sides of the border.

**Keywords:** *activity rate, employment rate, unemployment, Romanian-Hungarian border region, workforce market*

### 1. INTRODUCTION

The present study analyzes the processes taking place in the workforce market in the neighboring counties in the southern part of the border region, counties that have daily and intensive contacts with each other. The studied counties are Timiș and Arad on the Romanian side of the border and Békés and Csongrád on the Hungarian side. All this represents an underlying study which points out the social background of the relations/ contacts along the border and it also studies how much the current social-economical circumstances and their possible changes would contribute to the establishing of a (re)integrated border region in the future and how much this would facilitate the territorial cohesion on European level.

As far as the workforce market is concerned, we can ascertain that from the neighboring counties the Romanian ones have more favorable data about workforce and employment and generally speaking, the workforce market of Timiș and Arad counties is more active than that of Békés and Csongrád counties. This is mainly due to the rapid economic growth of the first decade of the new millennium as a result of the re-industrialization of the traditionally industrial region of Banat and due to the services concentrated around this industrialization.

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## 2. ECONOMICAL ACTIVITY RATE AND EMPLOYMENT RATE

When taking into account the employment rate in the studied counties we found that the Romanian ones have a more favorable situation because the age group is narrower, in Romania it is the 15-64 years old group, while in Hungary it is the 15-74 years old group. However, these figures do not influence the real situation very much as we can speak of a much reduced activity above 64 years.

The situation of the workforce market in Békés county is not very advantageous as its demographic indicators are unfavorable – among the neighboring counties it has always had the lowest values since the turn of the century. Both Hungarian counties' indicators show values below the national average, while the values shown by the indicators of the Romanian counties are above the national average.

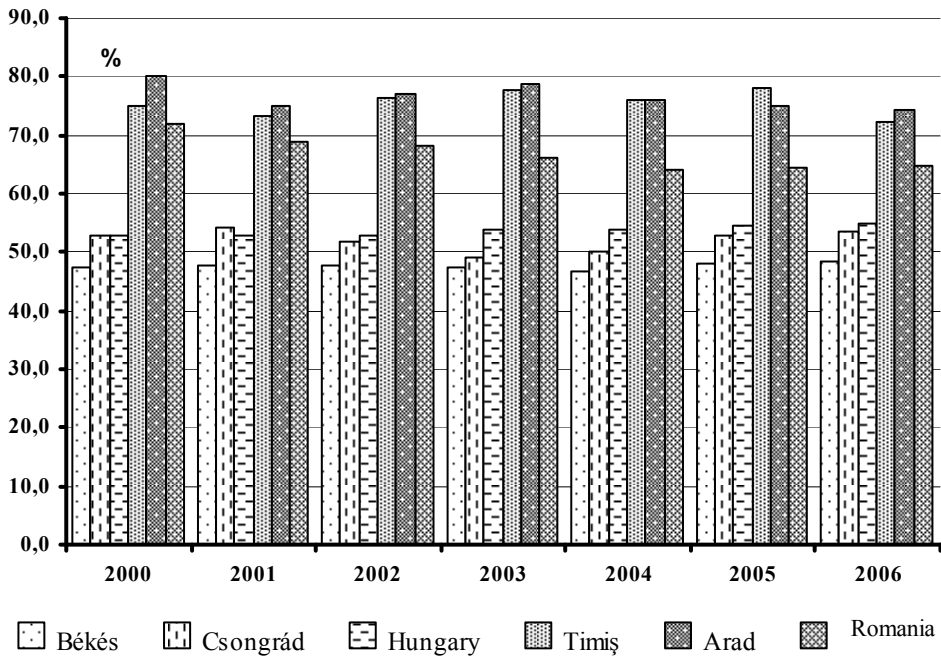


Fig. 1. The activity rate of the counties in the studied region.

Source: INS, KSH (National Institutes of Statistics in Romania and Hungary respectively).

Among the active population the number of employed people is proportionally smaller and it maps the regional sequence according to the proportion of the active population. In both countries, in Romania and in Hungary as well, the underemployment of the 15-64 age group is

an acute problem; these values in 2010 were much below the EU27 average, according to Eurostat. Thus, in Hungary this value was 55.4%, in Romania it was 58.8% and in the EU27 it was 64.2%. A significant problem is the fact that more and more people choose to live on social assistance; the number of active people is decreasing and there are people who illegally benefit from social assistance. Due to the budgetary restrictions caused by the global economic crisis in both countries the entire social assistance system will be looked over and those people who benefit from social assistance based on health issues will be checked individually. In addition to all these there is the increasing unemployment, another effect of the global economic crisis; authorities are trying to fight this off by supporting enterprises (creating and preserving workplaces), re-training of the workforce and by offering public and university education in accordance with the real demand of the workforce market.

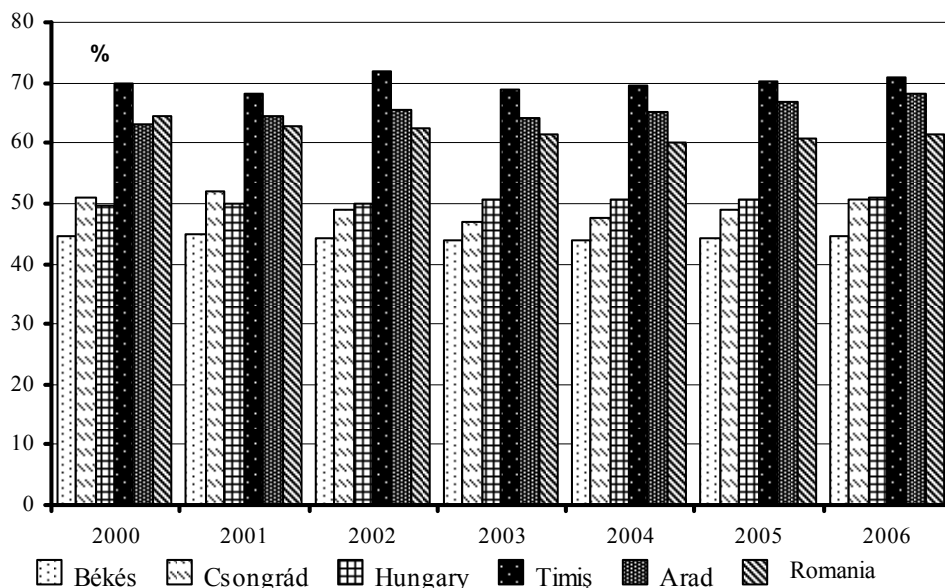


Fig. 2. The employment rate in the studied regions.

Source: INS, KSH.

**The breakdown of employees by activity of the national economy in 2008.**

Table 1

Breakdown by sectors of economy	Békés	Csongrád	Hungary	Timiș	Arad	Romania
Primary	8,2	4,9	3,1	2,8	3	2,31
Secondary	29,8	28,1	31,5	45,9	48,4	40,1
Tertiary	62	67	65,4	51,3	48,6	57,59

Source: INS, KSH



As far as the structural features of the workforce market are concerned we can state that in nearly all studied public administration units there has been a certain kind of professional re-stratification which is in accordance with the basic requirements of modernization. In other words, the primary sector of the economy has shrunk considerably after the fall of the communist regime the secondary sector has also undergone a slight change while the tertiary sector has seen a real boom. However, as a result of the industrial culture and following the reindustrialization after the turn of the century the number of people employed in the primary sector is still larger in the two Romanian counties and the growth of the percentage of the tertiary sector has slowed down.

The entire picture only becomes clear when we state that it is important the indicator we choose to present the phenomenon in question. The employed represent a smaller, more restricted group with permanent/stable contracts. In contrast to this, if we analyzed the proportion of employees in different economic fields, analysis that would include those employees without a permanent contract, then in the case of the Romanian counties the proportion of those working in the primary sector would be very high, several times the multiple of that in the Hungarian counties. The Romanian statistics includes in the active category those who work in agriculture but are self sufficient, thus the proportion of unemployed is decreased (Balcsók, I. 2009, Kerekes, K. 2009).

In my opinion, the apparent developmental advantage of the Hungarian counties, expressed by the higher proportion of those working in services, is only relative. In open, small economies, like the Romanian and the Hungarian ones the role of the industry is unquestionable, as the focus of the export is mainly on the capacity of the manufacturing industry. In the case of the Romanian counties the more significant representation of the industry is certain, it is more established and as far as the future is concerned it is a more sustainable transition towards a post-industrial society. This is mainly due to the fact that the industry leads the way to the apparition of the more value-added industrial and producer services and to the clustering processes in a region where the centers (county capitals) are larger cities than those in the Hungarian counties, thus creating better conditions for the economy of scales as well. The economical – cultural relations based on the former German inhabitants of Timiș county, who emigrated, the presence of the international airport at Timișoara and the presence of the prestigious Technical University in Timișoara, which produces the technical intellectuals, necessary for the industry represent great advantage for the Romanian counties as compared to the Hungarian ones. However the reindustrialization itself in the Hungarian side did not generated an increased value-added, because in Csongrád and Békés counties the FDI-s flowed especially in those economical sectors, which are based on simple assembling activities and wagework. It brought only an improvement in productivity and technological level.

### 3. UNEMPLOYMENT

As far as unemployment is concerned the Hungarian counties are in a much worse situation as they lag behind the rest of the region and the national average as well. Csongrád county appears to be in a better situation, so do the two Romanian counties. All these support the importance of the re-industrialization from the point of view of employment; it is the industry that keeps the economy of the Romanian counties alive, in a more significant way than in the rest of the country. In the same time there is a positive development appearing in all the administrative units of the border region as well as nationally; this development is slightly

broken in 2005 in Hungary. All these processes take a negative direction in 2009 following the outbreak of the 2008 global economic crisis.

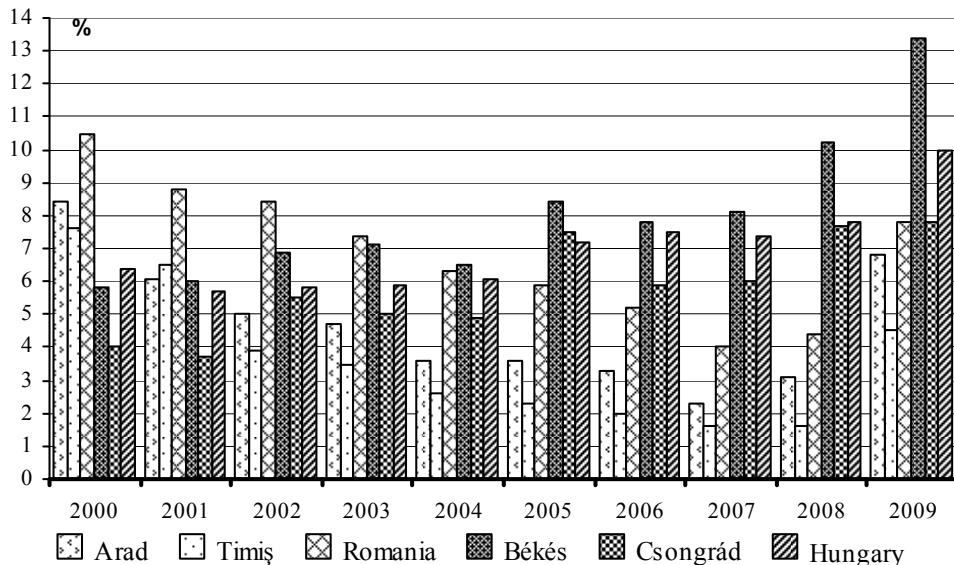


Fig. 3. The rate of unemployment in the studied counties.

Sources: INS, KSH.

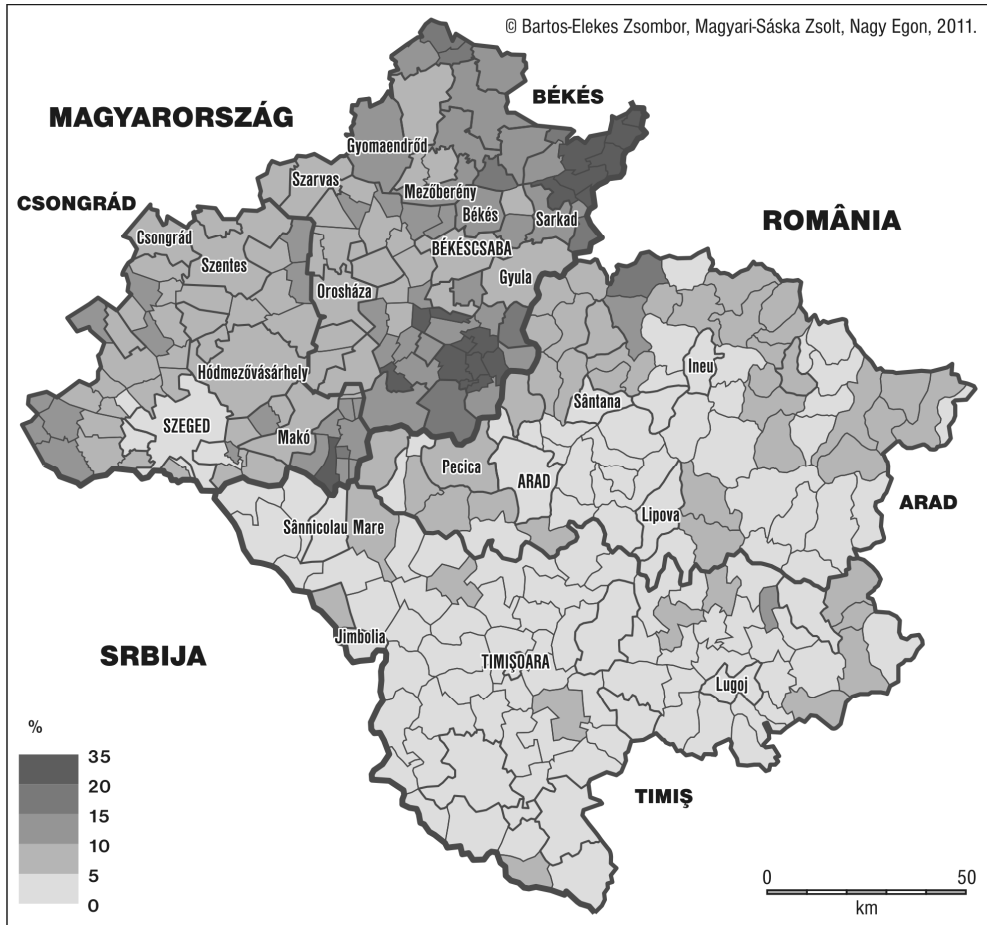
On a smaller territorial scale, at the level of the villages, we can uncover a more refined image of unemployment. We have to mention that these data in Hungary are concerning to the LAU2<sup>2</sup> level, while in Romania to the LAU1<sup>3</sup> level. As the concrete unemployment rate at village level is only monitored during census, in both countries, and the number of active population is not monitored we calculated a so-called relative unemployment rate. In order to do this we had the absolute number of unemployed, and from the potentially active population we took into consideration the 15-59 age group, as this made the comparison between the two countries possible, taking into consideration the different age limit for retirement. The relative rate of unemployment is practicable as it is routinely used in other statistical analyses, and because its value is strongly correlated with the real rate of unemployment.

Upon analyzing the situation at village level it appears that on the whole the Romanian counties are in a better situation, although, as we have already mentioned, this situation is somewhat disadvantaged by the fact that in Romania there is a different way of keeping record of the employed.

<sup>2</sup> Local Administrativ Unit, second level - settlements

<sup>3</sup> Local Administrativ Unit, first level - comunals

Higher rate of unemployment is related to peripheral situation on both sides of the border – firstly related to the position near the border, secondly, in the case of Arad and Timiș counties the more isolated hilly and mountainous areas must be considered. In this respect the same situation is specific to the northern sector of the Hungarian-Romania common border, as former analyzes have revealed already (Nagy, E, 2006).



**Fig. 4.** The relative unemployment rate at village level in the neighboring Hungarian (2009) and Romanian (2010) counties.

Source: INS, KSH.

In the case of Hungary in the border-stripe with high unemployment rate the disadvantaged situation of the Sarkad and Mezőkovácsháza micro-regions is striking. Only Szeged and its surroundings stands out, but its values are still below those of the villages on the Romanian side, which are in a more advantageous situation.

#### 4. CONCLUSIONS

Taking into consideration the above analyses, it is clear that the Hungarian counties have a more disadvantageous situation than the Romanian ones as far as the workforce market is concerned. This state of facts is due to the so far unstoppable economical decline of East-Hungary. The increase of the unemployment rate in Békés and Csongrád counties, although at a slower pace started in 2005, before the outbreak of the global economical crisis, is due to the wrong economical policies. Békés county is in a multiply disadvantaged situation as far as both unemployment rate and activity rate are concerned.

The more favorable indicators and the more dynamic economical growth on the Romanian side of the border represent a real alternative for the Hungarian workforce to come and seek jobs at the workforce market of Arad and Timiș counties, contrary to the model, depending on the possibilities of commuting or moving.

In the same time, an important feature is that employment problems in the region are cumulating along the border and generally in the more peripheral, and quite inaccessible hilly and mountainous areas on the Romanian side.

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## THE IDENTIFICATION OF THE GEOMORPHOSITES IN BUZĂU SUBCARPATHIANS. TOURISM CAPITALIZATION OPTIONS

D. IRIMIA<sup>1</sup>, BIANCA TOMA<sup>2</sup>

**ABSTRACT.** – **The Identification of Geomorphosites in Buzău Subcarpathians. Tourism capitalization options.** The capitalization of the geomorphosites present in Buzău Subcarpathians may represent an alternative option for the improvement of the economic situation of many communities located in this area. The majority of them are unique, while their capitalization, locally or nationally, is quite weak. A part of them are scientifically valuable and can be successfully used for practical work with students or undergraduates. In connection with this, there could be mentioned: the mudflow from Chirlești and the slide from Joseni. The Live Fire from Terca or the mud volcanoes are touristically, scientifically, aesthetically valuable and could become „must-see” places in any period of the year and for a large variety of tourists. What is important is their inclusion in various projects or tourism quotes, as well as a better and more effective promotion.

**Keywords:** *geomorphosite, mud volcanoes, live fire, slide, flow/drift, tourism, capitalization.*

### 1. INTRODUCTION

The conducted research is based on the latest concepts, which emerged in the specialized literature only two or three decades ago. They highlight the necessity that geography will not remain a „readable” science, but also a useful one in the economic environment present nowadays. The conceptual aspects refer to notions that define ways in which some special elements of the natural environment, especially those belonging to landforms, can be constructively exploited economically. It could be said that the ideas used in this research are a „natural” demand, a way of converting a possible scientific or aesthetical value into an added value which could contribute to the development of the area and the communities located important is their inclusion in various projects or tourism quotes, as well as a better and more effective promotion.

The evergrowing interest in geosites, especially the geomorphological ones led to the emergence of a new term in order to encompass the geomorphological complexity of an area's relief and to measure its economic value. Therefore, an inventory has been defined as well as a methodology of identification and assessment.

The theoretical and practical importance of the geomorphosites has been determined by a group of geomorphologists, members of the IGA (International Geomorphologic Association).

They have defined the term, established the evaluation methods, the mapping techniques and the protection modes.

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*Geomorphosites are relief forms which have received a scientific, cultural and historical, aesthetic or/and social-economic value based on man's perception and exploitation (Panizza, M., Piacente, S., 1993).*

These may be either simple geomorphological sites or relevant areas of landscape. Geomorphosites can be altered, degraded or ruined through anthropogenic activities. In order to describe a geomorphosite, an assessment criterion is needed, eventually leading to an accurate presentation of how it can become tourismally valuable:

- the **landscape criterion** is highly intuitive. That is why the approach towards nature depends on the individual who fills in the information and his state of mind at that moment. It is derived from feelings, personal and subjective perceptions, therefore they are difficult to capitalize and to compare with other perceptions;

- the **social-economic criterion** relies on the possibility of using them for tourism or leisure purposes;

- the **cultural criterion** means that a geomorphosite may belong to an artistic branch or to a cultural tradition, for example the cave paintings from Alunisu. Therefore they may be used as social-economic initiatives of a tourism or religious nature;

- the **scientific criterion** is founded on the understanding of the laws which govern the evolution of a geomorphosite.

Due to these reasons, its importance must be evaluated through four features:

- as a pattern of the geomorphological process - ex. karst creeps;

- as an object used with an educational purpose: – ex. a river loop;

- as a paleomorphological example – a river bench;

- as an ecological oasis, as it can be the exclusive habitat of a certain type of animal or plant species – ex. a lake.

Each of these features may take on a lesser or greater value due to its scarcity, therefore, a differentiated level of interest attributed to each of these four categories associated with the above-mentioned features: globally, super-regionally, regionally, locally.

With respect to the protection of the geomorphosites, a first level of reflexion refers to the appreciation of their natural or acquired vulnerability, due to the fact that one can already identify sites provided with other functions.

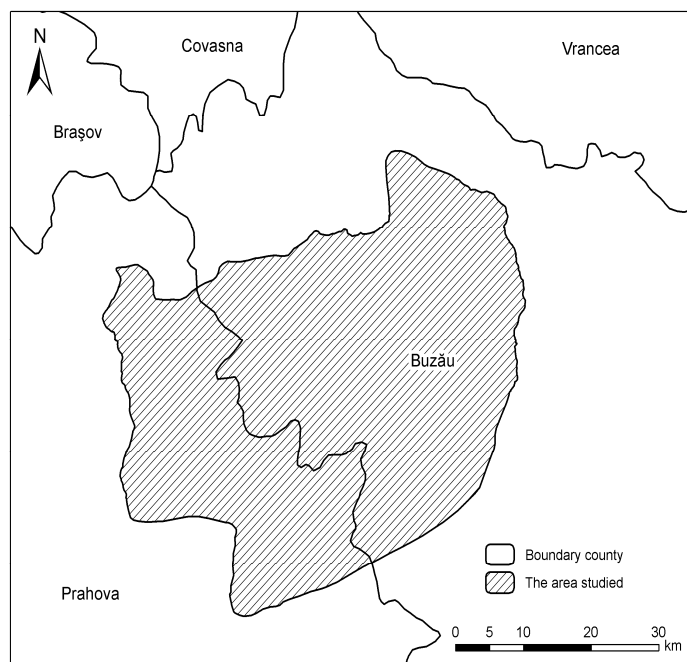
## 2. WITHIN REGIONS

The studied area is a component of the Curvature Subcarpathians, a region which represents the contact area with the Curvature Carpathians.

The complexity of this area plainly stands out in the structure of Buzău Subcarpathians (fig. 1).

The scientific approach with respect to this has as an objective to emphasize the specific traits of the studied area, taking into account the characteristics of the Curvature Subcarpathians, as well as the comprehension of certain aspects related to the geographical location, boundaries elements of the natural environment. From both an administrative and a territorial perspective, the region is located on the territories of the Buzău and Prahova counties.

The scientific approach with respect to this has as an objective to emphasize the specific traits of the studied area, taking into account the characteristics of the Curvature Subcarpathians, as well as the comprehension of certain aspects related to the geographical location, boundaries elements of the natural environment. From both an administrative and a territorial perspective, the region is located on the territories of the Buzău and Prahova counties.



**Fig. 1.** Geographical position in the country.

Buzău Subcarpathians occupy a surface of 2760 sq.km. and have as boundaries Slănicul Buzăului to the east and Teleajen and Cricov to the west. They have the maximum width among all the subcarpathian sectors: 40 km. They are generally differentiated from the Subcarpathians based on the following characteristics:

- the hydrographical network is primarily transversal;
- the lithologic composition is diverse;
- they have a large structural complexity;
- they change the folds general orientation from north-east to south-west up to the Nişcovului Valley, then from east-west further from it;

- they show an emphasized endogenetic and exogenetic velocity;
- frequently, there are highly degraded landscapes;
- relief inversions are frequent.

The Buzău Subcarpathians are a series of hills and inter-knob creeps with a great complexity. The main polarization axis is represented by the Buzău Valley, to which the main peaks and hollows converge, as well as the hydrographical network. To the west, the Draşna-Chiojd hollow and the Priporului Hills revolve to the Teleajenului Valley. The relief altitude varies between 300-800 m; it consists mainly in neogenetic molasses, Roman gravel and sands, covered in loess.

### 3. THE GEOMORPHOSITES OF THE STUDIED AREA

Buzău Subcarpathians have a large variety of geomorphosites, the majority of them being related to the geomorphological processes taking place nowadays. There is large number of landslides, mudflows, mud torrents. Therefore, the tourism capitalization is nearly impossible for many of them (fig. 2).

Yet, due to its closeness to the university centre, Bucharest, the area has become a real research source, thus the area gained a scientific and educational value.



That is why they are used as “educational material” for on-the-field practice and for a better understanding of the phenomena. The following belong to the above-mentioned category:

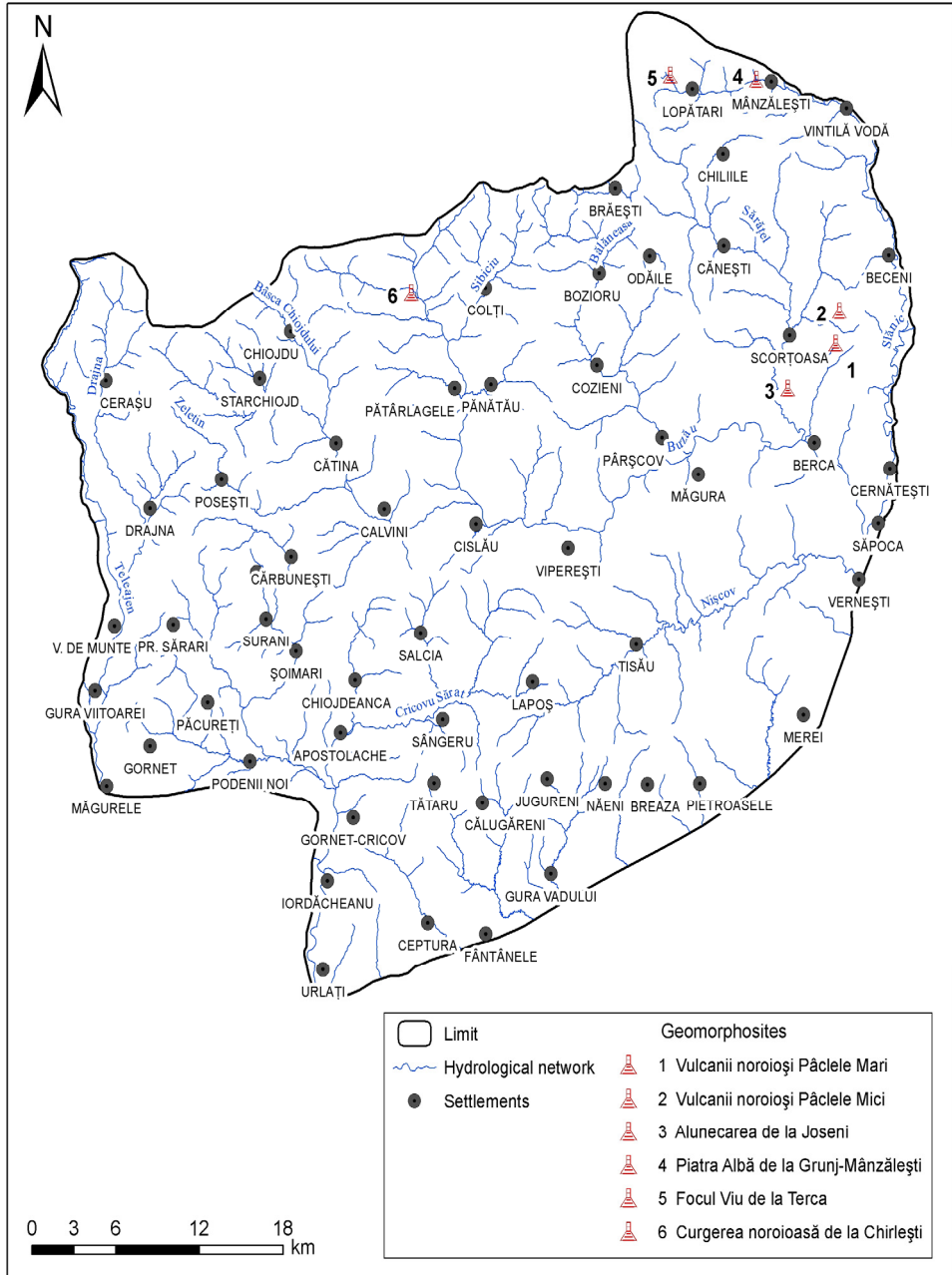


Fig. 2. Geomorphosites map of Buzău Subcarpathians.

a) *The mud torrent from Chirleşti* is located in Curătura Valley, in the joint area between the Subcarpathians and Pintelul Ivăneţu. It is situated in the area belonging to Chirleşti village, 8 km North of Pătârlagele, and is accessible from DN 10 Buzău-Braşov (fig. 3). The slope is highly prominent and the deforestation and excessive grazing have led to a strong

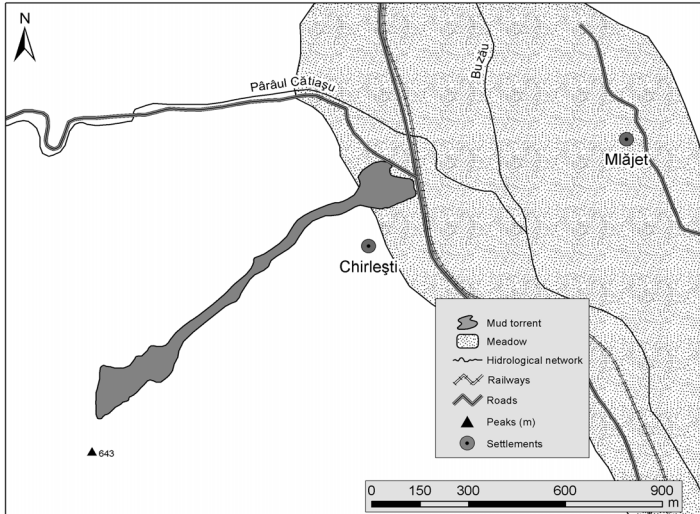


Fig. 3. The mud torrent from Chirleşti – location.

vertical erosion. Its origin is situated at 590 m absolute altitude (Posea, Gr., Badea, L., 1953), and its lowest point is located in the vicinity of the bed of Buzău river (fig. 3).

Its length is over 2 km, and the scattering cone has an actual opening of 220 m. The torrent is active and it has become a great problem for the nearby villagers and for the traffic on DN 10 (fig.4).

It can become a “research platform” for students and not only; it can also be used as a research model for those specialized in land/terrain planning or for civil engineers. As far as tourism is concerned, it could stand out as a live natural catastrophe.

1. Cornice of detachment;
2. Secondary separation;
3. Material accumulated;
4. Shallow landslides;
5. Island.

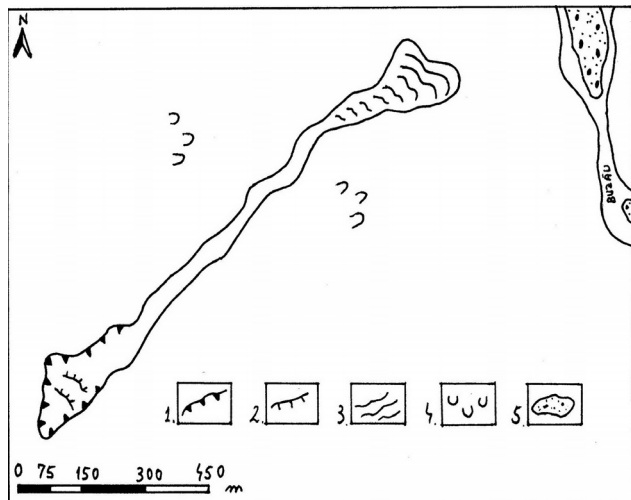
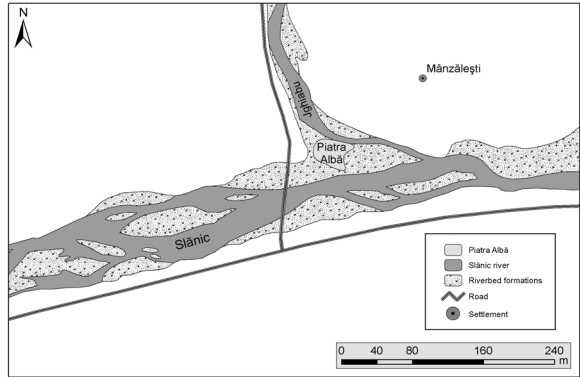


Fig. 4. Geomorphological sketch of the muddy torrent Chirleşti.

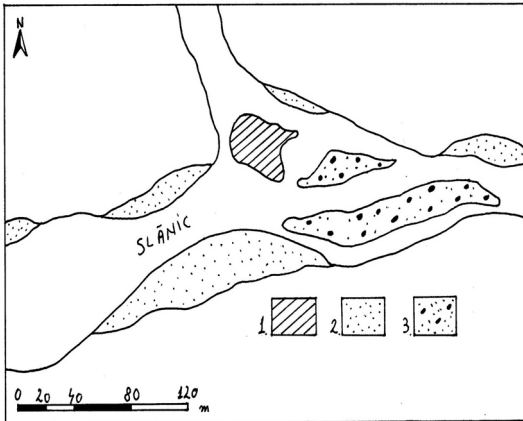
b) *Piatra Albă* – a white-greyish pyramid-shaped block located at the confluence between the Jgheab stream and the Slânic river, on Mânzălești’s territory (fig. 5).

It is formed out of tectonic deposits, especially white-greenish Dacian tuff embedded between the layers of shale and sandstone, almost in a vertical position.

The erosion caused by the two river streams have separated *Piatra Albă* from the hill which it was previously part of (fig. 6).



**Fig. 5.** Piatra Albă– location.



**Fig. 6.** Piatra Albă – Geomorphological sketch.

1. Piatra Albă;
2. Reindeer ;
3. Islan

Tourismally, it is an accessible sight for all age categories, while from an aesthetical point of view it can be as attractive as the most important geomorphosites in the country.

The locals name is “Grunj” (colloquial name for ‘neck’); it has a surface of 25 m<sup>2</sup> and it is accessible from DJ 203K Buzău-Lopătari (fig. 7).



**Fig. 7.** Piatra Albă from Mânzălești.

c) *The Live fire from Terca*– methane emanations surface between the cracks of the crust. These may accidentally or intentionally (by the locals) burst into fire and can reach 1 m in height and 20-30 cm in diameter (fig. 8).



They are located in the north of the Lopătari Hollow, on the Slanic Valley.

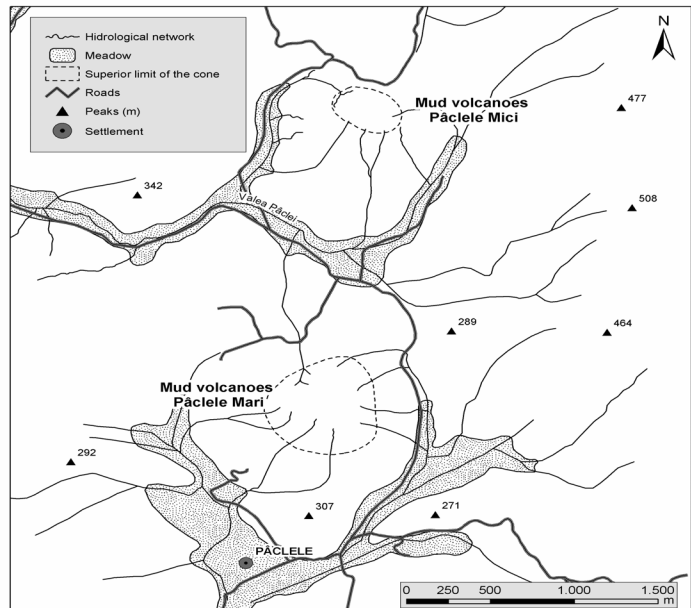
They are accessible from the newly-modernised DJ 203K up to the town of Plaiul Nucului, and then 7 km up to Terca (non-modernised road). This area is a monument of nature.

The phenomena is unique, with the accessibility being the only drawback.

**Fig. 8.** The Live fire from Terca – image.

This may prove to be a hold-back in its inclusion in tourism offers; locally though, it could be used for field trips with students in extra-curricular activities.

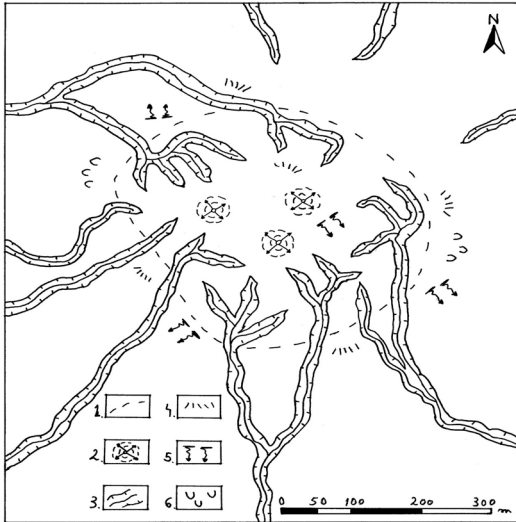
d) *The Mud Volcanoes* – they appear as a result of the amassment and degradation of some terrains (fig. 9). The craters are located in various areas such as the artificial hollow Berca-Arbănași, on crack lines through which the gases bring to surface salty mud resulted from the softening of the clay which is caused by subterranean water and oil.



**Fig. 9.** The Mud Volcanoes - location.

These volcanoes represent the only registered and legally exploited geosite from the investigated area.

In vicinity the volcanic cones, representing the main attraction, one can find plants of a Mediterranean origin.



**Fig. 10.** Geomorphological sketch of the mud volcanoes – Pâclele Mici.

The name is given by the three main volcanoes located in the centre of the plateau, which have a diameter ranging from 80-100 m (fig.11).

Here, there may appear secondary craters. The exterior half of the plateau is fragmented by gaps and torrents, leading to the development of the *bad lands*;

- in the *Beciu* area on the right shore of the *Arbănași* stream, there is a 2,5 m crater surrounded by a small plateau which contains cones and decimetrical craters;

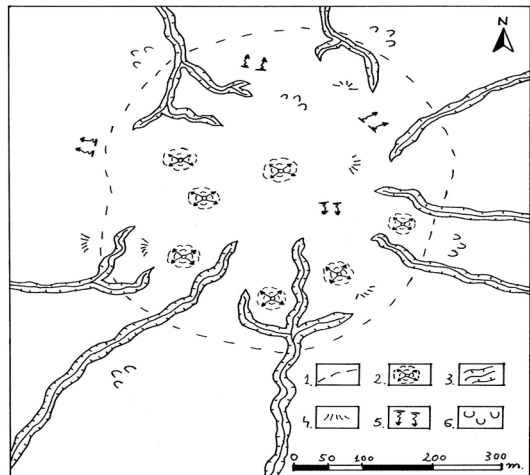
1. Upper limit of the volcanic cone;
2. The mud volcano;
3. Modeling torrential formations;
4. Pluviodenudare;
5. Surface wash;
6. Shallow landslides.

The main sectors with mud volcanoes are:

- *Pâclele Mici* has a surface of 10 hectares and is located near the town of *Berca* (fig. 10). The name originates from the centrally-located volcanoes with heights ranging between 2-8 m but with overall small dimensions. When it rains, the water flows on the cone flanks forming as a result gutters, gaps and deep torrents;

1. Upper limit of the volcanic cone;
2. The mud volcano;
3. Modeling torrential formations;
4. Pluviodenudare;
5. Surface wash;
6. Shallow landslides.

- *Pâclele Mari* has a surface of 20 hectares; the volcanoes are located north-west from the area above-mentioned. The



**Fig. 11.** Geomorphological sketch of the mud volcanoes - Pâclele Mari.

- at a distance of 2 km from Beciu, there is the *Arbănași plateau*, similar to the one at Pâcelele Mici. It has many cones and an erosion relief of much smaller dimensions;

- the mud volcanoes can be found in the following towns: Gloduri, Trestioara, Tulburea, Corneanu. A unique case is the swamp area in the town of Salcia where there are clogged up volcanoes covered in the specific vegetation.

The volcano area is appropriate for transit or week-end tourism, due to the fact that it has no tourist accommodation. They can be included in tourism routes or they can be sights for tourists located in other areas in the Buzau Subcarpathians.

#### 4. OPPORTUNITIES FOR TOURISM CAPITALIZATION

The majority of the geomorphosites belonging to the Buzau Subcarpathians are unique in Romania. Although they should attract a considerable number of tourists, this does not happen. The reasons are trivial: the lack of a modern technical-town infrastructure, the lack of tourists promotion, a very low involvement from the local communities due to the lack of money, and low interest from big tour operators to include this area in various tourism programmes and offers.

Rural tourism and agrotourism, transit or week-end tourism could be the best opportunities to emphasize the value of these sights. There are great impediments to what concerns tourist accommodation and food supplies, since their absence represents a drawback for most tourists.

Economically, these geomorphosites have been and will continue to be important tourism sights, with emerging business development around them, which will contribute to the growing interest of the investors in this area. It is highly important to include them in tourism programmes and quotes, so that their contribution to the local economy will become more prominent.

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## THE DRĂGOIASA-TULGHEȘ DEPRESSIONARY ALIGNMENT. THE TOURISM POTENTIAL, ARRANGEMENT AND CAPITALIZATION

G. B. TOFAN<sup>1</sup>

**ABSTRACT.** – **The Drăgoiasa-Tulgheș Depressionary Alignment. The Tourism Potential, Arrangement and Capitalization.** This study is an analytical approach regarding the main components of the tourism offer needed for outlining a special tourism personality. Within the natural tourism potential, the morphological component is predominant, represented by the Căliman, Bistricioarei, Giurgeu, Hășmaș and Ceahlău mountains, adding the presence of mineral water springs associated with a suitable climate for treatment and rest. This, together with the biotic shell, contributes to the individualization of protected areas (reserves) of great scientific and landscape value. As for the elements of the tourism anthropogenic fund, they have a complementary character within the tourism potential and encompass historical vestiges, museums, art monuments, folk and ethnographical creations, found in most of the localities from the Drăgoiasa-Tulgheș Depressionary alignment.

*Key words:* mineral waters, glacial relics, development, capitalization.

### 1. INTRODUCTION

The Drăgoiasa-Tulgheș area is a well individualised geographic unit, situated between the crystalline-Mesozoic area of the Bistriței Mountains (to the east) and the Neogene eruptive of the Căliman Mountains (to the west), which takes the form of a narrow and high passageway, made of a string of small depressions: Drăgoiasa, Glodu, Bilbor, Secu, Borsec, Corbu and Tulgheș.

This suspended inner-mountain string represents the middle area that connects Dornelor Depression with the Giurgeu Depression, whose sides are flanked by the Căliman Mountains to the west and north-west, by the Giurgeu Mountains to the south-west, Hășmaș to the south and on a small side by the Ceahlău Massive to the south-east, while to the west by the Bistriței Mountains.

Clearly demarcated by the above mentioned mountainous areas, these depressions appear as a complex and distinct morphological unit (volcanic barrage and erosion), within the Moldavian-Transylvanian Carpathians.

The surrounding mountains had a decisive role in the settlement and keeping the population in these areas, being „humanisation nuclei” of the mountain and the first bases for knowing it, preserving century old traditions, transmitted by man from generation to generation. Thus, this space saw the development of a system of predominantly rural settlements (with the exception of Borsec) with specific physiognomies, with activities adapted to the natural conditions that led to the outline of a civilisation (rural-pastoral, wood and mineral water).

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## 2. THE NATURAL TOURISM POTENTIAL

It stands out through a great geographic diversity, represented by a complex natural framework, where the lithology and the geological evolution led to a three tier morphological structure: the surrounding mountainous area, the contact glacia area and the hearth of the depressions, which can be found not only in the morphological hypsometric contrast, but also in the considerable number of components. Among the elements of the natural framework, of great attractive potential for tourism, there are: *the relief forms, the climatic conditions, the hydrographical resources, the vegetation and the game fund.*

### 2. 1. The morphological tourism potential

It establishes itself through predominantly landscape valences reflected by the characteristics of the lithological substratum affected by external factors, which led to a diversity of forms with distinct personality, that form specific categories of tourism objectives.

*The Căliman* is the most specific mountainous unit for this area, whose slopes have different appearances. The denivelation and individualization of Căliman are emphasized by the presence of volcanic barrage depressions (Drăgoiasa, Bilbor, Secu), the eastern slope of these mountains, corresponding to a lava plateau dominated by large hills, used by the locals, who built permanent settlements nearby, but also temporary ones (sheep dens, hay huts, tourism and hunting lodges), especially in higher areas.

In the northern and eastern compartments of *Giurgeu* there are a series of depressions - Bilbor, Secu, Borsec, Corbu and Tulgheș, and along the main edge there are some lower areas, marked by the presence of *Creanga* or *Borsec* passes (1110 m), *Chioșrezul Mic* (1298 m) and *Țengheler* (1025 m), which play a decisive role in the concentration of tourist fluxes, on certain preferential directions, their contribution being less of a attractive potential, and more of a functional one. Within the same mountainous area, there is also a landscape potential of the relief developed on limestone. Therefore, at Borsec, in the area of the main mineral water springs („Usturoiului” Valley, „Scaunul Rotund”, „Dealul Cetatea Bufnițelor”, „Șapte Izvoare” Ridge) due to the precipitation of calcium carbonate from the chemical composition of bicarbonated mineral waters an important travertine formation appeared („the Borsec marble”) which sometimes preserves the structure of plants.

The travertine found here has been quarried ever since 1958, being used to decorate the facades of many public buildings all around the country. The tourists can see the old travertine quarry whose element of specificity is the presence of terraces. Today, there is a series of ongoing programmes that intend to transform this place in a summer theatre. In the immediate vicinity of the quarry there are three caves: *The Ice Cave*, 40 m long. Due to its position and conformation, it favours the formation of a very thin layer of ice on the walls of the cave, ice that melts at the end of summer.

The most important cave found in the *Scaunul Rotund speological preserve* is the *Stalactites Cave (Scaunul Rotund Cave)*, the longest in the country formed in limestone (235 m long). The entrance to the cave is a 4-5 m deep doline.

Another highly attractive tourism objective is the *Bears' Grotto*, an ensemble of massive rocks, separated by deep chasms formed due to the natural erosion of rocks. Near this cave, a small cavity was recently discovered called „*Cerdacul Iadului*”, which requires a future thorough study.

The south-eastern part of the depression is flanked by the *Hăghimaș Mountains*, made of Mesozoic deposits whose lithological variation led to great relief contrasts, through simple summits, conical peaks, steep slopes. The *Licaș Avene*, 51 m deep.

*The Ceahlău Massive*, appears as a well outlined mountain, north of Bistricioara, while the western limit reaches the Hășmașului Mountains, being separated by the Penticului Valley, tributary of Bistricioara, bordering this area only slightly. It is a suspended synclinal at over 1900 m, with specific relief forms, on limestone and conglomerates (differentiated erosion, slopes, plateaus), accessible from all areas, which makes it one of the most tourismally important massives in the Eastern Carpathians.

The last mountains that close this alignment to the east are the *Bistricioarei Mountains*, which encompass a part where the individualization of the massives, due to the cross fragmentation, recedes, which is why a series of well outlined massives begin to appear: the Dark Blue Hill (1641 m), Negrișoara (1338 m), Șesul Popii (1480 m), Vămanu (1418 m) and Harlagia (1586 m). The last hill still holds the outlines of the trenches and graveyards from the First World War, specifically from the fights to liberate Transylvania.

To the south, within the territory occupied by the Corbu and Tulgheș localities, only their south-western is present, which corresponds to a part of the Budacu Massive, fragmented by the middle basin of Bistricioara, with an altitude of over 1600 m (Muncelu Peak, 1689 m and Țibleșul Mare Peak, 1664 m). This area stands out due to its picturesque landscapes with steep slopes, rock formations and structural plateaus from Piatra Runcului, Șesu Comarnicului, Pietrele Roșii Plateau, the latter being declared a geological reserve (10 ha).

When analysing this mountainous area, one cannot omit the presentation of some valleys with transverse sectors, such as *Bistricioara Gorge* (860 m high), between the Bistriței and Giurgeului Mountains, which besides its landscape value, are access points to the high mountain area, through roads and then through pastoral trails.

The components with the highest tourism impact are the slopes with a northern exposure which can become ski areas or areas for other winter sports.

## 2. 2. The climatic and bioclimatic potential

It is influenced directly by the morphological multi-stage characteristic and can have stimulating or restricting effects alongside other natural components, thus determining some forms of tourism practice. This is reflected in the complex of climatic elements variation, so the average annual temperatures vary between 2 and 6 grades Celsius.

Corresponding to these averages, the extreme temperatures are -4 and -6 grades C, in January, and 14 and 16 grades C in July. In these depressions and within the valleys, there are frequent temperature inversions that influence the tourism and economic activities in the area.

The precipitations also have that altitudinal multi-stage characteristic, which means higher quantities, over 1000 mm/year at Drăgoiasa and Glodu, at more than 1100 m high and less than 700 mm/year in the valleys, at Corbu and Tulgheș. The average number of days with snow per year is over 35, the average number of days with a snow layer per year is over 100, while the average multi-year snow thickness is 50 cm, which means plenty of time for skiing.

A characteristic for this place is the prevailing atmospheric calm, that lasts between 60-80% of the year, being less frequent in spring and in the beginning of summer, and more frequent in winter and autumn. *The temperature comfort* registers high values of 10-12 days in July. *The bioclimatic stress* has relatively small values, especially the *skin stress*.

Winter, due to low temperatures, is stressful, hypertonic. A charge with negative-positive ions can be felt in the air, and also the presence of resin aerosols, due to the fact that temperature inversions lead to an inversion of forest vegetation layers (conifers reach all the way to the base of the mountain). The bioclimatic conditions in the depressions are generally tonic, stimulating, relaxing, due to the shelter effect provided by the surrounding mountains.

The mountain cure has been prescribed for anemia, convalescences, insomnia, and up to 1000 m this bioclimate is recommended for those with acclimatization deficiencies of the cardiovascular and respiratory systems, the most suitable month for mountain hikes being September. We consider that, according to these arguments, this space can host a series of mountain resorts.

### 2. 3. The hydrographic tourism potential

It is mainly represented by hydromineral sources, such as: *mineral waters, therapeutic muds, therapeutic gases*, as well as the *hydrographic network* which has a great landscape impact.

The mineral waters from the territory at hand are part of the northern sector of the moffette of the Căliman-Harghita eruptive, represented by the springs from the Dornelor area where three mineral water springs have been surveyed, one in *Păltiniș*, brought through a pipe to Coverca, where in 2010 a mineral bottling factory was built (*Aqua Carpatica*). The other two springs caught in fir vats (*știubee*) are the ones in Drăgoiasa, in a place known by the locals as „*Bolovăniș*”, and one downstream of Gura Glodului, from the Glodu village.

Most springs in the area are rudimentary captured and used by the locals only in summer, as they are very far from the base of the depressions.

Within Bilbor depression, the mineral water springs can be found in its western part, meaning on the right side of Bistricioara, in a relatively small area, with approximately 15 springs, held mostly in fir trunks or concrete tubes. The most important are: *Simion Lungu*, the only spring that stands out through a more intense continuity and intensity of the CO<sub>2</sub> emissions, as it has „*noisy boiling*” effect. Even though the area of the spring „boils” because of CO<sub>2</sub>, the water is less mineralized, the mixture of CO<sub>2</sub> taking place on the surface and not within, it can be used as a moffette in the future. Then there are *Șeștina, Iacobeț, Truța, Raita, Vălcănești* (with three mineral springs), *Borcut* and on the Bistricioara valley in the area known as *Hurubă*, on a 300-400 m<sup>2</sup> surface there are 6 carbogaseous springs from a travertine mound.

In Borsec the most important mineral water springs that still attract tourists are: *the Main Spring* and *Elisabeta, Boldizsár, László, Lázár, Caprelor, Kossuth, Petofi* and the *Pierre Curie Spring*. The mineral waters found here have been renowned for their therapeutic qualities ever since the 16th century, leading to the development of a spa resort centered on treating digestive, endocrine and cardiac illnesses.

1500 m away from the center of Borsec, within the Scaunul Rotund speological reserve, there are two main tourism attractions: *the Old Spring*, used as a moffette, where a new building has been erected that can house up to 10 people and *the Fairies' Glade*, where some rehabilitation and renovation works were conducted for the traditional baths (foot baths), with the financial support of the Harghita County Council, an investment of around 250,000 lei. Those with digestive tract illnesses can also treat themselves with the waters of *Emese spring*.

The mineral waters from Corbu and Tulgheș are less important from a tourism point of view due to their high content of iron and sodium, but can be considered potential reserves used for spas and bottling and also can contribute through transferable quantities to the rehabilitation of Borsec. The most important are: *Șesul Comarnicului, Laurențiu, Branea, Prisecani, Diacul de Sus, Diacul de Jos, Cibeni, Șandoreni, Rezu Mare springs*.

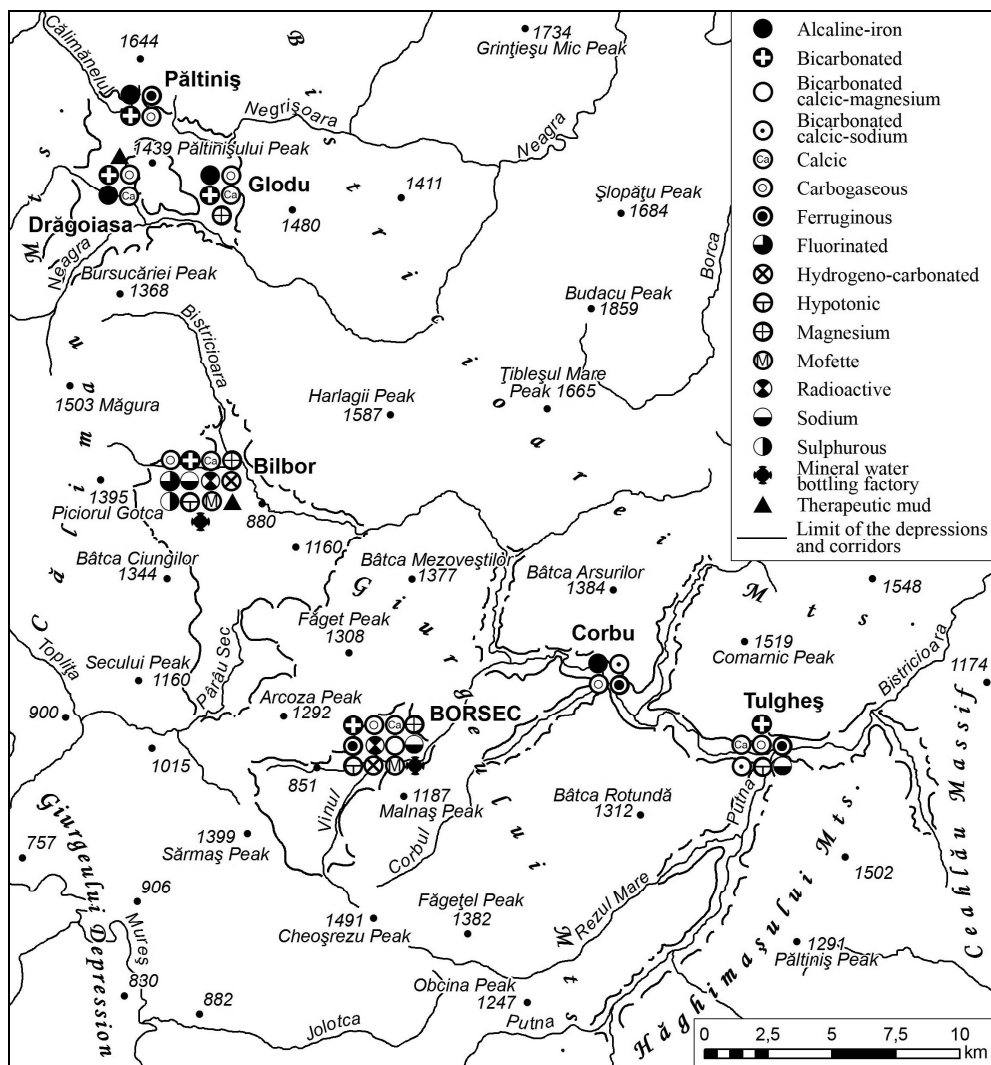


Fig. 1. The map of the hydrographic network and of the mineral waters from the Drăgoiasa-Tulgheș alignment.

All the mineral waters of the area are prescribed in the prevention and treatment of digestive, endocrine, cardiac and circulatory illnesses. *The peat muds with mineral waters* found only in Bilbor depression can be used for peripheral circulatory ailments, in stimulating endocrine functions or enzyme secretions.

*The hydrographic network*, through its two water courses –*Neagra Broștenilor* and *Bistricioara* and their tributaries, offer different possibilities for recreation activities such as sport fishing, swimming, weekend tourism.



Fig. 2. The foot baths-Fairies' Glade.

#### 2. 4. The biogeographic tourism potential

It is closely correlated with the morphological and climatic conditions characteristic for the Carpathian area. The forest is the most complex natural ecosystem from this string of depressions (Drăgoiasa-Tulgheș), and in 2011 covered 44 333 ha.

Due to the ever more stressing social-economic activities, the forest becomes an important recreation factor with favourable bioclimatic influences. An unusual element for this microregion is the existence in Tulgheș, on the left slope with southern exposure of the Bistricioara, of the Pedunculate oak (*Quercus pedunculiflora*), covering approximately 77 ha, considered by some botanists as a relic from the „spruce with mixed oak and hazel tree” stage of the postglacial period (E. Pop, 1944, V. Leandru, 1963). Other rare species from the deciduous category are the dwarf birch tree (*Betula nana*) and the dwarf willow (*Salix reprens*), also glacial relics found in „the eutrophic bog” situated near the Dobreanu stream and at the confluence of Rușilor stream with Bistricioara, as well as in Borsec.

The surfaces covered with mountain pastures, existent or resulted from deforestations, diversify the forest landscape, increase its luminosity and become places suitable for weekend tourism. We also would like to mention several protected herbaceous systems: the lady's slipper (*Cypripedium calceolus*), mountain globe-flower (*Trollius europaeus*), (*Lingularia sibirica*), (*Manyanthes trifoliata*), edelweiss (*Leontopodium alpinum*), (*Nigritela rubra*), (*Astragalus pseudopurpureus*), (*Hieracium pilosella*).

In terms of fauna, the forests surrounding the depressions have important game resources, that are rationally capitalized, in order to maintain and ecologic balance among the species. The inclusion of fauna in tourism activities is more obvious and direct in the case of some activities, and here we include *hunting and fishing*.

#### 2. 5. Tourism and environmental protection

Within the Drăgoiasa-Tulgheș depression string, the natural landscape has been affected in many cases by human activities, prolonged and diversified, due to the increase in population, in settlements and need for farm land, and through intense deforestations, excessive grazing and construction material exploitation.

Therefore, there have been numerous environmental unbalances, with repercussions on its quality and risks involving the disappearance of now rare and endangered species of plants and animals. Some protection measures were introduced, leading to the creation of some nature reserves, with plant and animal species declared as nature monuments, having the same protection status.

A series of preserved plants, among them glacial relics from wetlands, are protected within nature reserves. According to Law no. 5 from 6<sup>th</sup> March 2000 regarding the approval of the Arrangement Plan of the National Territory-Section III-Protected areas, within the analyzed territory there are a series of nature reserves: The *Pietrele Roșii Geological Reserve* Tulgheș (10 ha), *Harmasliget Botanical Reserve* Borsec (2 ha), *Scaunul Rotund Speological Reserve* Borsec (40 ha), *Mlaștina Pârâul Dobreanului Botanical Reserve* Bilbor (4 ha).



**Fig. 3.** Harmasliget Botanical Reserve Borsec and Mlaștina Pârâul Dobreanului Botanical Reserve Bilbor.

In the near future 5 more nature reserves will be established: *the Fossil Deposit of Glodu*, *Pârâul Rușilor Botanical Reserve* (Bilbor), *Poiana cu narcise* (Corbu), *Stejăriș Reserve* and *Floarea de colț Reserve*, the last two in Tulgheș.

### 3. THE ANTHROPOGENIC TOURISM POTENTIAL

In contrast with the tourism resources belonging to the natural framework, created by nature, the anthropogenic tourism fund represents a series of elements with an attractive function erected by man, whose emergence was not always premeditated, having other functions (economic, strategic, cultural), the recreation valence being gained in time.

#### 3. 1. Archaeological vestiges

Near Borsec, after 1880, when the Toplița-Borsec-Tulgheș freeway was built, over Creanga pass, two intact Roman sarcophagi were found containing the remains of Romans on reconnaissance missions beyond the Tulgheș pass, part of the auxiliary troops from the Brâncovenești castrum.

Also in Borsec, locals found 10 gold coins dating from the 4th century AD. In Tulgheș in 1865, a series of coins were found dating from the time of emperor Constantinus II (Flavius Claudius Constantinus), (337-340 AD), as well as a stone axe, found in the 19th century. On a terrace on the left bank of Bistricioara, in 1986, a spear and two rings were found dating from the Bronze Age, very interestingly decorated by incision, now hosted by the Museum of Miercurea-Ciuc. Two artificial terraces were also discovered at the base of Runcu, where many started digging, thinking a treasure is buried in the area. This place is known by the locals of Tulgheș as „*At the Holes*”.

Here, during the 19th century several horse bits and old instruments were unearthed, which eventually were lost, as no one knew their value. In *Tulgheș Pass* a medieval wooden boat was found, belonging to the Moldavian sentries that guarded this pass.

The most recent and most important discovery belongs to Prof. D. Ioniță (2007), who found, in the same Tulgheș pass, in a ravine, a Turkish scimitar which probably belonged to a high Ottoman official. The scimitar is 70 cm long, with a blade made of Damascus steel, and an ivory handle. At the end, the scimitar is decorated with oriental motives with gold and precious stones. It is believed that the weapon dates back to the 16th century, thus confirming the presence, in 1529, of the second Moldavian army led by the ruler Petru Rareș in Țara Românească and Transilvania.

### 3. 2. Cultural-historical tourism objectives

From this category we point out *The Monument of Romanian Heroes from the First and Second World Wars* from Bilbor, built in 1986 out of concrete and marble, by the Bilbor Town Hall.

On a bronze plaque, set on the monument, the names of 52 Romanian soldiers are inscribed, 19 dying in the Unification War, while 33 in the Reunification War. In the eastern part of Bilbor depression, 3 km away, in the Harlagia Mountains, there is also an obelisque situated right on top of the graves of the soldiers fallen during the First World War in the fightings to liberate Transilvania.

Not far from Bilbor, at Gura Secului, there is an imposing *mausoleum*, dedicated to the heroes from both world wars. It is built out of stone blocks, each 6 m high. The construction of this monument ended in 1927. Around the main vault there are the remains 771 heroes fallen during the fights of August 1916 to liberate Transilvania from Austro-Hungarian domination, and also the remains of those who lost their lives in these parts during the Second World War. The last restoration was conducted in the summer of 2011.

Another two monuments dedicated to the *Romanian Heroes of the First and Second World War* can be found Corbu and Tulgheș. The former is situated in the Orthodox church's courtyard. It has a height of 2.10 m and made of granite covered with marble. In front, it bears the inscription: „*In remembrance of the heroes fallen in 1914-1918*”, under which there is a list of 60 heroes and their regiments. Later, two new marble plaques were added containing the soldiers fallen in the Second World War.

The obelisque of Tulgheș is made of granite, situated in the commune's cemetery, being 1.30 m high. In front there is the following commemorative text: „*The heroes fallen in the War for Reunification 1914-1919*”.

In the village of Capu Corbului (Corbu commune), in the courtyard of the Orthodox church, there is a *first cemetery for the Romanian heroes of World War I*, containing 40 fallen soldiers, while, on the Dry Valley, there is another one with approximately 50 soldiers.

13 km from Tulgheș, on the Poiana Mare Mountain, there is a similar cemetery, containing the remains of 49 soldiers, in individual tombs.

*The religious objectives* that have a tourism attractivity are the most numerous, and can be found in all the settlements of the region. Some of them are art and architectural monuments, with high patrimonial value. This category includes 20 churches, built between the 18th-20th centuries, and a monastery in Catrinari, recently built in 2006.

They stand out through architectural characteristics and patrimonial objects found in three wooden churches, the one in Bilbor („*St. Nicholas*” Church, built between 1795-1801, extremely valuable, being the only church in Transilvania that transposes the Moldavian church style into wood), Borsec („*Schimbarea la față*” Wooden Church-1847, a former Catholic establishment) and the one in Tulgheș („*St. Archangels*” Wooden Church-1828), plus two wooden chapels (*The Roman-Catholic Chapel* of Secu and the „*St. Peter and Paul*” Chapel from Tulgheș, both dating from the 20th century. All the above mentioned churches can be found on the list of historical monuments of Harghita County.

As for the Orthodox churches, we point out the one in Bilbor (1933-1937), built in Byzantine style, with two towers and a dome painted by C. Călinescu, as well as those from Corbu (1927-1929) and Tulgheș (1912).

Besides the religious sites, we would also like to mention the *ethnographical museums* from Bilbor and Tulgheș, and the museum of *mineral waters from Borsec*.

### 3. 3. Economic sites of tourism interest

We include in this category a series of technical accomplishments with economic as well as tourism impact: *the narrow railway viaduct* from Borsec, built between 1954-1955, an emblematic construction for the town, that carried transports of mineral water from Borsec to Toplița. There is also the old power plant of Borsec, built at the end of the 19th century, as well as a series of villas included in the architectural patrimony of the town: Villa no. 51 (Emil)-1936, Villa no. 53 (Doru)-1936, Villa no. 60 (Vasalopol)-1880, Villa no. 56 (Barbu)-1896, Villa no. 14 (Szentkovits)-1933-1935, and a series of spa amenities from the 20th century (Villa no. 17 (Bernstein), Villa no.19 (Stoica), Villa no. 20 (Heiter), Villa no. 71 (Budapest), Villa no. 15 (Nefelets), Villa no. 23 (Csilla); Mélik Hostel-1845, Remény Hotel-1883, the Culture House (Spielman), Făget Restaurant.

We can also add the mineral water bottling instalations - *Bilbor Mineral Water, 2010* and *Romaqua Group Borsec*, the latter with a 205 year tradition.

### 3. 4. The ethnographical tourism patrimony

It has an extraordinary material and spiritual value here in this area of Drăgoiasa-Tulgheș, giving this part of the world a specificity found nowhere else, that remained alive, still well preserved, with a great pull factor.

The settlement network of Drăgoiasa-Tulgheș came into being in time, starting from the 16th century - Borsec (1594), 18th century-Bilbor (1776), 19th century- Păltiniș, Drăgoiasa, Glodu, Catrinari, Secu, Corbu (1808), and Tulgheș (1850). Most probably, the first inhabitants of this area were Romanian colonists from Bucovina, that settled the lands owned by the border communes of Ditrău and Lăzarea, proven by patrimonial evidence, followed by the Szekler population from Giurgeu Depression, as well as by Czechs and Germans, as qualified work force in mining.



In most rural settlements of the area, the position of the hearth changed in time, at the contact between mountain and the piedmont area: Păltiniș, Drăgoiasa, Glodu, Catrinari, Bilbor and Secu, while another category of settlements were formed by “swarming” („roire”) (Borsecul de Sus și Borsecul de Jos, which now form the town of Borsec, Corbu, Capu Corbului). One of the traditional activities of the area is *animal husbandry* (cows and sheep), whose fodder is supplied by the surrounding areas, specifically hayfields and lands cultivated with perennial vegetables.

*The exploitation and primary processing of wood* as well as *bottling mineral water* are the main industrial activities of the area. *Vegetables and cereal* are grown only where the climatic conditions allow it. Other activities include: *iron forging*, one of the oldest activities, *bee keeping*, *bread making*, *carpentry*, *burning lime* and *tailoring*.

Within these settlements, the most important is the elementary habitat-*the household*, reflecting the functional profile, with adaptations to the natural factors. The traditional households that are still preserved fall into two categories: permanent households, situated in the hearth and temporary households, further out. Examples of the former category can be seen in Tulgheș (*the Viorel Hangan household*, containing an old house with barn and shed, dating from the beginning of the 20th century, as well as a *wooden house* (Aurel Crușitu), from the Valea Frumoasă, 19th century, *the lime kiln* (Apostol Sabin), 19th century, *the water mill* and the *Olar Gheorghe sawmill*, 1875, all on the list of historical monuments). Within the household, the traditional house stands out, a reflection of the way of life, of ethnic and cultural traditions, because it is here that most activities are performed, this is the place where children are raised and educated, this is the place for rest and relaxation. The most common type of house, especially the old ones, is the two chamber house. The house’s interior decoration contains old canvases called „*plocuțuri*” (rugs) and „*lipideie*” (bed sheets), with varied colours and different sizes and trimmings.

The houses are surrounded by a wooden fence, and the entrance in the courtyard is through a small gate for people and a large one for hay. Each household has secondary amenities such as barns, chicken coops and pig sties, as well as a sheep den, called „*corlă*”, all situated around the courtyard.

*Customs and traditions* are a reflection of the ancientness of the civilization and of the specificity of activities that found an artistic outlet. The customs regarding pastoral activities begin with making the flocks or herds by gathering all the sheep and cow owners, at a so called *associated den*. Among the pastoral customs we find: *the sheep’s measure*, *the sheep’s shearing and cheese calling*. The cheese making technology is also extremely interesting.

One can add a series of customs *linked with life’s great events* (birth, christening, wedding, match-making, engagement, wedding calling, taking the bride, handing over the bride, funeral). Manifestations of great folklore richness, the winter holidays include the following customs: *caroling*, *star caroling*, *plough caroling*, *goat caroling*, „*sorcova*”, „*jianul*”.

Regarding national costumes, Romanian women wear a long shirt, „*prijitoare*”, „*bondă*” shoes with „*gurgui*”, while on their head kerchief or „*șidă*”. Men wear lamb skin hats, a long shirt, long trousers or „*țări*”. Over their shirts, across the waist, they have a wide belt or cow skin vest. On their feet they wear cow skin shoes. The Szekler men’s clothing includes trousers made of white wool, black boots, and a vest over their shirts. The Szekler women have two main clothing pieces (dress and vest), plus boots.

*Folk songs* include „*doine*”, military songs, ballads, love songs, wedding songs, drinking songs, etc. The order of the dances is the following: „*Roata stelelor*”, „*Țărănește cu femei*”, „*Floricea*”, „*Ștraierul*”, „*Învărtita*”. They are followed by men’s dances: „*Rața*, *Boiereasca*”, „*Lelea Albă*”, „*Țărănește cu bărbați*”, „*Brustureanca*”, etc.

Some of the most prominent human activities with tourism functions are the celebration of the churches' protector saints, which also includes a series of folk celebrations („Bilborul in celebration”, „The Heroes' Day” at Gura Secului, „Days of Borsec”, „Days of Corbu commune” and „Days of Tulgheș”, on 15th August each year. There are also some weekly fairs, spring and autumn fairs at Bilbor, Corbu and Tulgheș.

### 3. 5. The ethno-tourism impact of sheep husbandry

Is manifested on several levels such as the anthropisation of the mountain and alpine landscapes, due to sheep dens and cottages, to the instruments used and the traditional products manufactured, pastoral activities and folklore. The sheep den is the traditional elementary habitat found in mountain areas, with temporary character, used for sheltering shepherds overnight and for preparing and fermenting cheese. They are built of round wooden beams, containing two chambers, covered with fir trunk and more recently with wooden boards or shingles.

The first room contains the fire hearth, that must be continually fed with wood, using thick dry fir trunks. There are also „*priciuri*” (beds), on top of which a layer of dry moss, earth or fir branches is laid. The dairy products are prepared in this room, then deposited in another chamber (pantry) in order to dry, and only then can they be distributed to animal owners.

At a cow farm the following pots are used: *budaca* and *budăcuța*, *donița*, *fedeleșul*, „*putina*”, „*bribideul*”, „*țăjueru*”, the 100 litre bucket, the measure pot, the big wooden spoon, the strainer, „*bărbânța*” with sour whey and the polenta pot.

In 2008, in Tulgheș, the first European standard compliant den was built, with running water, evacuation duct and platform for the milking instalation.

## 4. THE MATERIAL TOURISM BASE-TOURISM AMENITIES

The tourism development of the Drăgoiasa-Tulgheș area started at the end of the 19th century, when the first private villas were built in Borsec, in the vicinity of the mineral springs. The lodging capacity was low, and the entire organisation was based on high prices for a small number of tourists. Most villas were not suited for winter periods, the resort being used only in summer.

The greatest revival was during the interwar period, when most villas were built, having the same architectural style with astonishing wood lacery. The communist regime brought major changes in the spa activity, thus beginning to nationalize villas, baths, restaurants, under the management of the *Local Spa Enterprise* (I.L.B Borsec), a state run enterprise that managed the tourism activity, some time later being given the name *Borsec Spa Resort Enterprise* (I.B.C. Borsec).

The peak period of Borsec resort was in the 80s, but due to the wear and problems of many accommodation units, it went into decline.

So, the constitution of the accommodation places has changed, villas being replaced by hostels. After the changes of 1989, the Borsec Spa Resort Enterprise ended under the management of the State Property Fund, and became joint-stock company, under the name *Commercial Joint-Stock Tourism Company*. An entrepreneur bought most shares, then sold part of the villas, while those still belonging to the company ended up in the hands of another group of entrepreneurs.

The tourism activity in the resort, after the closure of the spa amenities in 2001, was continued by private entrepreneurs, but only for food and lodging, Borsec being „downgraded” from national interest resort to local interest resort.

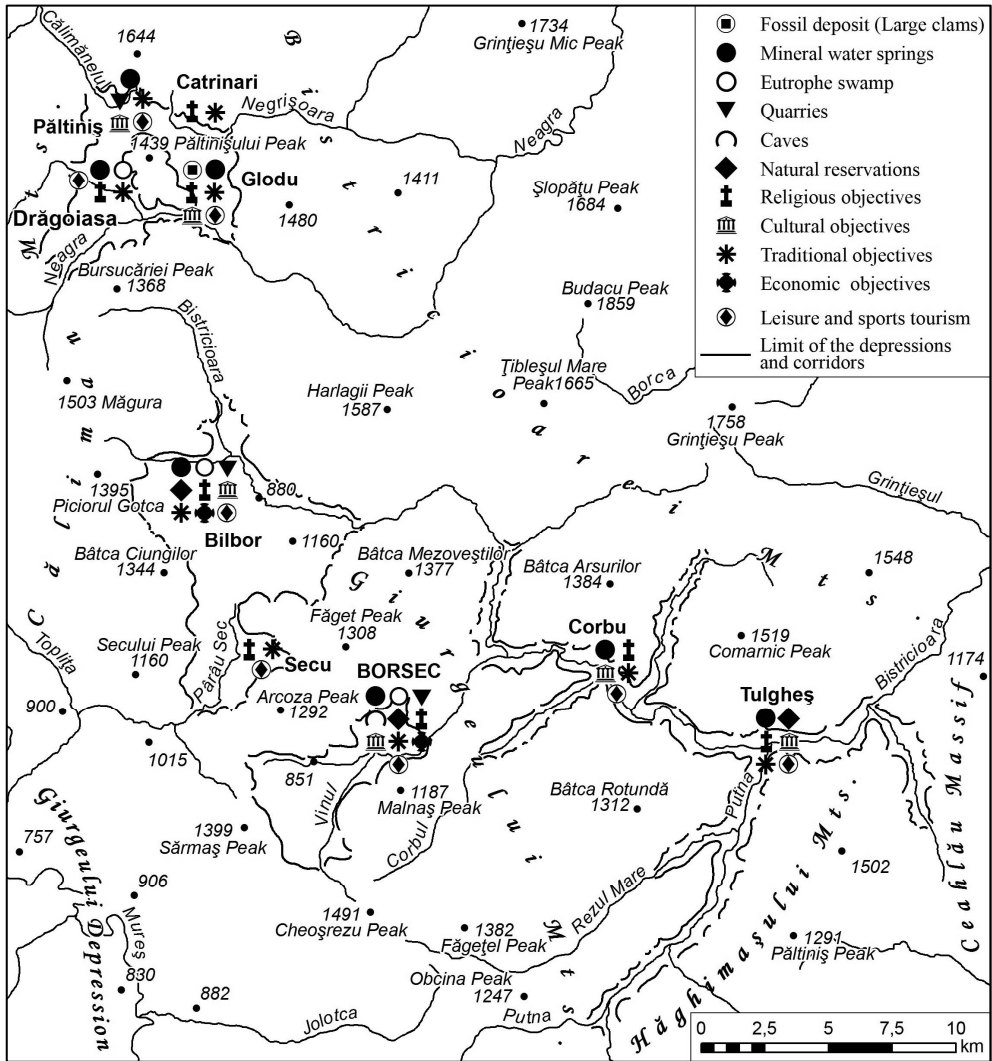


Fig. 4. The map containing the natural and man-made tourism sites.

Borcea resort still is the most complex tourism settlement from the area, with 15 constructions, encompassing one villa, one camping, and 13 hostels.

The total capacity of the resort exceeds 353 places, from which 40 places in villas, 120 places in tourism cottages and 193 places in hostels. In 2010, the tourism circulation reached 4244 overnight stays and 1208 tourists.

In 2011, works started at a multifunctional spa complex that will ensure, besides treatment, the possibility for relaxation and spending free time all year round.

The complex's total daily capacity is estimated at around 694 persons.

Borsec resort recently acquired a functional skiable domain, made of three slopes (one for beginners - 750 m long, the main slope, illuminated during night-time - 630 m, with a level difference of 120 m and a slope for advanced skiers - 680 m), with a monopost T-bar lift, that can hold a traffic of 720 persons / hour. Bilbor was declared a spa resort of local interest in 1955, but due to its reduced lodging capacity, lack of instalations and spa amenities and no specialized medical office, it loses its status.

Bilbor, Corbu and Tulgheș have a few accommodation units, fit for tourism (hostels – rural households), lodging being mainly supported by the locals of these communes. After 1950, a few lodges were erected, like Secu Lodge, as well as some mountain refuges and some hunting lodges (Vămanu, Casa Țifrii), with closed circuits.

An alternative for finding accommodation in summer, in Bilbor commune, is the Special School's boarding house, situated in the centre of the village, that also offers meals in the school's cafeteria.

The total lodging capacity of the Drăgoiasa-Tulgheș depression string is estimated at over 791 places, 347 rooms in total, within 44 units, some of them still undeclared and not present in the official statistical data.

## 5. CONCLUSIONS

The development of agrotourism in the area at hand has several advantageous implications, contributing to population stabilisation by grounding the work force, creating new jobs, promoting and developing services and supporting folk art and the local artisanal industry, rehabilitating the built patrimony, improving the degree of female participation in the work market, attracting new investments, but also disadvantages such as: pressure on the environment, limited character of accommodation availabilities, planning problems, local control, unwillingness from the local populace. In the future, the accommodation base will go through a more emphasized development process, due to the connection that will be established between Bilbor and Dornelor Depression, by building a connection road, that for now only partially satisfies the access between the above mentioned depressions.

Situated on the trans-Carpathian axis of Bistricioara valley, in the vicinity of Borsec resort and the Ceahlău Massive, Corbu și Tulgheș now benefit from an intense transit tourism from the counties of Moldova towards Borsec and from Transilvania towards Ceahlău, which is why we find it necessary to establish a competitive material base, balanced and functional, that will determine not only the numerical, structural and qualitative dimension of the tourism demand from the offer of that particular area, but also will ensure an easy access for the tourism fluxes and the efficient consumption of tourism attractions.

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## URBAN CULTURAL TOURISM PRIORITIES OF SUSTAINABLE DEVELOPMENT IN THE TRANSYLVANIAN DEPRESSION

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**ABSTRACT.** – **Urban Cultural Tourism – Priorities of Sustainable Development in the Transylvanian Depression.** Sheltered by the rich arch of The Carpathians, The Transylvanian Depression is highlighted by the complexity of its defining elements. Our article approaches a fascinating geographical space, with multiple development opportunities. The historical evolution of the Transylvanian Depression has been both complicated and difficult. However, today, in many respects (economic achievements, cultural concerns), it occupies the first place in Romania. Why? The answer is simple: although the wounds of history sometimes don't let us admit it, Transylvania wouldn't be itself without the imperial imprint. Along the Romanians there lived, worked and created for centuries Hungarians, Saxons, Armenians, Jewish. The question is: how can we now value our common heritage? In our opinion, the priorities of the sustainable development of the cultural tourism in the towns of the Transylvanian Depression include the articulation of an unitary system of values, turning into account the adjacent rural areas, the rehabilitation of historic centres, finding new ways of "recycling" the industrial ruins, solving environmental and traffic problems, creating a complete, accurate and accessible database of information on cultural tourism potential, highlighting the attractive elements of the urban space, creating and developing new thematic tours.

**Keywords:** *cultural tourism, heritage, urban space, palimpsest, multiculturalism, sustainable development.*

### 1. INTRODUCTION

Each town in the Transylvanian Depression represents an open book, offering the reader numerous cultural-historical objectives, whether ancient (ruins of Dacian and Roman settlements), medieval (fortresses, fortified churches), modern or contemporary (palaces, cathedrals). Starting from this premise, one can appreciate that many of the attractive objectives from the tourist point of view are in a relatively satisfactory state of preservation, but not properly placed into the light. Many measures can be taken in order to better exploit their resources. Fortunately, the importance of cultural tourism is increasing. A very good example is Sibiu, an interesting European cultural capital, or Sighișoara, with its impressive fortress.

Justified by the need of knowledge, cultural tourism has been since ancient times one of the most complex and yet relaxing ways of discovering the world, the human communities in their relation with nature and the peers and also in their profound relation with God. The side effects are beneficial, too: broadening one's interior horizon, building the capacity to accept and cherish the others, finding life's real purpose. Keeping its privileged status from the past, cultural tourism has now become one of the most important directions for sustainable development.

From our point of view, culture means spiritual growth. In the same time, cultural tourism, in addressing different areas, takes into consideration not only the cultural-historical objectives, but also the lifestyle of the people and the ambience created by blending these two

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aspects. We must however underline that we should follow only what adds value and not any innovative human manifestation. Today, while modern man gradually closes himself in a virtual world, culture loses its meaning. Accepting its degradation can determine the transformation of cultural tourism in a negative way, or even its disappearance as a phenomenon. That is why we must rethink our system of values, selecting and promoting only the elements that mean growth, becoming and spiritual elevation, through all the modes of expression of the human being.

Cultural geography studies human groups and societies in the most complex and noble forms of their existence and cultural tourism seeks the journey motivated by the desire to discover and understand, as their bond (M. Crang, 1998). Facilitating the communication between members of different nations and ethnic groups and mutual appreciation, it can stop the devastating effects of globalization, supporting the preservation of identity and cultural diversity.

## **2. METHODOLOGY**

We intended to achieve a synthesis of the elements which give attractiveness to the urban space of the Transylvanian Depression and the ways in which they can be put into value. Our conclusions are based on both bibliographic and field research, as well as a brief survey conducted among the Romanian and foreign tourists encounter over the last four years.

The three principles that lay at the basis of our approach are the principles of spatiality, causality and integration. Of working methods, the direct geographical observation, assuming that the researcher must go to the site in order to pass the geographical facts through his own prism, gave us the opportunity to understand the Transylvanian space, also providing authenticity and value to the documents produced during the study and to the final conclusions. Then we used the geographical analysis and the synthesis. We also used the investigation and motivational research, trying repeatedly to get a clear picture of the preferences and behaviour of those involved in this phenomenon.

## **3. RESULTS AND DISCUSSIONS**

### **3. 1. The urban space of the Transylvanian Depression, the perfect space for cultural tourism.**

The Transylvanian Depression, the geographical area on which we focused, is distinguished by the favourable character of all components of the natural environment. Protected by the Carpathian Mountains, the Transylvanian Depression is the core of the Romanian landscape. This allowed and supported the individualization of a large network of settlements (Gr. Pop, 2001). Transylvania was also noted over time for the constancy of its population (Ş. Pascu, 1983), even though the towns of the Depression often bear a foreign imprint. Details of it are found everywhere, both in the visible domain, in architecture and urban structure and also in the social, cultural, political or economic field. The minorities are generally the subject of a process of assimilation by the ethnic majority, but the most frequent situation is that of a cultural mosaic, where different groups meet and collaborate, without sacrificing the distinctive details, essential in terms of identity. History has brought about the Romanian, Hungarian, Saxon, Székely, Armenian and Hebrew, to build together, literally and figuratively, the Transylvanian Depression, as we know it today.

Built in a multicultural space, the towns of the Transylvanian Depression have a rich tourism potential (Arabela Muscalagiu, 2008). Putting it into value primarily means knowledge of its component elements. The urban cultural tourism potential includes on one hand the objectives of the immobile cultural heritage, both laic and religious, and also archaeological, historical-documentary, artistic, ethnographic, scientific and technical goods, that make up the mobile cultural heritage (Melinda Căndea, *et al.*, 2003). Present in all of the towns of Transylvania, they are very numerous, but poorly put into value, despite their importance.

From a synthetic perspective, the towns of the depression belong to three basic generations. Thus we can identify ancient settlements, such as Napoca (Cluj-Napoca), Apulum (Alba Iulia) and Potaissa (Turda), medieval towns (Sibiu, Bistrița, Mediaș Sighișoara, Târgu Mureș, Făgăraș, Dej, Sebeș) and modern towns (Ocna Mureș, Victoria, Târnăveni etc.). The Antiquity is characterized by the development of an extensive urban network, whose centres are placed along the major roads. In the middle Ages, the increasing interest for crafts and trade, brings a new stage of development in which appear and are consolidated firstly the fairs and then, after the invasions, the fortresses. The towns then evolve both in terms of architecture, but also of facilities for daily life. The Modern era, in the spectrum of the industrial revolution, brings new urban centres on the map of the Transylvanian Depression (their structure is substantially changed). Nowadays, the accelerated development of the technology imposes the rapid and sometimes forced transformation of the original urban framework.

Returning to the importance of understanding the urban palimpsest, we add the idea of continuously rediscovering our towns and cities. The charm of each town lies in the attributes of the natural environment, in the historical past, in architecture, in the treasures of art and science protected by the museums, but also in the legends and stories, in the beliefs, the occupations and the way of being of its residents (Arabela Muscalagiu, 2009).

Often called „fortresses of culture”, the towns of the Transylvanian Depression offer their public a wide range of cultural events, suitable to all ages and expectations, throughout the year.

Although essentially marked by an extensive array of personalities from all the fields of art and science, but also of the ecclesial space, the towns lean too little on their life and their work, a worrying fact, including from a tourist perspective. Why do we say this? Because ignoring these valuable details destroys the importance of the objectives. Their belonging to a certain historical stage or to a special current of architecture is only one side of their accepted value. The context in which they were created and the personality of those who in one way or another have linked their destiny to that of the objectives are also worthy of consideration. Born in the rural space of the depression, many personalities have strengthened and perfected their knowledge and passions in its towns. So here is a fortunate meeting between the profound world of the Romanian village, sincerely and inextricably linked to God and the refined, rational world of the city, always in search of novelty. Outlining the true value depended on the ability to precisely balance the essential and the newly acquired values, and its recognition at a national and European level was determined by opposite political, social and economic factors.

### **3. 2. The current state of the infrastructure of accommodation, alimentation and communication**

According to the data provided by the National Institute of Statistics, the towns in the Transylvanian Depression currently have a wide network of accommodation units, (hotels and guesthouses, in the first place, followed by tourist villas, motels, inns, hostels and rarely, camping



places). The last emerging forms of accommodation are apartments for rent. However, although the number of units and the accommodation places follows a positive trend of development, the financial crisis of the last years caused a gradual decrease in the number of overnight stays. Hence, the accommodation managers must fight to retain customers and attract new ones by offering quality services at decent prices. Regarding the infrastructure of alimentation, the towns of the depression use, according to the data provided in 2011 by the Ministry of Regional Development and Tourism, a total of 797 units (of which 271 one star units, 255 two stars units, 194 three stars units, 64 four star units and 13 five star units). Rail and road networks have a relatively high density and there is a general concern for improving them, with visible benefits. The Transylvanian Depression is crossed by three main railway lines (M2, in the south, along the Făgăraş and Sibiu depressions, M3, which crosses the plateau diagonally, in the SE-NW direction, M4 in the north of the corridor of Someşul Mare) and three important European roads: E60, E81, E68, to which we add the recent highway, which is currently under construction, designed as the main axis of movement of the depression in the future. The three airports of the depression (Cluj-Napoca, Sibiu and Târgu-Mureş) allow the inhabitants to travel at a national and international level and give the foreign tourists an easier way of access to its towns. Regarding the special forms of transport, they are provided by a complex network of pipelines, aqueducts and power lines.

### **3. 3. The tourist circulation**

In the studied area has a number of distinct features, such as a long evolution, directed mainly by economic and social factors, a relative stability of internal circulation and an intense dynamics of international tourism demand, a less intense manifestation of the seasonality of the tourism phenomenon, due to the continuous attractiveness of the cultural heritage (N. Ciangă, 1984). Tourist flows are oriented mainly to the cities, without bypassing the smaller centres, except the industrial ones. Amazingly, although the number of accommodation units and the accommodation capacity values are constantly increasing, many towns in the depression warn us about the decrease of the number of tourists who choose to spend their time inside them, demanding greater involvement in the promoting of the tourist potential.

### **3. 4. The promotion of cultural potential**

Born from the general concern to attract tourists, both nationally and internationally, has gone through some notable changes in the recent years by increasing the number of channels of information dissemination and by multiplying the means used in this process. Advertisements are also more numerous and with a better image quality. The sustainable development of the towns, seen in terms of tourism, requires further research, adding a careful study of marketing and redefining cultural publicity. Essential during this step is the capacity to see the city as a whole. Only then can we create quality brands, which correspond to reality and are more than a facade. Outlining the details is important precisely because it ennobles the whole, simultaneously offering specificity, without approaching the component parts separately.

The traditional media for travel information has been supplemented in recent years by tackling a new means of communicating with multiple valances: the Internet. It offers several advantages and considerably expands the area of coverage of the invitations to travel. Tourist sites are available anytime, almost anywhere and can be accessed by anyone. The information can be very complex without paying anything more. Another important advantage is the possibility

to update the information, whenever this is needed, to maintain a real, correct image of the destination. The Internet is one of the simplest means of getting tourist information, but in the towns of the Transylvanian Depression, it is rarely used at its full potential. Regarding the creation of an accessible database to all actors involved in the tourism phenomenon, and also of specialized sites, the situation is worryingly delayed for lack of funds or lack of interest. The objectives, the accommodation units, the ways and means of transport are presented in a chaotic manner (with a few fortunate exceptions). The data provided by various sources are sometimes very different, which makes the search meaningless and easy to abandon.

Currently, the most successful sites belong to the cities of Sibiu, Cluj-Napoca and Alba-Iulia. The provided information is complex, but attractively organized and very accessible. So there are, fortunately, several models that can be followed.

### **3. 5. Positive and negative effects of cultural tourism**

Regarding the impact of cultural tourism on tourist demand and tourist destination areas (in the second case we stopped on the changes appeared in the built environment and on the economic and social level) there can be highlighted a number of positive and negative effects. In the first category we find the following: boosting the cultural life of urban centres; expanding the cultural horizons of residents and tourists; increasing ones self-respect; acceptance and appreciation of foreign values; economic growth of the towns involved and increasing social cohesion. The negative effects of cultural tourism imply: excessive adaptation and loss of personality; artificial increase in prices; the appearance of a false, exaggerated or wrong image of the town/city.

### **3. 6. Current problems and possible answers**

Placing into the light the cultural heritage of the towns in the Transylvanian Depression is, in our view, a complex and dynamic process, in which are called to take part the people and the local authorities. Financial problems often can be resolved with simple and effective solutions. It is essential to find a unitary vision on tourism development, which would allow the removal of the current gaps.

Bibliographical research showed the existence of many cultural sights, concentrated mainly in three major centres of the Transylvanian Depression, but present in all of the other towns. Different authors that have approached the patrimony of the Transylvanian towns brought to light their undeniable value.

Field research has indicated, however, the incomplete and sometimes inaccurate character of the bibliographic data, partially explained by the difficulty of updating them. There is a need for an unified action to collect and verify the data and to develop comprehensive studies, adapted to the requirements of both tourists and researchers. On the other hand, the status of the objectives of the national heritage is of concern, both for lack of financial resources and the lack of interest of the local communities.

The ideas formulated by the tourists themselves have stressed the following aspects: in every town there is at least one objective that is worth being discovered; many objectives are poorly put into value and only seldom do we refer to the personalities that influenced the existence and evolution of the towns; small towns are not put into value from the point of view of cultural tourism; the most attractive centres remain Sibiu, Sighișoara, Cluj-Napoca, Alba-Iulia, Târgu Mureș, Bistrița, Sebeș și Mediaș;

In the context described above, there rise three questions that need to be answered.

**What can we rely on?:** the existence of a strong network of urban settlements; the remarkable value of the cultural heritage (movable and immovable); the large number of secular/laic and religious cultural objectives; the cultural diversity and the frequency of cultural events; the existence of prestigious cultural institutions.

**What problems must we face?:** the rapidly rising phenomena of subculture; the decreasing interest in cultural events of the population; the overcrowded large urban centres; the decreasing number of population of the small towns; a progressive degradation of the built environment in towns without economic power; the loss of cultural identity in the growing process of globalization; the fast migration of young intellectuals.

**What can we do next?:** intensify the activities to promote the cultural tourism potential; turn into account the multicultural character of the urban space; improve the perception of the towns in the eyes of the population; increase the involvement of young people in the cultural life of their cities; create an attractive cultural image of the towns/cities; increase cultural exchanges between twin cities; multiply tourist information centres; improve the accommodation and communication infrastructure.

### **3. 7. Priorities of sustainable development**

**The importance of a powerful value system** (why do we need it?). Drawn more and more in a Brownian economic motion, the man of nowadays becomes either unconsciously or knowingly, the destroyer of his own inner universe. Crushed by the weight and the uncertainty of tomorrow, he slips to facile and refuses any effort, including that of spiritual growth. Surrounded by the traps of virtual life, he is becoming more aggressive and frequently agrees to fall prey to them. Even some so-called "acts of culture" are transformed into treacherous means of spiritual mass destruction. Shows intended especially for young people, on various occasions, offer disturbing examples. Regardless of the level of education of the people to whom it is addressed, culture plays the essential role into helping them make a step forward, not into justifying their stagnation, or worse, regress. Articulating a common system of values is as much needed, as it is difficult to achieve. Through values, we relate to ourselves and to everything that surrounds us.

**The usefulness of urban planning actions.** Urban planning must meet two essential conditions: 1) optimum use of natural cultural and human resources; 2) rational use of financial resources (R. C. Spânu, 2003). It is recommended the establishment of teams of specialists with different profiles: architects, geographers, sociologists, psychologists, marketing experts et al., able to present the current situation of each element taken into account, as well as the possibilities of improving it. At the same time, planning has been called upon to answer the three questions that synthesize the aims, objectives and steps to be taken in a process: What? Why? How? It makes also use of elements of forecasting, trying to determine the final result.

**A thorough highlighting of the elements that offer tourist attractiveness to the urban space.** The attractiveness of a city is usually awarded to the existence of cultural objectives, but there is a whole complex of factors that must be taken into consideration, their discovery and recovery being vital. Here they are:

a) the name of the town (its origin, semantics, changes over time and, if any, other similar names in the country/world);

b) the natural environment (his description, the explanation of its effects on the development of the locality);

c) the characteristics of the inhabitants (details of the demographical structure, qualities and defects);

d) laic cultural objectives (presentation of architectural patterns that have transformed the image of cities over time, interesting urban complexes, elements of uniqueness or similarities with other edifices);

e) religious cultural objectives (a short and useful presentation of basic concepts related to the religion to which they belong, description of specific elements);

f) important figures (personalities who lived for different periods of time in each city, highlighting the connection between their destiny and that of the urban area, the presentation of the role played by them in the cultural and economic development of the city, visiting memorial houses, teaching institutions, related to them etc.)

g) cultural events (a list of the most attractive events which take place annually in each town, their description);

h) legends and stories associated with urban space, its objectives or public figures;

i) streets, passageways, markets and parks that retains the unique atmosphere of each city (a short description and remembrance of the historical events which made them well-known, the description of the role they plays now in the life of the town/city).

**The importance of the adjacent rural area** (why should we bring it out?). According to several studies carried out by CSCDC the most attractive cities in the Transylvanian Depression are Sighișoara and Sibiu, followed by Cluj-Napoca, Alba-Iulia, Mediaș and Bistrița. The towns of basin can be placed in what we would call "a rural frame", able to keep their identity, but also add an additional value. Every town is part of a complex of settlements and never progresses independently. It is the exponent of a new way of life, of a new cultural current, but remains tributary to the past, to its initial pattern of existence. The distribution of settlements known for the development of Romanian folk traditions and crafts shows that many of them are grouped around two towns, lying diametrically opposed: Sibiu and Bistrița. Hungarian popular culture has its own centre, the village of Corund, right next to the towns of Sovata and Odorheiu Secuiesc. At the same time, over 70 well-preserved Saxon fortified churches are found in Târnavelor Plateau, in emblematic villages, enhancing the attractiveness of the towns around which they are grouped: Mediaș, Sighișoara, Agnita.

**"Recycling" industrial ruins - the German model.** In order to obtain visible effects, the cultural field requires economic support. Unfortunately, even though the European experience proves we are wrong, we still don't seem to understand the huge role played by culture in the development of the modern society (Lidia Moise, 2009). Investing money in a city's cultural legacy is not only an act of wisdom, but also a correct choice in terms of sustainable development. In Romania, small towns like Copșa Mică are waiting for an uncertain future. Beyond their distressing appearance, industrial ruins continue to astonish us by their ingenuity and complexity. Great efforts are necessary, but the results of the transformation can be amazing. The right way was already shown by Germans: in Essen, investors and local authorities have transformed a former mine into a landmark, sheltering at the same time scientific, economic and cultural events, as the industrial infrastructure was transformed with architectural ingenuity. Why did they not choose demolition as a cheaper solution? For that would mean deleting an essential chapter in the history of the place. The Zollverein complex became in 2001 a part of the UNESCO world cultural heritage.

**Solving traffic and environment problems.** As a result of industrial activities, some of the cities in the Transylvanian Depression face difficulties due to air, water and soil pollution.

Best known cases of this kind are Turda, Coșșa Mică, Sebeș, Cluj-Napoca, Târgu Mureș, Luduș. It would be absurd to claim that the solution lies in closing the factories (which would mean losing dozens and hundreds of jobs), but it is imperative to follow the legal terms (in Sebeș, for example, the differences related to formaldehyde pollution continue for several years without any effective solutions being found). Crowding and traffic jams add as negative effects of economic development, as vehicles (especially high tonnage ones) release exhaust gases and generate noise. From another point of view, drivers are often forced to expect tens of minutes or to advance at a speed of 10-15 km/h, when entering or leaving a town and public transport networks face serious inconveniences during peak hours.

**Creating a uniform and accessible database.** During our research we have encountered a series of difficulties related to the bibliographical information. Although relatively abundant, it is not sufficient to form a real image of the cultural heritage. The visits we made in each studied town have sometimes disproved the data offered by the books. The information found in tourist guides is frequently incomplete, which decreases significantly the attractiveness of cities or objectives (e.g. it is a gesture of respect towards the reader, when inviting him to discover an 18th century church, to point out at least its confession and its dedication). It is obvious that present data must be completed and corrected, an action apparently expensive and time consuming. Simple solutions, however, are always at hand: local teachers and students can help gather and synthesize the information. Benefits, in this case, will be much higher than the implementation of an information database. Students will have the occasion to discover the area where I live, with everything that it has more valuable. They will become not only proud of their heritage and able to promote it, but also able to develop communication skills and feel the benefits of teamwork. The teacher-student relationship will climb a qualitative step by leaving the classroom and sharing common values, in a new, pleasant and creative atmosphere. Data can be subsequently stored in the libraries and mayoralities, then sent to the Ministry and made available to all interested parties.

**Building education through travel: thematic circuits and paths.** The organization of urban tourist circuits and paths can be achieved on different spatial positions, depending upon the available time and the interest shown by those involved. In the following lines we present several proposals.

Travelling paths inside the city:

- a) a sightseeing tour in different time limits (one hour, three hours a day);
- b) thematic trails: "A short journey inside the history of architecture", "Churches and Cathedrals", "Chests of treasures"- discovering museums and libraries, "Forgotten faces. A journey in the memory of the city" – following its personalities.

Travelling paths within a region:

- a) multicultural heritage trails: " The Saxon Fortresses of Transylvania", " Hungarian centres of culture and civilization" etc.;
- b) trails for historical and cultural figures: "Throughout Transylvania, in the footsteps of Michael the Brave"(Avram Iancu, Lucian Blaga, Mihai Eminescu etc.)
- c) religious tourism routes: " The Monasteries of Transylvania"; "Looking for Saint Nicholas" (a circuit of Churches bearing Saint Nicholas as their patron, regardless of their confession, is an opportunity to understand how each ethnic group relates to God, through ecclesiastical architecture and art; the same type of circuit can track churches dedicated to the Virgin Mary or the St. Archangels Michael and Gabriel);

d) trails/circuits for tourism gourmet: " The Wine Roads of Transylvania.

National travelling paths:

a) sightseeing circuits tracking vestiges of the ancient towns, medieval fortresses and modern cities.

b) routes for the revival of cultural figures: "In the footsteps of Mihai Eminescu".

c) circuits/routes of exploiting the heritage of ethnic minorities: "Centres of the Armenian culture and civilization in Romania";

d) trails of religious tourism: "One journey through the Romanian heaven"-discovering the Orthodox monasteries;

e) tours of the old communist prisons, in order to understand one of the most terrible sides of the Communist regime, but also to celebrate the memory of thousands of martyrs: "Gates to Heaven";

International travelling paths:

a) paths/circuits for specific objectives: "The most beautiful museums of Europe", "Medieval Castles of Europe" etc.

b) trails/circuits dedicated to different personalities (e.g. Franz Liszt)

c) tours/trails of discovery of twin cities (panels usually located near the City Hall, or at the entrance of each town, offer a list of twin towns/cities. It is true that the friendship between towns is manifested through cultural activities and cultural exchanges, through the institutions, but they most often occur in a restricted space, without the large participation of the public).

#### 4. CONCLUSIONS

In the context described above, taking into account the cultural tourism potential of the towns in the Transylvanian Depression should be based on a thorough knowledge of the realities of the geographical space, the environmental and human characteristics, the advantages that each town/city has. The construction and application of development strategies require the involvement in this process of teams of specialists from all fields of research and the active involvement of the authorities and local communities.

Among the imperatives of the moment, we find the need for:

-defining and articulating a unitary vision of urban centres, no matter their size;

-creating an image and a special identity for each town; creating stable structures to ensure efficient and correct management of European funds;

-developing investments in areas where there is local tradition and identifying new ones;

-improving communication between cultural institutions.

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## OPEN ACCESS EVENTS AND TOURISM IMPACT ON ECONOMY. CASE STUDY: “HORA DE LA PRISLOP”, BORȘA - MARAMUREȘ

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**ABSTRACT.** – **Open access events and tourism impact on economy. Case study: “Hora de la Prislop”, Borșa – Maramureș.** Open access events have developed to a great extent over the past few years. Such events are those which take place entirely or partly in an area where the access is not controlled. Located in the south-eastern extremity of the Maramureș Land, the Prislop Pass enjoys a remarkable festival every year, usually taking place on the second Sunday of August. The event has evolved from a pastoral gathering, as it was mentioned in writing for the first time in 1373. The festival takes place outdoors, at 1416 m above sea level, around a main stage, with the audience placed in a huge natural amphitheatre. During the event one can visit various exhibitions of master craftsmen, as well as a variety of areas for the tradesmen. The festival is preceded by a religious service at the Prislop Monastery, which is located nearby, built in honour of the fallen heroes of the World War II. Our work tries to present an assessment of the economic impact of tourism associated with this festival in the year 2010, as it could become in the future an even greater attraction for the Romanian and foreign tourists.

**Keywords:** *festival, tradesmen, tourists, exhibition, impact of tourism.*

### 1. INTRODUCTION

“Hora de la Prislop” is an outdoor celebration and a folklore festival which usually takes place in the second Sunday of August on the Prislop Pass (1416 m) and reunites inhabitants and artistic bands from the Maramureș, Suceava and Bistrița-Năsăud counties. It has also acquired an international character over the last years through the participation of several foreign ensembles (e.g. “*Les Pastourelles de Campan*” from France in 2007).

This event has evolved from an ordinary pastoral gathering. In what concerns the original purposes of this kind of events, some authors claim that they originated from the Dacians’ habit to celebrate their victories in the mountains, but eventually these sites also became trading places. Ion Ghinoiu claims that these pastoral gatherings – “*nedei*” – had a connection with the celebration of the god of fire and sun ([www.cimec.ro](http://www.cimec.ro)).

The first documented mention of a pastoral gathering in this area appeared in an oronym “*Wegsaghauasa alio nomine Nedele*” (Mihaly de Apșa, p. 67, 1900 and Mihaly de Apșa, p. 85, 2009) from the diploma 36 issued on August 11<sup>th</sup> 1373 by king Ludovic in Szlvasvarad, for Balc, Drag and Ioan, the sons of Sas, in the possession of the Cuhea domain.

Ivanciuc T. and Botiș I. (2005) express the fact that in the Maramureș Mountains, during the medieval times, there existed three places for pastoral gatherings, one near the Cornu Nedeii Peak, where inhabitants from Maramureș, Bucovina and Năsăud came, a second one in an area situated between the Polonica Peak and the Șerban Peak where, besides inhabitants from

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Maramureș, there came Moldavians as well, and another one in the Farcău Massif, possibly in the area of the Vinderel Lake, where Hutsuls, Poles and Czechs met with inhabitants from Moldova and Maramureș. The latter one was held clandestinely, as a pastoral, professional fair, until 1970. Out of these meeting points, the Cornu Nedeii – Prislop area was the most important, through its geographic location (fig. 1).

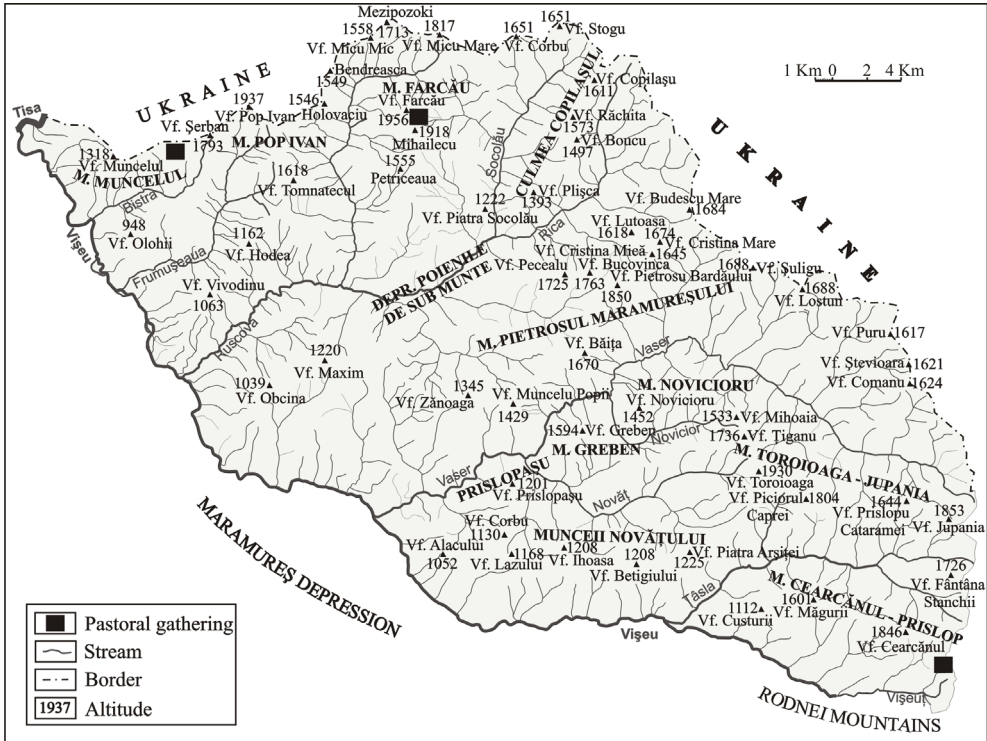


Fig. 1. Pastoral gatherings in the Middle Ages.

In 1738 a document written in Latin referred to these celebrations “of which the Austrian crown has knowledge and requires from the regiments located in the area to be more vigilant” (Mesaroș C., p. 103, in Ulian P., 2008). The existing documentation (according to Ivanciuc T. and Botiș I., 2005) recalls afterwards an event from 1847, which was banned after a rebellion. Until the First World War there had been several other sporadic events, but afterwards the tradition was completely interrupted until 1968.

The tradition of this celebration was resumed in 1968, after just a few days from the URSS invasion in Czechoslovakia – *the soviet troops passed through the area where the festival took place* – with the name “Hora de la Prislop”, which according to Timiș N. “means the unity of the Romanian nation ... and symbolises the solar circle, an ethnographic motif which was often depicted by the popular creativity” (Ulian P., p. 100, 2008). The event received several artistic connotations and also trading connotations during the last few years, with a very different appearance compared to the past.

Starting with the year 1968, this event has been held regularly every year, until present (2010), with only one exception, due to the flooding of the year 1970 (Mihali N., 2008).

The festival takes place at 1416 m above sea level, around a main stage, with the audience placed in a huge natural amphitheatre. The event includes several exhibitions of handicraftsmen (folk art, pottery, wood carving and household products), even a book exhibition (starting with 2008), as well as small playgrounds for children and areas for vending stalls. At the 2010 event there was also an exhibition dedicated exclusively to the history of the festival, a canine and a horse exhibition.

The event's organisers are the Maramureş County Council, the County Center for Promotion and Conservation of Traditional Maramureş Culture, the City Hall and the Culture House Borşa, and the festival's motto is "*Up there, on mountain top*". At their invitation, a large number of bands and vocal artists participate each year (e.g. in 2010 there were 18 groups and 15 vocal artists).

The festival is preceded by a religious service held at the Prislop Monastery, located in the close vicinity, built in honour of the fallen heroes of the World War II.

## 2. MATERIALS AND METHODS

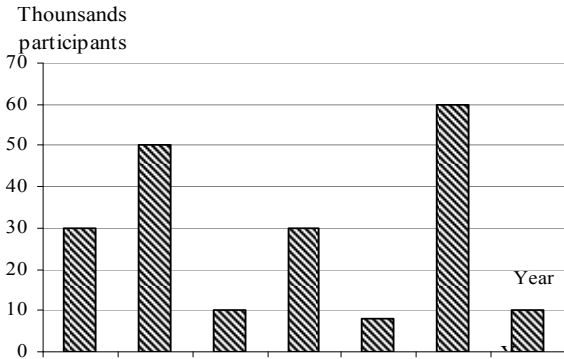
In order to justify the applications for financial support from public sector organizations and private sponsors, organisers of open access events are often invited to estimate the economic impact of the tourism associated with the event. However, many of these events are rather modest, they enjoy only small budgets and do not have the qualified personnel, neither the necessary funds, to make a proper research on the economic impact of tourism. Most of the time no such studies are made or they rely on estimations which cannot be trusted.

In this respect, in August 2010, we made an evaluation study on the economic impact of tourism associated with the "Hora de la Prislop" festival, from Borşa, Maramureş County, and its results will be partially presented further on. Several questionnaires (358) were designed for the Romanian and foreign participants, as well as for the traders. For the Romanian and foreign visitors/tourists which were present at the event, some specific aspects were considered: the continuity of their presence at the festival, information source, the number of nights spent in the region on this occasion, the place of accommodation, the importance of the event in choosing their destination, the composition of the group they came with, means of transportation, number of hours and the amount of money spent on this event, general evaluation of the event etc.).

## 3. RESULTS AND DISCUSSIONS

As it is mainly an open access event, it is almost impossible at the present moment to know the exact number of participants, due to the high level of mobility on the site.

From the previous years there are only some estimations which appeared in several sources (books, media). The number of the participants has always been large, over 10.000 – 15.000 people. At the 1968 event there were approximately 30.000 participants, while the largest number was recorded in 2009 (approximately 60.000 people), and the smallest number in 2003 (8.000 people). For the year 2010, according to our study, the number of participants rises up to 9000 (fig. 2).

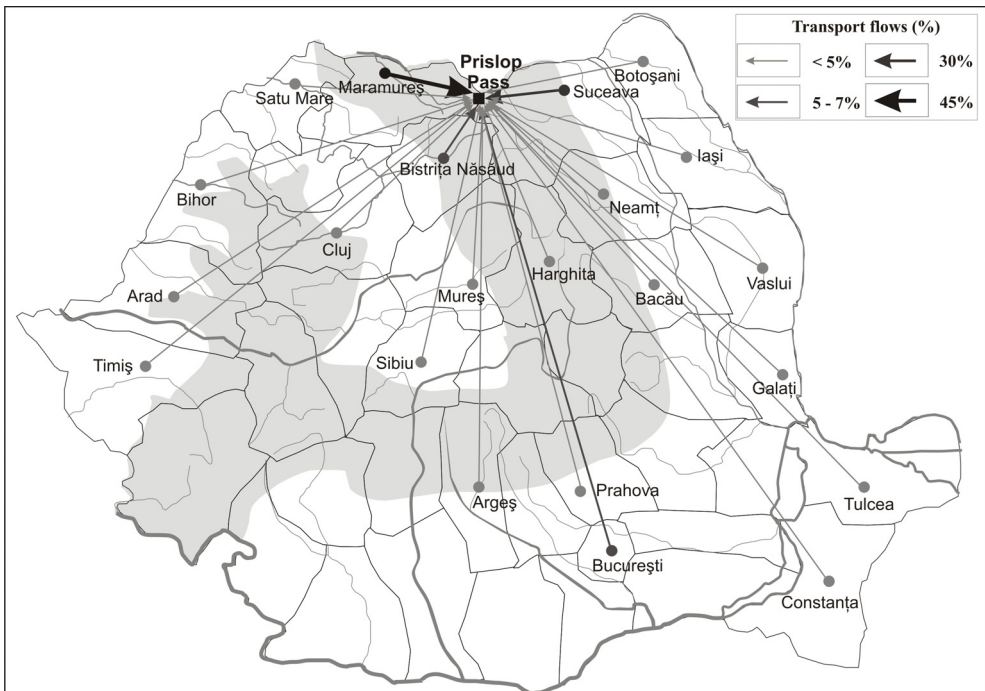


**Fig. 2.** The evolution of the number of participants (according to several written sources).

At 13 o'clock, considered by us to be the hour with the highest affluence, 891 means of transportation were identified on both sides of the pass (833 private cars, 42 minibuses, 12 motorcycles and 4 coach buses.)

During the census of the parked vehicles in the area reserved for the event, we noticed a high percentage of cars with foreign license plates (33%), while the rest of 67% were Romanian. The high percent of foreign cars doesn't necessarily point to the presence of foreign tourists, due to the well known

fact that an important proportion of the population from this region works abroad and has registered the cars in the respective countries.



**Fig. 3.** Fluxes of participants from Romania, by counties.

In the case of the fluxes of means of transportation from Romania, the highest percentages are from Maramureş (45%), then Suceava (30%), followed by Bistriţa-Năsăud and Bucureşti (fig. 3). The other counties have small percentages.

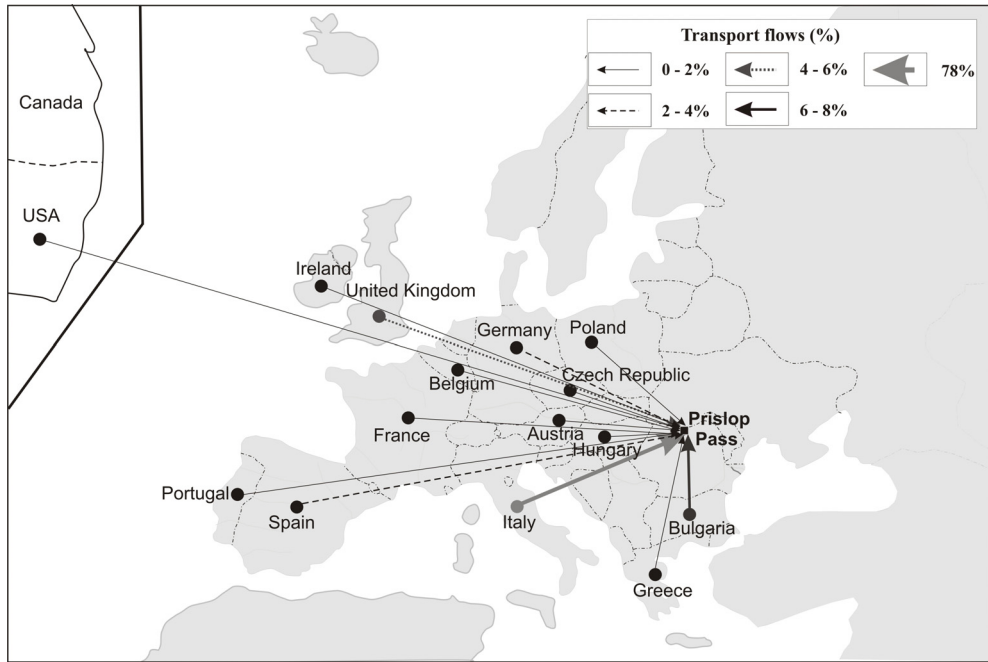


Fig. 4. Fluxes of participants, by countries.

In what concerns the international participants, fluxes from 15 countries have been identified. Italy stands out with the highest proportion, explained by us through the large number of Romanians who work there, while on the second place there is Bulgaria (possibly due to the cheaper price of license registration which has been used in this country by Romanians over the last few years). Great Britain and Spain also have important percentages (fig. 4).

Regarding the percentage of Romanian and foreign tourists, according to the field questionnaires, in 2010 the majority was represented by Romanians (93%), while foreign tourists represented 7%. The latter ones came from Germany (Berlin), France (Lille and Paris), Italy (Rome, Naples and Palermo) and Spain (Madrid), while the Romanians came from Bistriţa, Botoşani, Braşov, Bucureşti, Câmpina, Cluj-Napoca, Constanţa, Craiova, Dej, Galaţi, Iaşi, Oradea, Piatra Neamţ, Satu Mare, Suceava, Târgu Mureş, Timişoara, Vatra Dornei, Zalău etc. Naturally, most of the participants came from Borşa, as well as from the other settlements located nearby, especially those from Maramureş Land.

To the question regarding *the presence at the event in the past years*, only 16% of the tourists gave an affirmative answer, while the participants from the nearby settlements came with regularity every year.

The most important source of information for the tourists is represented by the Internet, while the local participants get their information from friends, family and posters.

The time spent by tourists on this event varies between 2 and 6 days, with the small observation that it includes the visit of the Maramureş Land as well. The accommodation locations chosen by tourist are in Borşa (65%), Vişeu de Sus (10%) and the rest in the agro-tourist guesthouses from the villages Poienile Izei, Botiza, Baraga, Săcel, Ieud, Onceşti, Călineşti and Şieu. The importance of the event in choosing Maramureş as a tourist destination on a hierarchical scale from 0 (pure coincidence with the event) to 10 (main reason for the visit) reveals the fact that only 25% of the tourists came especially for this event.

The questionnaires analysis reveals that most of the tourists came together with their family (78%), while others with their friends (20%) and only 2% alone. Their predominant means of transportation was their personal car (95%).

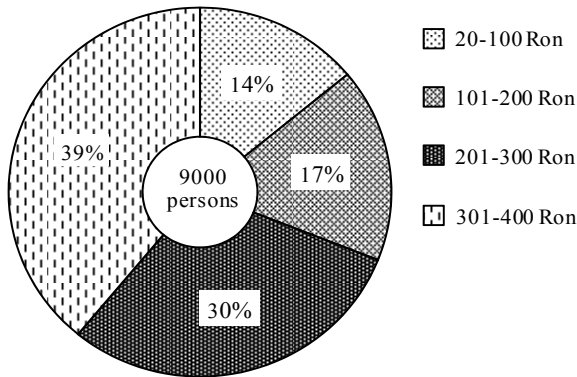


Fig. 5. Expenses generated by the event for each group.

The expenses generated by the event for each group/family vary from 20 to 400 lei, the percent of those spending more than 300 lei representing 14%. (fig. 5). Most of these costs are given by restoration and souvenirs.

When evaluating different characteristics of the event (food, entertainment, waiting time, toilets, parking) only the entertainment rose to the tourists' expected standards. However, in the general evaluation of the event, on a hierarchical scale from 0 (very

little satisfied) to 10 (very satisfied), most of the tourists place themselves in the interval 6-10 and 70% of them say they will return to "Hora de la Prislop".

For the local participants the most important reason for coming to the festival was to get some fresh air (40%), the traditional folk music show (35%), the entertainment (20%) and the religious service (5%). Most of them came with their family (75%) and friends (20%) and reserved the whole day for this event. The means of transportation used were personal cars (73%), minibuses (25%) and scooters (2%). The expenses related to the event vary between 50 – 450 lei (restoration, souvenirs and clothes). The evaluation of the various characteristics of the event (food, entertainment, waiting time, toilets, parking) positively highlights food and entertainment. The general evaluation of the event appreciates its overall quality, with some minor deficiencies, and the attendance at the next edition is indisputable.

The trading aspects were also not neglected in our study, knowing the fact that these have always had their role at such events. The confession of Nicoară Mihali is very suggestive in this respect (Graiul Maramureşului, 17<sup>th</sup> August 1990): "When the festival at Prislop took place, we would wake up at 3 o'clock in the morning and tread anxiously like restive horses. We would leave the gate open in the evening, look for our Sunday clothes in which we would secretly hide the money we had carefully gathered the whole summer. At the festival I would buy some kind of sweets, like candies on a string, incredibly tasty... Some would buy a small hat, others peasant shoes, but most of them a plastic flute".

In the questionnaires directed to the traders we targeted their regions of origin, the products they sold, their earnings etc. There is a variety of products and the traders' area of origin covers different places: *religious objects* (Baia Mare, Borșa, Fălticeni, Focșani, Oradea, Piatra Neamț, Suceava), *handicraft objects* (Baia Mare, Cernăuți, Câmpulung Moldovenesc, Cluj-Napoca, Corund, Miercurea-Ciuc, Fălticeni, Giulești, Iași, Săcel, Șomcuta Mare, Târgu Frumos), *agro-household objects* (Baia Mare, Bistrița, Galați, Suceava, Târgu Mureș, Tecuci, Zalău), *agro-food products* (Baia Mare, Bistrița, Cotnari, Dragomirești, Focșani, Galați, Miercurea-Ciuc, Iași, Moisei, Săcel, Sighetu Marmăției, Tecuci, Târgoviște), *DVDs, audio and videotapes* (Beclean, Cluj-Napoca, Sighetu Marmăției, Suceava, Zalău), *clothes and accessories* (Baia Mare, Bistrița, București, Cluj-Napoca, Dej, Galați, Gherla, Reghin, Săcel, Satu Mare, Târgu Mureș, Vișeu de Sus, Zalău), *bars, outdoor bar areas* (Baia Mare, Borșa, Bistrița, Ciocănești, Cluj Napoca, Seini, Vatra Dornei), *toys* (Bistrița, Galați, Gherla, Iași, Reghin, Satu Mare, Suceava, Târgu Frumos, Tecuci, Vișeu de Sus, Zalău) (fig. 6).

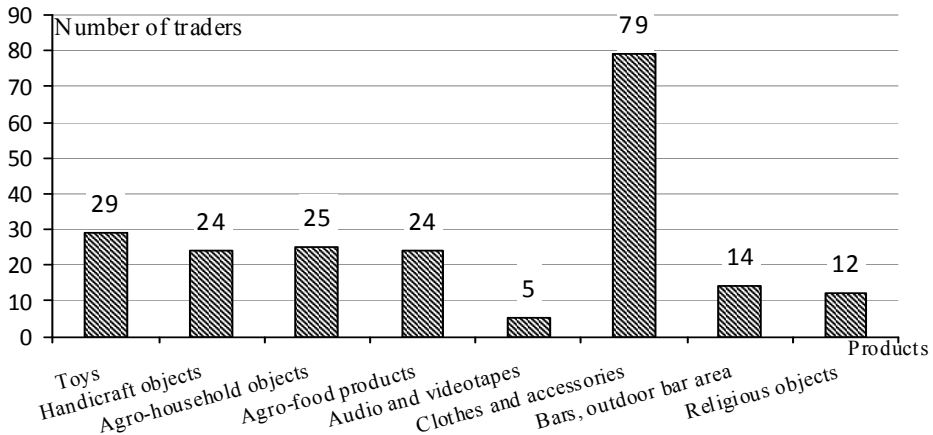


Fig. 6. Number of traders at the festival, by product categories.

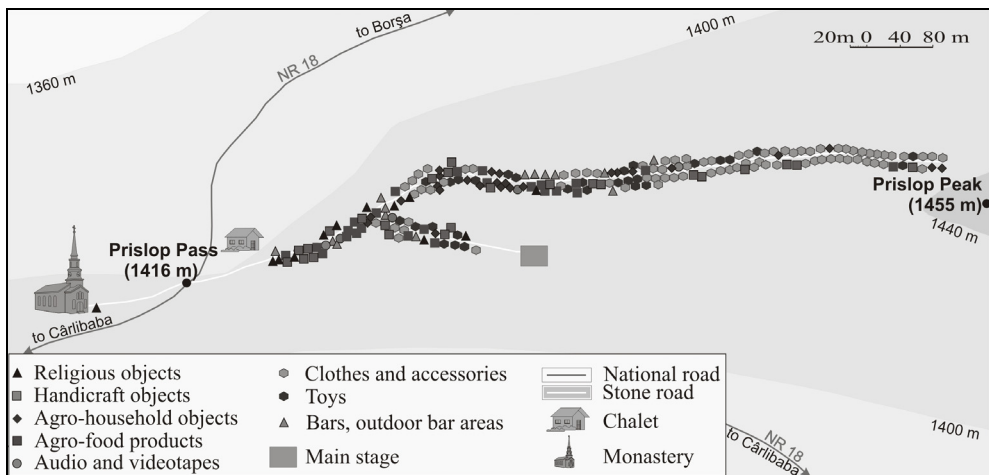


Fig. 7. Position of traders in the festival area.

The total number of traders reached 245, the most numerous ones being those selling clothes and accessories. The earnings they declared for this event rose up to 222.460 lei, but this amount is with certainty much larger, taking into consideration their fear in declaring their earnings for the survey.

In order to have an overall view on the festival area, we also made a graphic representation with the traders' position (fig. 7). Unfortunately, the presence of some particular traders, their chaotic placement and the mixture of products cast a shadow on the event, but this aspect could be easily improved in the future editions.

#### 4. CONCLUSIONS

Considering all the previously analysed elements, we consider that the "Hora de la Prislop" festival represents through its history, location and large affluence of visitors and tourists, one of the largest outdoor events from Maramureş Land and could attract even more Romanian and foreign tourists in the future.

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## FOCUS POINTS FOR A SUSTAINABLE MOBILITY IN CLUJ- NAPOCA METROPOLITAN AREA

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THORA IONESCU, C. MOLDOVAN<sup>1</sup>

**ABSTRACT.** – *Focus Points for a Sustainable Mobility in Cluj-Napoca Metropolitan Area.* From the perspective of sustainable development, transport issues represent one of the greatest challenges to metropolitan areas. This article focuses on two major directions: the first refers to a functional and environmental assessment of the current transport system in the Cluj-Napoca metropolitan area, while the second one points out several key elements to support the metropolitan area administration in developing a mobility strategy in order to ensure a systemic functioning of its territory. Furthermore, the highlighted issues are sustained by examples of good practice in some European cities that have already developed mobility strategies that contributed to improved quality of life.

**Keywords:** *mobility strategy, mobility management, sustainable development*

### 1. INTRODUCTION

Meeting the challenge of sustainable mobility is a complex matter of promoting sustainable transportation technologies, influencing people's travel behavior and transforming society's social and spatial structures (Frandsen et al., 2010).

Many of the urban transportation problems affecting numerous European countries are a combination between historical deficiencies and recent worldwide trends. While the historical aspects are mainly a consequence of the lack of both human and financial resources, the recent problems are a consequence of the strong reliance on the automobile as the main transportation alternative to provide mobility for urban citizens. Therefore, many efforts have been done to develop a new concept of mobility in many countries that would constitute the starting point to enhancing the overall mobility patterns of urban areas.

Until the end of the 1970s, the concept of mobility was predominantly seen as a matter of transportation services provision. Thus, the main problem faced by transportation planners was to match infrastructure supply with transportation demand, for both goods and passengers. In addition, the planning approach at that time was marked by: an emphasis on road transport, a priority for private rather than for public transportation, limited efforts to promote non-motorized modes and a frequent separation between land-use and transportation planning (Rodrigues da Silva et al., 2008). However, the way cities and their circulation systems are

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planned started to change in the last decades of the last century. That change resulted not only in new planning strategies, but also in the development of a new urban mobility concept. The new concept is based on the assumption that the mobility problems are not only a consequence of a limited physical access to the transportation modes. On the contrary, they involve complex environmental, economic, social and behavioral issues. These are directly connected to the physical planning of the city, to financing issues and to a system management approach to deal with mobility problems. Romania is rather deficient from this point of view, as none of the large urban areas nor the new metropolitan associations have a clear vision on sustainable mobility in their region. Transportation and traffic, despite the significant problems they create in urban areas, are mainly approached in general and theoretical terms, while the increasing urban sprawl problems, as congestion or lack of space, lead the Romanian large cities to a decline in quality of life. Thus mobility demand rises and while one of the primary objective of these cities in terms of mobility and space allocation should be reducing car use and encouraging the use of public transportation, administrative bodies still focus on hard measures as building new infrastructure or new parking lots. In Cluj-Napoca Metropolitan Area, no attempt in reaching a good management of mobility was noticed in the last years and thus this issue became more and more stringent.

## 2. ANALYSIS OF THE CURRENT STATE OF THE TRANSPORT SYSTEM IN CLUJ-NAPOCA METROPOLITAN AREA

The analysis of the current state of the transport system in Cluj-Napoca metropolitan area has been undertaken with the help of several relevant functional and environmental. The following paragraphs summarize this analysis:

- **the specific road traffic pollutants in relation to the maximum permitted legal limits.** Data related to this indicator has been provided by the Environmental Protection Agency Cluj. It is worth mentioning that throughout the metropolitan area, there is only one traffic air quality monitoring station, respectively the one located on the Aurel Vlaicu Boulevard, in the city of Cluj-Napoca. In 2009, measurements showed values close to the maximum allowable limit only in the case of PM10 sedimentary powders (7.01  $\mu\text{g}/\text{cc}$  – 48.03  $\mu\text{g}/\text{cc}$  compared to the value of 50  $\mu\text{g}/\text{cc}$  provided by the Ministry Order 592/2002). Regarding the level of other flue gas pollution associated with traffic (nitrogen oxides, sulphur dioxide, heavy metals, etc.), the report reveals that they fall within acceptable limits. However, it should be noted that in order to assess the effect of traffic on air quality, the monitoring locations are insufficient;

- **the economic development of the region expressed through the Gross Domestic Product.** For this macroeconomic indicator reflecting the market value of all goods and services for final consumption produced in all sectors of the economy within the region, only the situation in 2006 was available in the Integrated Development Plan of the Cluj-Napoca Growth Pole 2009-2015, 11524.81 respectively, below the value for the Cluj county which has been 13558.6;

-**the noise resulting from traffic.** In the analysis of this indicator, data was available only for Cluj-Napoca, considering that only the city is subject to MO 1258/2005 that establishes the territorial units responsible for designing noise maps for railways, roads and airports in their

administration, strategic maps and action plans related thereto, in their own domain, and their limitations. Thus, 8 strategic noise maps, 6 of which related to traffic noise (2 for aircraft noise, 2 for road traffic noise and 2 for rail traffic noise) have been elaborated by the Cluj-Napoca local administration. Aircraft noise has been calculated with the ECAC.CEAC method – standard method of noise contours calculation around civil airports, for calculating the road traffic noise the French national method has been used, and for the rail traffic noise, the Dutch national method. Furthermore, for each source of noise, there have been considered two noise indicators recommended by Directive 2002/49/EC, respectively *L<sub>zsn</sub>* (*L<sub>den</sub>*) and *L<sub>night</sub>* (*L<sub>night</sub>*). The noise indicator for day-evening-night or *L<sub>zsn</sub>* is associated to the general discomfort, and *L<sub>night</sub>* is determined for all periods of the night in a year and is associated to sleep disturbance between the hours 11:00 pm and 7:00 am. The documentation related to the Cluj-Napoca agglomeration strategic noise map includes data on the number of inhabitants living in dwellings exposed to different ranges of values of the two noise indicators (tab. 1).

**Number of people exposed to different values of the *L<sub>den</sub>* (dB) indicator in Cluj-Napoca**

**Table 1**

Noise source	55 - <60	60 - <65	65 - <70	70 - <75	>75	Allowed values
Road traffic	72,600	77,400	41,600	10,100	400	70
Railway and tramway traffic	5,100	3,800	500	0	0	70
Air traffic	500	0	0	0	0	70

The total number of persons exposed to daytime noise from road traffic is 202,100, a number of 9,400 from railway traffic and 500 from air traffic.

Related to the *L<sub>den</sub>* indicator, the registered values exceed the permitted limits (10,500 people are affected by noise values higher than 70 dB).

**Number of people exposed to different values of the *L<sub>den</sub>* (dB) indicator in Cluj-Napoca**

**Table 2**

Noise source	45 - <50	50 - <55	55 - <60	60 - <65	65 - <70	Allowed values
Road traffic	75,000	65,500	33,400	9,500	500	60
Railway and tramway traffic	7,000	4,400	2,300	100	0	60
Air traffic	65,400	3,700	400	0	0	60

The total number of people exposed to road traffic noise during night time is 183,800; the total number of people exposed to railway traffic noise is of 69,500, while 13,800 people are exposed to air traffic noise. The L<sub>night</sub> indicator values exceed the maximum permitted limit for road traffic (10,000 people affected by noise levels above 60dB) and for railway and tramway traffic (100 people affected by noise levels above 60 dB). The Cluj County Environmental Status Report from 2009 reveals the fact that even though during night (L<sub>night</sub>) the number of population exposed to noise resulting from air traffic is higher, the maximum permitted levels are not exceeded.

**- existing road infrastructure.** Cluj metropolitan area is crossed by the E60 highway (DN1): Bucharest – Brasov – Cluj-Napoca – Oradea – Budapest – Vienna (its length being 41,5 km). Further development of the area is affected by the Transylvania motorway project as well, as that runs through its southern part. Its length measures 33 km within the metropolitan territory. Road density in the metropolitan area equals 0.36 km/sq km, higher than the national density (0.335 km/ sq km) and lower than the county density (0.39 km/ sq km). The total length of county road in Cluj metropolitan area is 380,207 km, and that of municipal roads, 239,403 km. In terms of road traffic related to Cluj-Napoca, there are general dysfunctions caused by the lack of functional connections between the city's access points (as evidenced in the Local Urban Plan that came into force in 2009). Thus, crossing the city on the W-E (Oradea – Dej) or S-N (Turda – Zalău) directions is made through downtown, due to the lack of bypasses (morphology constraints make it difficult to create). The crossing is hampered by congestion at the entrance/exit of the city, especially at rush hours due to the insufficient lanes. Furthermore, there is a lack of functional connections between downtown and the great residential neighborhoods. Among the shortcomings of the existing road network configuration is the lack of "ring" routes that bypass the central area (the connection between the main access points – DN 1 Turda, DN 1 Floresti, DN 1C Apahida, DN 1 Baciu – passing through the center of different residential areas). Due to the lack of bypass highways, the traffic of commercial vehicles has been directed to routes avoiding the downtown area, but these routes overlap most of the time with the main neighborhood axes. The consequence of this aspect is that on these residential streets one can find all categories of traffic, leading to high levels of pollution and accidents. The municipal traffic is slow and exposed to jams. The urban traffic is hampered by the extremely high number of cars and the downtown urban architecture (made up of narrow, crooked streets and old buildings). According to a traffic study concerning the city of Cluj-Napoca, elaborated by Search Corporation in collaboration with Planwerk and the Technical University (2005 – 2007), the average speed in urban traffic is of 13 km/hour. This raises the need to develop alternatives of detours around the city. From analyzing the actual street structure capacity for the perspective of 2020, it is noticed that without the increase of traffic capacity on certain sectors and new roads, the existing main road network cannot take the foreseen traffic. In terms of road infrastructure serving the villages, roads are in an advanced state of degradation. Their rehabilitation is needed to ensure functional links between villages and communities.

### 3. KEY ELEMENTS IN DEVELOPING A MOBILITY STRATEGY IN CLUJ-NAPOCA METROPOLITAN AREA

Under urgent need for a mobility strategy and an implementation plan in Cluj-Napoca metropolitan area, the following aspects reflect several key elements to support authorities, together with some examples of good practice from foreign territorial units of the similar hierarchical level that have elaborated sustainable and functional mobility strategies:

- achieving sustainability mobility in Cluj-Napoca metropolitan area can be possible only by applying a **cyclical approach** and persistent action, the development of a strategy and implementation plan being insufficient, as the goal should be understood as a continuous process taking place on many levels: political, decisional, organizational and operational;

- the development of a vision over mobility that focuses more on **measures and concrete actions**, easy to implement, rather than insisting on theoretical aspects for the glory of the theory of planning. It is well known that many European cities that have developed an efficient management of mobility and are now considered as examples of success in the field have not had a clear from the very beginning. One thing is certain, that adopting isolated measures is not enough to improve mobility, an integrated clear vision to be correlated with that of other sectors such as territorial planning is required. In Stockholm for example, congestion fee was initiated as a way to increase government revenues, but is now actively promoted as an instrument to improve the quality of life in the region and tackling the congestion problem in the downtown area. Another example is the city of Freiburg, whose mobility policies are functionally integrated into a broader vision on sustainable development. The "green city" profile of Freiburg is evident in all its policies (environmental, energy, landscape, land use or mobility).

- **establishing measurable objectives.** An effective strategy must be based on clear and verifiable goals. Thus, when setting the indicators of the strategy, it should be taken into account the opportunities/difficulties of their implementation. These indicators should reflect the functionality of the transport system, but also some environmental issues mostly related to air and noise pollution. In Stockholm, for example, a database has been created to be accessible to all stakeholders, and monthly, based on established indicators, an assessment is made on what has been achieved and which steps still need to be taken;

- **public participation.** Citizen involvement in developing a mobility strategy is extremely important, but it must be coherently understood, and the difference between consulting the public and their proposal of certain solutions must be well specified, because otherwise chaos and obvious delays could be reached. The degree of public consultation over transport strategies varies greatly from one region to another. Region Odense in Denmark is always given as an example in this direction as it has for a long time enjoyed a culture of civilian participation. The extent to which citizens are consulted depends on the scale of the project or proposed action and its consequences on people's lives, thus the public participation is considered to be more important for a particular street traffic reorganization than for a regional mobility plan. In Zurich, however, as in all Switzerland, public participation through a referendum is undertaken for any public interest project as it is part of their culture;

- **integrated approach between land use plans and mobility.** There is a growing awareness that the integration of land use and transport planning is a crucial prerequisite for the transition towards more sustainable transport patterns and urban development that foster

interaction between people, support a sustainable economic climate and reduces negative effects on the environment (Van Nunen et al., 2010). The spatial structure of each metropolitan region determines the mobility needs of both its inhabitants or visitors, as well as the potential for alternatives in the use of car. Compact urban structures are conducive to stimulating transport by bicycle and the pedestrian transport, while polycentric urban regions or those developed along corridors increase the potential for public transport. The success of any mobility strategy can not be achieved in the absence of correlations with land use plans, therefore the two administrative departments should work together very closely. In Freiburg for example, in order to control the expansion of the city and keep the compact structure, urban planning and transport are highly correlated. Thus, when it was decided to set up a new residential district in the city – Riesefeld – first the authorities built a tram line, after which they began issuing building permits in the area, so that the extension was only made in the planned direction;

- **make use of opportunities.** The development of an sustainable urban system in general is not a streamlined or orderly process. Specific issues and concerns arise in any city and administrative bodies are expected to address them. If however, the implemented solutions become part of a generally sustainable vision, the short-term results can be the starting point or the driving force for a long-term approach. Such a vision is but worthless if opportunities are not used to start up changes. The practical reason or initial motivation to take measures varies largely from one city to another (in some cases it was mobility, in others the quality of the environment or the need for an urban depopulation etc.). Anyway, it appears that initially it was not always public bodies which translated such issues into measures that fit into sustainable mobility policies. Sometimes, residents' associations take action in an active and constructive manner, while local authorities pick up these initiatives and use them on the way to a sustainable approach. Bologna introduced a selective ban on driving through the city centre as a result of a growing chaos in the city and a high degree of insecurity. In Freiburg, the green movement came from a group of environmentally conscious residents that fight against a possible construction of a nuclear power plant in a green area near the city. This made people aware of the fact that they can live differently, even if living in a city, they can breathe fresh air and move without the car.

#### 4. CONCLUSIONS

As a result of the undertaken analysis on the transportation in Cluj-Napoca metropolitan area, as well as of the analyzed relevant case studies in Europe, it was concluded that the first step in shaping a mobility strategy would be to adopt "soft" measures (information and communication, organizing services, coordinating the activities of various partners by establishing a separate organization, changing people behavior etc.) that do not require significant financial investment and that could support the implementation of the necessary "hard" measures (transport infrastructure construction, fleet improvement, etc.). These types of measures often enhance the effectiveness of urban transport infrastructure measures (e.g. new tram lines, new roads and cycle paths). Thus, such mobility management measures in relation to infrastructure construction may have a favorable cost-benefit ratio. The most feasible measures that could be adopted are pointed out below:

- setting up an authority to be responsible for establishing the vision of mobility in the metropolitan area;

## FOCUS POINTS FOR A SUSTAINABLE MOBILITY IN CLUJ-NAPOCA METROPOLITAN AREA

- campaigns and promotions on walking, cycling or public transport;
- accessible multi-modal information on the access to a specific location (internet, road signs, etc.) for people to be aware of the various alternatives available to reach a certain location;
- stimulation towards employers to provide employees with some administrative advantages if using public transportation and discourage the use of personal vehicle when travelling to work;
- introduction of car-sharing, available on certain streets at first and expanded if working efficiently;
- introduction of some pilot projects in schools with schemes or transport plans to facilitate safe public travel for children in moving to school;
- establishment of regional transport centers for a better administration of public transportation to regional destinations, especially towards tourist destinations;
- correlation of land use plans with the urban transport plans, for example by introducing new transportation to the newly set residential areas (Buna Ziua, Floresti, Apahida, etc.) and restrict parking in these areas;
- revitalizing public transportation by both soft measures (elaboration of a statistical study concerning the needs of using these means of transport in the metropolitan area and rethinking the routes and frequency in some areas, since the Cluj-Napoca network of public transportation lines has not been adapted to the major changes in the population dynamics that have been taking place in the area in the recent years) and measures to improve the technical infrastructure (increasing number of vehicles, replacement of those with outdated environmental performance);
- expansion of the public transportation in Cluj-Napoca from the urban pole to its periurban areas, as in present mobility between them is carried out almost exclusively by private car;
- introduction of a more efficient system of taxation, unique for all modes of public transport (buses, trolleybuses, trams), which is a central element in trying to stimulate people towards public transportation;
- stimulating tourists towards using public transport by establishing partnerships between transport companies and hotels so that hotels provide visitors with public transportation tickets throughout their stay;
- mobility education campaigns in schools and universities;
- organizing training courses on Mobility Management for the local and metropolitan administration employees;
- introduction of secure and intermodal bicycle routes;
- provide with secure bicycle parking in strategic locations that facilitate inter-modal connection (the central train station, bus station, university, etc.);
- financial aid for the acquisition of bicycles or other equipments to stimulate their use.

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## GEOGRAPHICAL VALENCES OF THE NOTES BELONGING TO THE BENEDICTINE MONK RAYMUND NETZHAMMER, IN THE WORK “*FROM ROMANIA: INCURSIONS THROUGH THIS COUNTRY AND ITS HISTORY*”

AL. PĂCURAR<sup>1</sup>

**ABSTRACT.** – **Geographical Valences of the Notes Belonging to the Benedictine Monk Raymund Netzhammer, in the Work “*From Romania: Incursions through this Country and its History*”.** Geographical valences of the notes belonging to the Benedictine monk Raymund Netzhammer, in the work “*From Romania: Incursions through this Country and its History*”). Appointed priest-professor at Bucharest and then Catholic Archbishop of Bucharest, the Benedictine priest Raymund Netzhammer undertakes numerous travels through Romania, a country which he describes in detail in his notes. He ends up by loving Romania as his second homeland, promoting with assiduousness its image, a country in full development, emphasizing its economic potential, its Latinity, its ancestral traditions etc. His descriptions highlight his spirit of observation and of geographic synthesis, curiosity concerning science, his qualities as a writer, as well as his vast knowledge of history, numismatics, topography – cartography. The publishing, at the beginning of the 20<sup>th</sup> century, in the German speaking countries, of his travel notes through Romania, awakened the interest of the public for our country, a beneficial fact for the promotion of its image. The study intends to detect the major themes of the complex geographical descriptions achieved by Archbishop Raymund Netzhammer.

**Keywords:** *Transylvania, the Carpathians, Dobrudja, the Danube, monasteries, Maria Einsiedeln, grains, woods.*

### 1. INTRODUCTION

Beyond doubt, the idea of publication of the book of the Benedictine monk Raymund Netzhammer “*From Romania: incursions through this country and its history*” by Humanitas Publishing House (2010, Volume I – 400 pages, Volume II, 320 pages) is salutary because it brings forefront the travel impressions of a “*participant observer*” (the expression belongs to Violeta Barbu) doubled by erudition, friendship and leaning towards Romania, of which he had shown evidence of, by becoming Roman-Catholic Archbishop of Bucharest. Tireless spirit, “*tous azimuts*” veritable constructor, Raymund Netzhammer is part of the gallery of the great personalities that worked for Romania, for making it known.

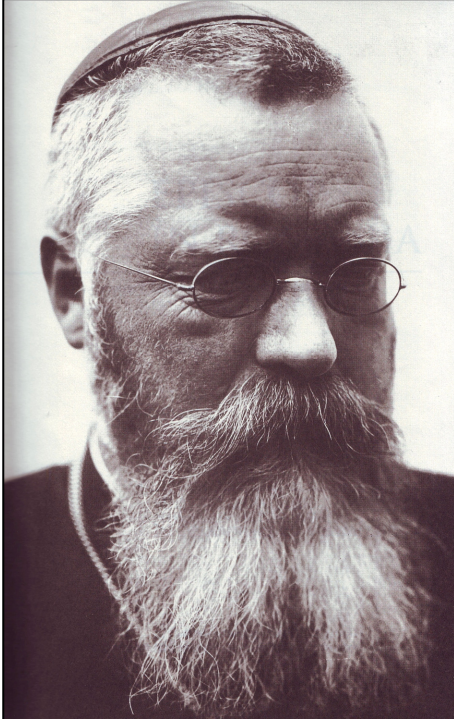
In this order of ideas, we ought to remind here, the publication in 2005, in the Publishing House of the Romanian Academy, of the journal of the Archbishop under the title “*Bishop in Romania*”, a monumental work in two volumes which sum up 1737 pages, a fresco of the Romanian society during the period of 1905-1924, in which the attentive expert of the Romanian realities, by identifying himself with its aspirations, did not hesitate to equally point out, both our qualities and our defects, for he loved Romania as his second homeland. The book, a monument of memoirs, points out the titanic personality of Netzhammer, similar to his conational, King Carol I.

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Both books were excellently translated in a beautiful Romanian language by Professor George Guțu. The memoirs journal has a comprehensive, objective and warm “Foreword” signed by Nikolaus Netzhammer, the nephew of the illustrious prelate, and “From Romania...” enjoys an excellent and synthetic “Introduction to the Romanian Edition” which belongs to the historian Violeta Barbu, to whom “the pilgrim” in the history of Romania is a “traveler” scholar, that does to us a veritable “education of sight”, being “a participating observer, a collector of images” who succeeds to return – a rare fact – “the unity between culture and nature”, as “apologist of the past and a reporter of modernization” of our country (2010, vol. I, p. 9-21).



**Raymund Netzhammer O.S.B. (1862-1945), Archbishop of Bucharest.**

The recovery, for the Romanian public, of certain similar writings, of several personalities that were marginalized, is beneficial for the resuscitation of self trust, during these moments when we are lacking models within all the fields.

## **2. RAYMUND NETZHAMMER THE MAN OR-BIOGRAPHICAL NOTES**

The future Archbishop of Bucharest was born in 1862 in Germany, in the Dukedom of Baden, at Erzingen, a location situated right on the border with Switzerland, which “maintained a common train station” with a neighboring settlement. He was one of the five children of the agriculturist (wine grower) Jozsef Netzhammer and of his wife Brigitta, born Stoll.

In his native village, “the same *allemande dialect* was spoken” with the one from the neighboring Swiss region, a spiritual center of the Roman-Catholic regional community.

In the year of 1876, at the age of fourteen, the young man is enrolled into the gymnasium of the monastery, in 1880 he enters as an apprentice within the Benedictine monastic order found there, so that in 1884 he could hand in “into the

*hands of the abbot the «perpetual monkish votes»*” (2005, vol. I, p. 1), becoming Monk Raymund, and “two years later he was ordained as priest” (*ibidem*, p. 12). Therefore, the development of his personality, his education, his formation and his life received the severe print of the assiduous work and belief, resumed in the dictum “*ora et labora*”, the golden rule of the Benedictine monks “the Benedictine Rule”, meaning “Prayer and Work”. After finishing his theological studies (1887), father Raymund was named professor of mathematics and, later, of chemistry and of physics, at the gymnasium of the monastery, having a great thirst for knowledge, an unusual curiosity, as well as an inclination towards exact sciences.

This young man, endowed with a superior intelligence, doubled by a curiosity for science that was out of the ordinary, is like quick silver: he works as a professor for the gymnasium of the monastery, writes and publishes books on trigonometry, he activates untiringly within the area

of religious assistance, he is passionate of natural sciences, photography, cartography and topography, of archive keeping and of ancient numismatics. He will be given the opportunity, on September 10, 1897, too see King Carol I of Romania for the very first time, at Einsiedeln, who was visiting there the famous monastery together with Queen Elisabeth, unassuming that this will become one of his most fervent admirers and collaborators.

When, at the request of the Archbishop of Bucharest Xaverius von Hornstein, addressed to the Monastery of Einsiedeln, in the year of 1899, for sending “*two patres for the purpose of the scientific leading of the School of Theology of the priests*” from Bucharest, the choice fell upon him and upon father Lucius Fetz, while he was on holiday, in Scotland, at Fort Augustus Monastery. As a disciplined soldier of Christ, Father Raymund leaves on a mission to Bucharest, where he will remain for over two decades and a half, fully proving his rarely found vocation, as a tireless constructor.

Once arrived at Bucharest, he is designated to be superior of the Theology School of priests, teacher of mathematics, physics and chemistry, as well as administrator of the archiepiscopal estate from Cioplea (situated near Bucharest), writing down in his diary, which he did with regularity: “*I have an even more bizarre feeling, I am sensing that here I am close, as if I was at home, in other words, that I feel good here and I am content, as if I am here since God knows when*” (2005, vol. I, p. 15).

Whenever he has the chance, the priest-professor travels to Romania, of whom he feels more and more attracted, writing down, with the accuracy of a true man of science, impressions and observations referring to the regions and institutions he visited, which he publishes in the mass-media from Switzerland, Germany and Austria, and which had a powerful echo, triggering within the conscience of the European public “*the touristic discovery*” of our country and the appetite for knowing it.

The young priest-professor and later archbishop, travelled even to the most remote corners of Romania, he visited all our monasteries where, among other things, an example of his high spiritual experiences, became passionate of the representations of the Mother of the Lord with the Child, as well as the numerous institutions created at the beginning of our state as a kingdom, from all the regions. Towards Dobrudja, he manifested a special attraction, due to its value represented by the antique archeological sites, as a realm where Christianity first emerged within this country, with the multitude of Paleo-Christian vestiges, with its martyrs who sacrificed themselves for the faith at the dawn of European Christianity.

For a short period (1902-1905) he retired from Bucharest while he was entrusted with other missions such as professor at his mother Monastery from Einsiedeln, then at the central college of the Benedictines from San Anselmo, located in Rome and chancellor at Colegium Graecum (1904)

In the year of 1905 he is appointed by Pope Pius X, Archbishop of Bucharest, who encourages him “*to be a good Romanian!*”, a mission he will honor until the year of 1924. During this entire period he becomes intimately acquainted with our country which became Great Romania, a fulfilled country, growing to love it as his second homeland. He was a witness, and most of the times, a participant at great and important events: the war during the years of 1916-1918, the Great Union, the crowning from Alba Iulia (1922), and so on.

As a consequence of several backstage schemes he was retired, in July 1924, from the position of Archbishop of Bucharest. He spent the period during the years of 1924-1927, a time of great spiritual turmoil mostly in Rome, trying to find out the true reasons of his alienation from Bucharest, where he accomplished a gigantic missionary and diplomatic work. From March, 1927, he

established himself on Island Werd located on the Rhine River, estate that belonged to his monastery from Einsiedeln, where he led a life of an ascetic in *“his position of supervisor of the holy dwelling of Otmar”*. He continues to be visited by numerous personalities, he keeps a vast correspondence, including with collaborators from Romania, and later he passes away on September 18<sup>th</sup>, 1945.

The merit of bringing forefront the life, the personality and the exceptional work of the one who was Raymund Netzhammer, his tireless activity, filled with accomplishments that honors his family, both his monastic race and Romania alike, the one who constantly remained under the word of his monastic order *“ora et labora”*, belongs to Nikolaus Netzhammer, his nephew.

### 3. GEOGRAPHICAL VALENCES – AND NOT ONLY – OF THE NOTES OF RAYMUND NETZHAMMER

Raymund Netzhammer was a tireless traveler, curious to discover the country where he was appointed to be Archbishop, who diligently noted his impressions, he described what he saw, therefore today these represent a precious source of information belonging to the great fresco of Romania from the first quarter of the 20<sup>th</sup> century.

Published in the media of that time, of German language and culture, his descriptions awoke the curiosity of the Europeans for this Latin country situated at the Gates of the Orient, and who began to visit it with an ever growing interest.

If we would integrate his descriptions within a thematic, then we would have a highly various one. The main themes of his notes are: the description of the places, of people and of their activities; the settlements (villages and cities); the monasteries; the resources of the subsoil; incursions within the history of the places; the description of the institutions of the state; the events he took part at – religious, political, sometimes mundane. Most of the times they interweave, resulting into complex descriptions, pages of a great beauty, the author succeeding in generating to the reader, visual, auditory and olfactory sensations, a rare performance, which is called *synaesthesia* by the French, due to his literary talent.

The descriptions are not merely the result of experienced emotions; they equally have a strong scientific charge, exact, precise, an attribute of the man of science that doubles Raymund Netzhammer.

He pleads for Romania, that is nearly unique in the publicistic scenery, which we exemplify with a longer quote of his, a true profession of faith: *“In my numerous travels and excursions through Romania, I have known so many beautiful things, interesting and pleasant, so it was a joy for me to outline these trips and impressions which I had gathered on this occasions. The one, who lives far away from Romania, cannot even imagine the multitude and the variety of natural beauties it possesses. It detains the peaks of the Carpathians, it holds the splendor of the mountainous massifs, and within its plateaus rich in woods and fruit trees, the charm of certain valleys and picturesque villages; the plains offer to us the images of one of the most vigorous fruitfulness, and the Danube River makes it possible for all those who research nature, hunters and fishermen, to cast a glance at a veritable paradise. All these natural beauties are easily approachable for the traveler, for the country is traversed by a dense network of railway and well conditioned highways, and besides this, as means of transportation he has at his disposal, on its main rivers, the rafts, and on the Danube, especially the boats.*

*However, not only the mountains and the plains, the valleys or the hills invite you to undertake travels through Romania, but the population of this country as well. This country has permanently welcomed me with politeness and amiability; its splendid national costumes confer remarkable colors and ambiance to the landscapes.*

*Most of the times, my travels led either to one monastery, or towards another. The monasteries are spread almost all over the entire territory of Romania and I am able to tell you more about the history of this country. (...) I visited preferably important places from the historical point of view. A particular place within my interests is occupied by Dobruja, with its Greek, Roman and Paleo-Christian memories and monuments. In the Southern Carpathians I went to Pietroasa, where Atanaric buried his famous treasure, in the Northern Moldavia I visited the ruins of the Catholic Cathedral from Baia, near Bucharest, the magnificent palace of the Brâncoveanu family, and at Silistra, the Istru, on which Ulfila led his Visigoths towards Haemus (...). My excursions through Romania caused me, permanently, great joy and delectation. I do not doubt, not even for a moment, of the fact that, whoever, might, feel encouraged by my writings to undertake such similar trips as well, will be fully satisfied” (2010, vol. II, p. 7-8).*

Being in Romania for the first time, the very first images of Transylvania are his source of inspiration for the following reflection: *<Transylvania (...) rich province and with a beautiful landscape, for whose sake Trajan led a part of his troops, in order to attack Decebalus the king of the Dacian people... The testimonies of the success of Trajan greet us starting from Arad and almost in each station. For those strong men with long hair and short bristly beards, dressed in splendid national costumes, walking in „opinci” (traditional peasant sandals out of use nowadays) and on their heads wearing a tall hat made out of sheep wool, were the Romanians, descendants of the Roman colonists> (2010, vol. I, p. 30).*

In describing Dobruja, “the geographer” within Father Raymund is revealed to us: *“Since I live in Romania, no other province of this country attracts me as much as Dobrudja. Above this corner of earth floats a special charm. What a multitude of forms did the Danube and the Sea create delimiting this province! The proud river meets the final hindrance within the hills and mountains of Dobruja, which forces it, a little bit before it finishes its course, to bear its waters towards north. And it struggles to tirelessly pierce the hard rocky massif, forming picturesque shores, overflowing each spring within the easily flooded area, filled with willows, until it eventually finds, through the large delta, its way towards the sea.*

*On the other side of Dobrudja, the sea works irresistibly, sometimes destructively, other times constructively, eroding headlands and depositing sand banks, a process through which lakes and lagoons are formed, that are spread along the sea coast starting from the mouth of the Danube until the harbor city of Constanta. Neither the inner part of this region is lacking of beauty, with its northern part filled with slopes covered in vine and on its southern side showing a sinuous relief, deprived of trees although fertile.” (ibidem, p. 241-242).*

It does not lack settlements either; for example Brăila “considered to be one of the most beautiful cities of Romania, due to interesting structure of the street texture built in the shape of a fan”, is “a land of cereals, for you could see everywhere, the uninterrupted line of stevedores, who carried wheat or corn on ships”, with “the wonderful ensemble of edifices located on the quays”, where “the numerous cylindrical recipients painted in white, situated here on the shore and from where it can be made direct connections, with the help of certain pipes, to the oiler ships in order to charge them, prove the fact that Brăila does not make commerce with grain, but with oil, the second main product of Romania” (ibidem p. 255-256).

At Vălenii de Munte where “everyone was coming and going” and where “the spirit of patriotism was taught, just as importantly as a sports discipline”, is impressed by the “entire caravan of immense barrels” with plum brandy “a drink that nowhere else in the country is better than here” (2010, vol. II, p. 221), just as in Constanza he becomes amazed with “the progresses this city presents” (ibidem, p. 159).

From Câmpina to Buștenari, where with each and every step *“the splendid and particularly clear panorama broadens, and then the Câmpina Plateau appears with its derricks, houses and factories”*, remarks the *“road that was built with much art”* that, at one moment, *“confers a especially unique view”* when *“you suddenly wake up before a forest of hundreds of derricks found one next to another and often in extremely difficult and abrupt places.”* (*ibidem*, p. 95-96). West of Câmpina he registers the same landscape, where *“beyond doubt we reached to Moreni”* where *“numerous oil derricks were raising up”* and where *“we naturally discussed about the miraculous derrick that erupts continuously for more than two months now and from where (May 3, 1910, s.n.) 120 containers of petroleum are gathered each and every day, even nowadays”* (*ibidem*, p. 97-99).

At Slănic, in *“the empire of salt”*, Director Lucaciu, the brother of the Greek-Catholic priest Vasile Lucaciu from Transylvania, guides Archbishop Netzhhammer and his secretary, priest Lucius Fetz, though the saline. While in Mehedinți Plateau, he writes about the unique natural stone bridge the following way: at *“the narrow opening formed between the rocks, we crossed it on a natural stone bridge, very wide, with a width almost similar to the one of a road...we reached to this wonder of nature from Ponoare”* (2010, vol. I, p. 283-284).

Many pages are dedicated to the inhabitants and to their ancestral activities. Therefore, *“the one who loves nature and life in the country, the one who has the sense and understanding for the peasant and his modest yard, does not have to go along Sabar on this alley of villages and will be rewarded completely according to the desire of the heart (...). We once again, find ourselves in an open field. After leaving Sabar behind (...) the splendid trees, project a continuous shade of great value. On the left side of our road, the region gains a swampy characteristic, but on the right side a black and fertile land is expanding. Today, the peasants came out in large number for the works of the field. Numerous wagons, around which the children are staying absorbed by their innocent games, prove the fact that all these people went out together with their entire families. They were plowing a lot, the women and the girls, dressed in their multicolor national costumes, were crossing across the furrows, placing the corn seeds and covering them, in two-three foot moves, within the broken-up ground. On everyone's foreheads you could recognize the joy of spring and the joy of working. What was surprising to me was the fact that, at such a small distance from the capital, you could see plows and harrows such archaic in their construction which could not be worse than these, not even during the Homeric age”* (*ibidem* p. 350-351).

About the gypsies, such a criticized ethnicity in the past as well as nowadays, the Archbishop has warm words, for he had always observed them, especially during the construction of the St. Vasile Church (1909) from Bucharest, when *“the weeks of spring and the months of summer were passed, and I was not bored at all while looking outside at the animated way of living and at the activity of the gypsies” on site. At work and while resting, while playing and jockeying, while quarreling or during times of sadness, the gypsies used to appear in images and scenes worth to remember. The images offered by the mothers and their children were full of affection and feeling. I have never seen, in my entire life, a greater maternal happiness and a brighter maternal joy than at these gypsy women working under my window. The endearment and the smiles, the head nodding and the kisses, the sweetness and caressing would not cease!...*” (2010, vol. II, p. 198).

After visiting *“the village of Germans”* Caramurat (nowadays Mihail Kogălniceanu s.n.) from Dobrudja, Raymund Netzhhammer, their conational, concludes: *“In his opinion, for this country (Romania, s.n.), the abandoning of the actual land, by this colonizing element, would represent,*

*in fact, a loss. Even if until nowadays (1908, s.n.) the other nationalities which live in Dobrudja have not yet learned anything or not enough related to the sense of order and neatness of the Germans, still there is hope that, maybe, the ulterior influence of these will be auspicious” (ibidem, p. 212).*

The attentive observer misses nothing at all, neither the architecture of the houses nor their originality or uniqueness.

Therefore, “*on the monotonous road down to Târgu Jiu*” he finds that “*I enjoyed another pleasant surprise. Oltenia, and especially, Gorj County is the homeland of those interesting fortified towers, a type of consolidated houses which in their lower sides form a tower without windows, having at the upper side a verandah with arcades where there are the windows of the rooms destined for living. It seems that this type of houses first appeared in Persia, later spreading to Asia Minor, Bulgaria and Serbia and then arriving to Oltenia. Besides this, we knew that at Curjișoara, near the capital of Gorj County, there is the most beautiful and the most famous fortified tower, based on whose model a new fortified tower was built, destined for an exposition of the centenary celebration that took place at Bucharest in the year of 1906*” (2010, vol. I, p. 309).

Passionate numismatist, an exegete in the field of the antique Dobrudjan coins, in collecting them, induces to Raymund Nutzhammer, real incursions within the memory of the places, as what they once were, enters in a dialog with himself, as in the chapter entitled “*What do my coins from Tomis tell me about?*”.

We find out many interesting things such as the high frequency on certain pieces of two divinities – Hermes and Demeter, “*the impersonations of commerce and fertility*” which “*are at home at the city of Tomis and appear in a highly significant way since the first issuing*”, and “*the spikes of the goddess of fertility, Demeter, indicates the main object of exportation, grains. That person who knows Dobrudja nowadays and experiences the joy to traverse, during a year of drought, its rich fields, during the season when the grains are nearly ripe, that will come to the knowledge of the richness of ancient Scythians, approving the inhabitants of Tomis, who were not greedy when coming to the personifications and symbols of fertility found on their coins*” (2010, vol. II, p. 106).

At the exposition of the centenary celebration from the year of 1906 from Bucharest, a memorable event during this epoch, he experienced an immense satisfaction concerning another passion of his, the one of topography and cartography. The Archbishop chronicles that “*the general Constantin Brătianu, the founder and inspector of the Romanian Service of Topometry, organized there such a systematic and rich exposition of the Geographic Institute of the Romanian army*” that he was drawn by this “repeatedly”, being able to follow there, “*not only the entire way of the evolution of the topometric system from Muntenia, Moldavia and Dobrudja, but I received even an exact idea regarding the way in which the officers measure the territory of the country nowadays and the way in which these are processed and multiplied at the Geographic Institute, all the original recording that they are doing in the field, so that this data to be available for the entire nation*” (2010, vol. I, p. 105).

This fact awoke his curiosity on the occasion of a visit at the Military Geographic Institute, led at that time by general Iannescu, as well as at the Meteorological Institute established not long ago (1884) that holds at Bucharest a “*property of two hectares, with splendid particular buildings*”. At that time – 1907 – in Romania there were 417 meteorological stations, where daily observations were performed for the Institute and 66 meteorological stations of II rank which were provided with a surface of 2000 mp and 348 stations of III rank which had the sole purpose to observe the rains. “*The material received monthly from the stations of observation is centralized for the meteorological forecast that has a monthly apparition. The same report communicates*

*the monthly average of the atmospheric pressure, of the temperature and of humidity from all the 66 II rank stations; simultaneously, from the report, you can find out which was the predominant wind during that month, for how many days it snowed or for how long it was frost, for how many days the wind blew hard, how many were unclouded, clouded or with completely covered sky, and finally the maximum and minimum of the temperatures with the indications of the specific days during that month. Then, the following is the table containing the monthly results of the pluviometric measurements from the entire country – For an agricultural country, such as Romania, the precipitations have, in a natural way, an entirely special importance.”* We also discover that at that time *“The Meteorological Institute makes exchanges of publications with 450 companies and foreign institutes (362 from Europe, 80 from America, 10 from Asia, 6 from Africa and 12 from Australia)”* (*ibidem*, p. 154-156, 164), a very remarkable fact altogether!

One of the favorite themes of Achbishop Netzhammer is that of the Orthodox monasteries from Romania, but of other confessions as well, which he visited and which he described in memorable pages, insisting either upon the place, the natural environment where these are located, upon the specific elements of architecture and iconoclastics, upon their importance regarding the history of our nation or upon their ecumenical and social mission.

Arnota Monastery – *“the national sanctuary”, “looks like a castle that thrones with splendor at the half height of the mountain”, where “there is River Bistrița, which meanders along the valleys when narrow, when larger”, on the left side of the monastery “the colossal Mountains of Lotru are rising”, and “at our feet we are able to find, in a majestic silence, the Bistrița Monastery”* (*ibidem*, p. 47), while Neamț Monastery is situated *“in the solitude of the woods, suitable for the monastic silence and for the reconciliation of the soul”* (*ibidem*, p. 61).

At the Agapia Monastery of nuns, *“surrounded by woods, above which floated, on the austere setting of the firs and of the cloudy mornings, a strange and charming melancholy”, (...)* we were shown a beautifully painted icon, covered according to the oriental custom in a golden and silver clothing, that King Oscar bestowed as a gift to the monastery, which he visited in the year of 1867 in his position of heir prince successor of the Swedish Crown, accompanied by King Carol of Romania”, and at Văratec *“the greatest Romanian nun monastery, where 415 nuns live (in 1902, s.n.) – while Agapia has only 287 – the first impression was not a very pleasant one”* due to the fact that *“the yard conferred the sad impression of a graveyard”* (*ibidem*, p. 77, 75, 79, 80).

Within the same register of impressions on the monasteries from Moldavia, at Iași he remarks Galata Church, Cetățuia Monastery, *“the great and new metropolitan church”,* as well as Trei Ierarhi which, *“occupies the very first place among all the houses of the Lord and the public buildings”,* and *“can only be compared to Curtea de Argeș Monastery”*. At Suceava, he admires St. George Church, *“a great church, which was recently renovated on the inside and on the outside, according to its style”* and that *“attracts each year, by the relics of Saint Martyr John, kept here, an immense mass of pious pilgrims”*. Alexander the Good was the one who, in the year of 1401, brought to the White Citadel situated near the Black Sea, the relics of the saint that was martyred by the Tartars in the 14<sup>th</sup> century and called John the New One, in order to be venerated here, in the capital. (*ibidem*, p. 215).

In the former capital of Walachia, Târgoviște he observes: *“no other famous church from Romania had such a profound and pleasant impression on me that this Church of the Court. Anyway, Ruler Grigore Ghica, to whom it is owed the restoration and painting of the church after the powerful earthquake from the year of 1748, was a man with a developed artistic sense”* (*ibidem*, p. 134, 137), and Church Stelea, *“built by a Moldavian Lord in the town of residence of Walachia, was the sign and assurance of the union and common belonging of the two Principalities, that fifty years ago was scarcely able to be finished completely”*.

From Govora Monastery *“the scenery of the region, first hilly, then of campaign, and finally, ascending again to the wooded hills, was captivating, due to the fact that above it floated the flickering and the golden blaze of the sunset, which allured the peasants and the countrywomen, who were working everywhere, to get out of their yards dressed in their red and white clothing, attributing them statuesque proportions. I truly understood the great man of state, Brătianu, who fell in love that much of this place since the moment he used, among the first, the healing springs from Govora”* (2010, vol. II, p. 27).

The fatigueless Archbishop studies Uspenia Monastery as well, *“the spiritual centre of the Lipovans from Dobrudja”*, situated *“at three kilometers from Russian Slava (Slava Rusă)”*, where *“the entire region breathes a profound peace, the hills are covered by dense forests and in the place where the valley grows more narrow, in the quiet of the forest, there you can behold the monastery...”* (2010, vol. I, p. 331).

On the way to Bratocea Opening he visits Suzanna Monastery *“a place of prayer found in the middle of the forest, separated from the world”* and Cheia Monastery, where he states the fact that *“I have seen the most famous Romanian monasteries, but neither one of them made such a deep and agreeable impression on me like Cheia Monastery”* (2010, vol. II, p. 226).

On Istrita Mountain, towards the places where *“Cloșca cu Pui”* (known as the Petrossa Treasure) was discovered, *“an untouched panorama, round about”* opens before him. *“An immense region of the Carpathian Mountains, of an overwhelming splendor, was unfolding in front of our eyes. It did not present itself as a range, but as a large and deep conglomerate of mountains. But the foreground of the image fascinated our eye sight the most. A wide surface of woods was reaching till the bottom, in a deep valley, getting thinner in that spot only along the highway and along a certain region occupied by a series of houses and then it ascended again on the other side up until the ridge of the mountain. This is the image of a secret quietness. Out of these dusky surfaces a white spot can be distinguished, that disperses upon the melancholic and dreamy forest the magic of an indescribable peace. It is about the whitewashed towers and cupolas of the Ciolanu Monastery of monks”* (*ibidem*, p. 260).

His high position as a representative of the Holy Chair from Bucharest and of Archbishop of Bucharest, confers to him the possibility of knowing the leading elite of Romania; he will become closely attached to few of them, for example to Dimitrie A. Sturza, or Ionel C. Brătianu (1864-1927), the prime ministers of Romania, and will never be understood by others, such as Nicolae Iorga. However, the priest, chronicles with minuteness, the meetings he had with our Romanian personalities, even the intentions he had towards these people, as it happened for example when *“our coachman was showing us a grove beloved by the inhabitants of Bucharest, a bathing place, ascending later towards Măgurele Village and pension. I did not have the intention to visit the foundation of the great philanthropist Oteleșeanu, who left his mansion and his estate as inheritance to the Romanian Academy, with the purpose to establish here a school for girls with a simple bourgeois education, but I only longed to meet Mr. I. Slavici, the director of this institute, the famous novelist of Romania”* (2010, vol. I, p. 357-358).

At Florica, the residence of Brătianu family, at Mr. Prime minister Ionel C. Brătianu, he becomes attracted to *“the lovely small church which was standing out, so gracefully and delicately, amongst its cream-colored stones, on the gloomy background of a forest”* which he ardently desired to see.

He is given the permission to visit it, and additionally, he has the opportunity to admire the panorama of the *“vineyards situated on the slopes”* where *“the plants are worked according to a modern system, and the vine that is produced is extremely delicious”*. Moreover, once arrived



at the villa of Mr. Brătianu, the small group of the Archbishop is allowed to take a glance at “his interesting library”, then they are showed a small wooden church brought from Transylvania, as well as a long and low leveled peasant house (2010, vol. II, p. 155-158).

In Moldova, at Răducăneni, “where the Catholics where approximately 950 souls in number”, the Archbishop visits the hospital where “there were 35 individuals hospitalized”, the majority of them sick of pellagra, as well as the mansion of Rosetti-Catargi family, at that time, the property of Ana Catargi. There, “in the reception saloons, truly princely, I have noticed especially the numerous paintings and portraits, which represented different events or members of the Obrecović Serbian Royal House. Especially numerous are the paintings representing King Milan and his wife Natalija. I immediately received explanations regarding the family relations between the Royal House and the old lordly family from that manor” (*ibidem*, p. 39-43).

The Archbishop had the opportunity of many encounters with King Carol and Queen Elisabeth, amongst which we present only two of them, which we believe to be most significant. In one of them, the king is presented to us, a little while after a trip on the Danube River and through Dobruđja, while “he was fully under the empire of favorable impressions, while he was feeling strengthened in body, uplifted both from the spiritual point of view and on the level of his soul as well, and profoundly satisfied with what he has seen. Numerous Danubian ports of his country, where he made stops during that travel, have well established keys and places of docking, with halls of embarking, built in a national style and as well as a long line of grain elevators. To all these are added the docks and grain elevators, as well as the great oil and wood deposits from Brăila, Galați and Sulina. All these are talking images, which confirm the progress of a Romania found in full development and of national wealth. (...) But these are surpassed by the progresses that are shown by the city situated on the seaside, Constanta”. There “the king visited not only the institutions and the public civilian and commercial buildings, but he analyzed in detail the ships, the harbor, the new great grain elevators, the equipment used for oil loading, as well as the station for wireless telegraph, by which a permanent connection is kept with the Romanian luxury cruise ships that travel to Constantinople and to Alexandria” (*ibidem*, p. 159-164).

On another occasion, invited to Peleş Castle, he has the privilege to visit “together with the great master of the castle several parts of the exquisite edifice”. At diner, seated on the left side of the Queen, who rallied from a long period of suffering, she, after learning that the Archbishop will be leaving on vacation to his monastery of origin – Maria Einsiedeln from Switzerland, “inquired about pater Nikolaus, the one with the look of an ascetic, who cared for the guests of the monastery, who asked questions regarding the organ on whose melodious notes she herself sang and she told me about the monastery cells, about the austere colors of the monasteries and, last but not least, about Saint Meinrad from the family of Hohenzollern, the founder of abbotship. However, nothing else impressed her that much at Einsiedeln, carried on the Queen, as the ancient song *Salve Regina*, that was sang that afternoon by the Benedictine monks in the holy chapel, in front of the icon of the Blessed Virgin, a song that rises from there to the heavens, each and every day, for centuries. She told to all her table companions about the beauty of the ceremony on such a tone and in such vivid colors, of which no one is capable but a poetess like *Carmen Sylva*” (*ibidem*, p. 54-55). Behold what leaders had Romania a century ago!, anchored through thousands of threads to the civilizing elites of the Occident. In this regard, it seems that today we are crossing over a much too great desert...fact that causes us to cry out along with the youth that composed the song: “I want a country just like abroad!”

#### 4. CONCLUSIONS

The publication of the book *“From Romania: Incursions through this Country and its History”* belonging to Raymund Netzhammer in the year of 1909 (vol. I) and in 1913 (vol. II) did a great service to Romania at that time. This regarded personality, known during that epoch as a devout man of the Catholic Church, doubled by a scientist, had a prepared public to whom he disseminated knowledge and information concerning our country.

At that time, Romania, an important agricultural European country, did praised efforts of industrialization, of building a modern network of means of transportation (railways, highways, harbors), of stabilizing the newly created institutions created by a young kingdom, elements that are discovered, described and offered to the European public of Germanic culture, by *“the collector of images”*, who was the Catholic Archbishop of Bucharest.

At the same time, the descriptions referring to the elements of the natural environment which confer uniqueness to Romania – the Carpathian Mountains, the Danube and its Delta, as well as the ones of the inhabitants, belonging to all ethnicities and to all social classes, especially of the peasants which he observes within characteristic aspects – the work of the field, breeding of animals, during different festivals, during other activities, are components of the colossal fresco of Romania at that time, which, like in a great puzzle, he completed with a brilliant talent, doubled by feelings of warm and sincere affection.

However, the erudition of Archbishop Netzhammer manifested itself, in all things, in its completeness, with the opportunity of “the incursions” he performed within our historical past, on various occasions, when he describes to us the monasteries and the churches, when he speaks about Dobrudjan coins, or when he recalls the past of an archeological site or of a certain location. We can assert, undoubtedly, that he is a character that experiences, with intensity, the history of the places, often from the angle of the Christian who was, anticipating illustriously the embracing of European multiculturalism, an attribute that confers uniqueness to our continent, and to the author the premonition of the promoting of the European values in achieving of what we nowadays call, unity in diversity. In this idea, when visiting Durustor (nowadays Siliistra) he wrote: *“the memory of those centuries, when the lower side of the Danube River was the witness not only of pagan culture, but of the Paleo-Christian one as well, moved me profoundly; but I was greatly penetrated to the soul by the thought that even the name of the Bishop of the Goths, Ulfila, was bound to this region and, very probably, this city Siliistra as well. Just like to the other German gymnasiasts, I was inspired to have, since my youth, a high veneration regarding this name, with who, in fact, begins the history of German literature. When I dealt with the Gothic translation of the Bible, I could say with enthusiasm, back then, the following: solitary and separated from the other literary productions that were published later and during the past three centuries, the translation of the Bible done by Bishop Ulfila, is the oldest monument of our literature, resembling with a giant fortress, besides who the needy nations of the later centuries pass by with a timidity filled with veneration”* (Vilmar, August Friedrich). *During those years of youthfulness, when I was told about the famous Bible of the Goths from Upsala, with its pages of bergamot, colored in purple, and about its letters written in silver ink, I have never become aware that the region where Ulfila unfolded his activity was located here, at the lower side of the Danube River”* (2010, vol. II, p. 131-132). Behold the uniqueness of Europe, assumed nowadays, and reproduced so well by “the pioneer” of the incursion within the memory of the locations, the one who was Raymund Netzhammer. If we also add the fact that his volumes

were accompanied by 108 illustrations, 3 maps (vol. I) and 115 illustrations (vol. II), most of them highly unprecedented, we have before us a complex touristic guide of modern Romania. This may serve as a model for handbooks which exist nowadays, and its illustrious author, for what titanic work means, done to the best interest of the community.

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## ACCESSING FINANCING PROGRAMMES IN MOTILOR LAND

NICOLETA MARIA ERCHEDI<sup>1</sup>

**ABSTRACT.** – **Accessing Financing Programmes in Moșilor Land.** From an economic point of view, as a result of the restrictive climate and relief conditions but also due to the political conditions, Moșilor Land has never been a well developed region. Added to this, the restructuring of the mining sector after 1990 and subsequently the closing of the mine at Roșia Montană in 2006 have aggravated the economic problems that this region has been facing. The degree in which the local communities and the authorities are able to access various financing sources from the county level to the international one, has become essential to the survival of the localities in the region, many of which are facing depletion due to aging, feminisation and migration of the population. The present article aims at analysing the degree in which these financing programmes are accessed at the regional but also at the local level, in order to determine which are the more active communities and to establish if there is a certain trend present and to establish its causes.

**Keywords:** *Moșilor Land, European funds, development, Roșia Montană.*

### 1. INTRODUCTION

Moșilor Land is located in the NV part of the Alba County, on the upper Arieș Valley, in the central part of the Apuseni Mountains. The region covers an area of 1068.89 km<sup>2</sup> and has approximately 44 634 inhabitants (2006). The localities of the region are comprised in 16 administrative units out of which 14 are communes<sup>2</sup> (Albac, Arieșeni, Avram Iancu, Bistra, Bucium, Ciuruleasa, Gârda de Sus, Horea, Poiana Vadului, Roșia Montană, Scărișoara, Sohodol, Vadu Moșilor and Vidra) and two are small towns (Câmpeni with 8080 inhabitants and Abrud with 6195).

The region of Moșilor Land has been confronted with economic problems for a very long time due especially to the restrictions imposed by the relief and climate that translate into low quality or unproductive soils. This makes it impossible for the local population to ensure itself the minimum quantity of food necessary for survival and as a consequence the inhabitants resulted to exploit the wood of the forests, to mine for gold and silver and to breed animals and then exchanging the products resulted from these activities for food brought from other areas. At present, the local mines have all been closed and the exploitable wood is diminishing and thus the local communities and authorities are forced to look for financing sources in order to develop new types of economic activities and to improve the local infrastructure. The ability of the communities and local authorities to access various financing sources from the county level to the international one, has become essential to the survival of the localities in the region, many of which are facing depletion due to aging, feminisation and migration of the population.

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<sup>2</sup> Commune= the smallest administrative unit in Romania, comprised of several villages

The strength of character and the pride of the local inhabitants are well known in Romania, the Moșilor Land having a special symbolism for the Romanians as it is the birthplace of many heroes that fought for the rights of the Romanians from Transylvania that were for many centuries under the foreign rule (Horea, Cloșca, Crișan, Avram Iancu, Ecaterina Varga). The historic conditioning has created in the ‘moș’ a high degree of lack of trust in the authorities and the difficult natural conditions have shaped the mentality of the locals into one typical for mountain inhabitants making them less communicative and quite conservatory. This mental traits are not very favourable to change and so is also the ‘expecting something from the state’ attitude reminiscence from the communist times when the private initiative was not encouraged. In spite of this, due to necessity and as a result of the contacts and information acquired during their travels outside the region in order to sell their products in exchange for food, in the 20 years that have passed since the Revolution some of the local communities have managed to make the mentality “leap” necessary in order for them to be able to (and want to, for that matter) access financing programmes.

Many times, obtaining financing through these programmes requires the filling of complex applications with well presented business plans that often require a high level of administrative and technical competences. It is for this reason that we believe that the ability to access financing programmes represents a faithful barometer of the adaptability and innovation capacity of the communities of Moșilor Land pointing out those with a higher chance for development.

## 2. FINANCING PROGRAMMES

In the post-communist period, the insufficient local capital has been partially compensated by the possibility to access financing programmes at national, European and even at global level, programmes especially designed for the development of rural areas. Thus, in Moșilor Land a series of programmes have been accessed: **PHARE (Poland and Hungary Assistance for Restructuring Economy)**, **IFAD (International Fund for Agricultural Development)**, **SAPARD (Special Accession Programme for Agricultural and Rural Development)**, **EAFRD (European Agricultural Fund for Rural Development)**, **RSDF (Romanian Social Development Fund)**, **ROP (Regional Operational Programme)** and others.

The **PHARE** programme has offered financing in domains like: industrial restructuring and human resources development, the assistance of micro-enterprises and small and medium enterprises recently opened, the modernisation of local administrations, waste management and education (TVET Phare- Technical and Vocational Education and Training). At present, the value of the financing obtained through PHARE in the studied region surpasses the amount of 2 million Euros. The highest number of projects financed through PHARE CES (Social and Economic Cohesion Component) at the level of administrative units is found in Abrud -7, Câmpeni -5 and Bistra-3.

**IFAD** was established in 1977, being the result of The World Food Conference from 1974. In Romania IFAD has financed only one project, the *Apuseni Development Project* in a quantum of 31.5 million USD. It offered the local entrepreneurs loans with a subsidised interest of 6.64% repayable in Lei or the equivalent in USD or Euros. The project ran between 1999 and 2006 and had as a main target the rise in the income level and in the standard of living by sustaining projects aimed at modernising the technologies for milk and meat processing, at the mechanisation of agriculture, at promoting local crafts and agrotourism etc. In Moșilor Land the financing obtained through IFAD surpassed 100000 USD.

Between 2000 and 2006 **SAPARD** offered financing in a quantum of up to 50 % of the value of the project (75% EU funding and 25% national funding). There are 29 projects that obtained financing through the SAPARD programme in Moșilor Land on the basis of the following measures: Measure 2.1 "Development and improvement of rural infrastructure", Measure 3.4 "Development and diversification of economic activities generating multiple activities and alternative income" and Measure 3.5 "Forestry". The value of the funding obtained surpasses 3.8 million Euros. Most of the projects financed through SAPARD were in Arieșeni -7, Câmpani -5 and Albac-4.

**EAFRD (European Agricultural Fund for Rural Development)** is a post-accession fund that started offering financing beginning with 2008. The main objectives of EAFRD are: the improvement of the competitiveness of agriculture and forestry by supporting reconstruction, development and innovation, the improvement of the environment and the countryside by supporting land management and the improvement of the quality of life in rural areas and encouraging the diversification of economic activities. In Moșilor Land funding was obtained in a quantum of over 21 million Euros in the areas pertaining to the following programme measures: Measure 112 – „Setting up of young farmers”, Measure 121- „Modernising the agricultural holdings”, Measure 123- „Adding value to agricultural products”, Measure 312 - “Support for the creation and development of micro-enterprises”, Measure 313 - “Encouragement of tourism activities”, Measure 322 - Villages renewal and development, improving basic services for rural economy and population and upgrading of rural heritage”, Measure 431 - Sub-measure 431.1 – Stage 3 - "Financial support for preparing the files for the Local Action Groups (LAG) selection" and Measure 141 "Support of Semi-subsistence Agricultural Farms". The total number of projects financed through the EAFRD is big, 719 projects, of which, the majority, 686 projects, funded through Measure 141 for the period 2009-2010. Through Measure 141 financing is given to semi-subsistence agricultural farms over a period of 5 years in the form of non-refundable funds of 1.500 de Euro/year/farm. In Romania, the public contribution for Measure 141 is of 476 077 390 Euro of which: 20% is the contribution of the Romanian Government and 80% of the European Union. The specific objectives of this measure aim at the increase of the market production for the semi-subsistence agricultural farms in order for them to become economically viable and the diversification of production in conformity with the market and the introduction of new products. By mapping the number of projects funded through Measure 141 of EAFRD (Fig.1.) we can see that there is a significant difference between the north and the south of the region: in the north the number of projects are significantly higher then in the south where most of the administrative units have less then 19 projects, exception being Avram Iancu with 34 projects. The most numerous projects funded through Measure 141 of EAFRD are in Albac-83, Arieșeni- 80 and Gârda de Sus -76.

**RSDF (Romanian Social Development Fund)** was established in 1998 and through two programmes initiated by the Ministry of Economy, **SDSMC (Social Development Scheme for Mining Communities)** – first phase (2004-2006) component of the programme " Mines closing and social impact mitigation" and **SDSMC-second phase**, sub-component of the programme "Mine Closure, Environmental and Socio -Economic Regeneration" (2007-2010), offered funding to projects aimed at the economic development and the infrastructure development in the areas affected by the restructuring of the mining sector. Although the entire area of Moșilor Land was eligible for funding through these programmes, most projects, 16 out of 26, were made in Abrud. For the entire region the total amount of funding obtained through RFSD surpasses 8.8 million RON. One of the main reasons behind the reduced number of projects financed through RFSD is the poor involvement from the local authorities. This is especially the case of Roșia

Montană commune that even though is directly affected by the mine closures only one project has been implemented with the help of RFSF funding (the rehabilitation of the road Gura Roşiei-Dăroaia) while the neighbouring commune of Bistra implemented 4. This is mostly due to the fact that the local authorities are still waiting for the opening of the mining project proposed by the company Roşia Montană Gold Corporation (RMGC).

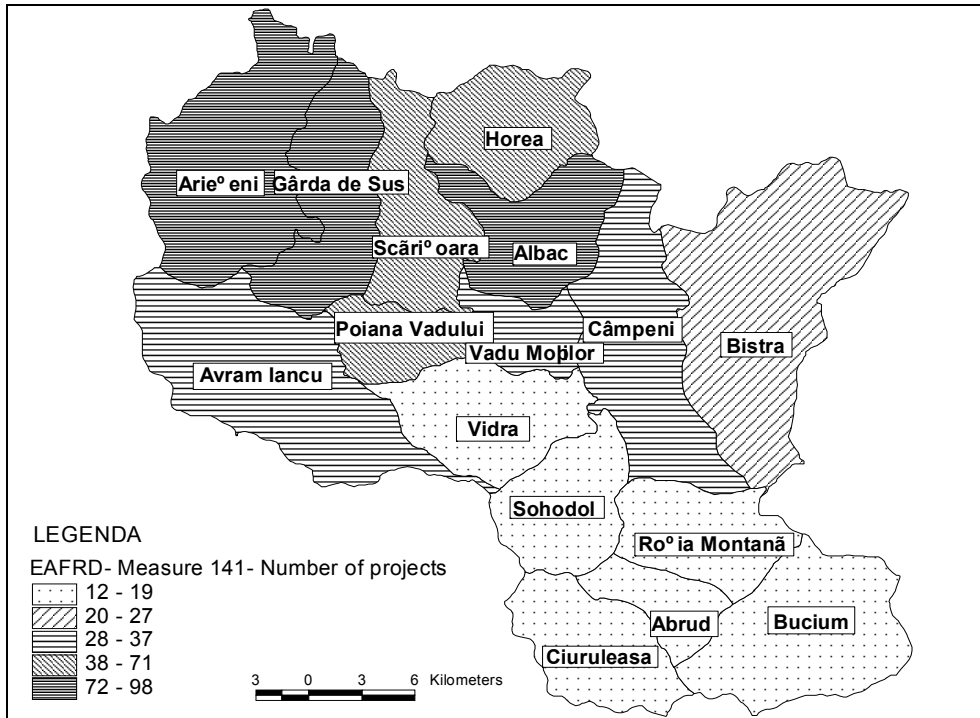
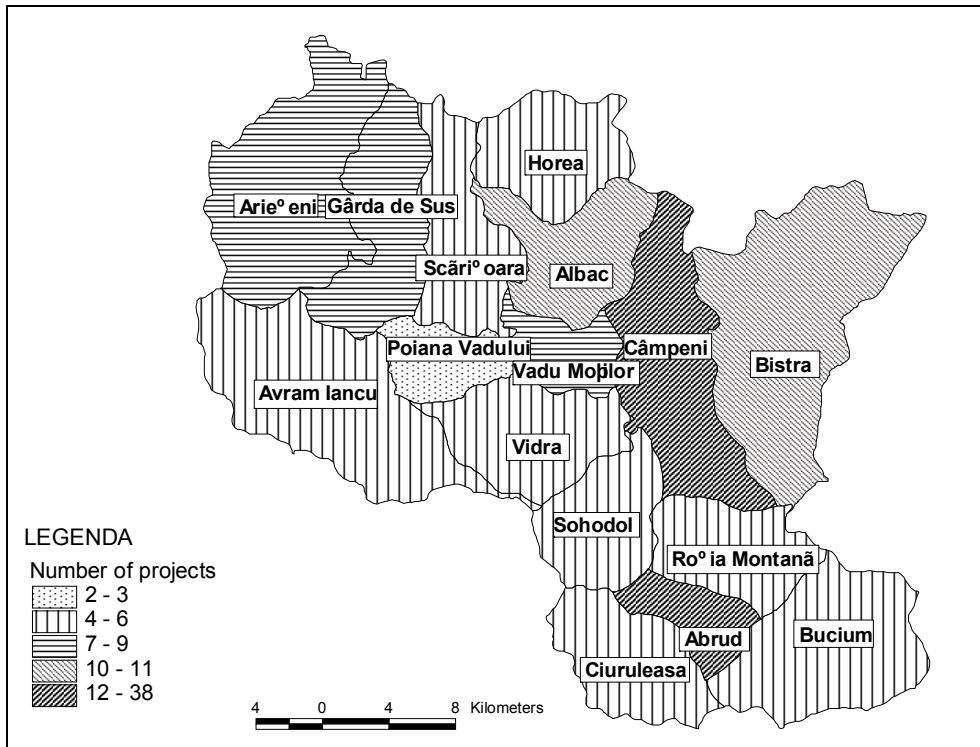


Fig. 1. Moşilor and. Number of projects per administrative unit funded through EAFRD Measure 141.

**RASDIZ (Romanian Agency for Sustainable Development of the Industrial Zones – former National Agency for the Development of the Mining Zones)** through **SGS (Small Grants Scheme)** offered financing for micro-projects designed for those groups that have a lower ability to adapt to the economic and social changes generated by the restructuring of the mining sector like: women, children, the young and the old. So far, 9 such projects have been implemented in Moşilor Land (3 in Abrud) totalling an amount of 178 034 RON.

**ROP (Regional Operational Programme)** planned to run between 2007-2013 is co-financed through the European Fund for Regional Development (EFRD) and has as a general objective to support a sustainable economic and social development of the regions of Romania and as a priority the sustaining of less developed regions and of the urban poles of growth as it aims at reducing the differences in the development of regions in Romania. In Moşilor Land have been implemented 3 projects funded by ROP. The projects of over 6.4 million RON were funded under the priority axis 3: “Improvement of social infrastructure and priority axis” and 4: “Strengthening the regional and local business environment”.

**There are other financing programmes available.** Loans for businesses were offered for 9 projects with a total value of 1 753 759 RON from the national budget through the governmental programme “*The Development of Alba County*” (thus were created 255 jobs). Other funds were offered by *The Department of International Development of the British Government*, by *The Environmental Fund Administration* etc. These funds offered financing for 18 projects in a quantum of 7 116 597 RON, 5885 GBP and 15000 USD.



**Fig. 2.** Moșilor Land Number of projects financed per administrative unit (minus those financed through EAFRD Measure 141).

### 3. CONCLUSIONS

In the entire region, there were 118 projects funded through the programmes mentioned above (without EAFRD), 45 of which obtained financing before 2005, 20 in 2005 and 49 after 2005, thus most of them, 69 were completed after 2005, a year that seems to mark a turning point in the number of projects submitted and funded. Starting with 2008, other 721 projects have been funded, this time through EAFRD, raising the total number of projects at 837. More than half of the funding offered, 90 million RON out of 139 million RON total, were for EAFRD financed projects. Here we have to make the observation that because EAFRD started offering funding only from 2008, some projects, especially those funded through Measure 141 (totalling about 22 million RON) will receive the financing gradually over 5 years following the



date the contract was signed provided that the beneficiary upholds the contractual terms. As a result, in a period of 14 years, since 1998 when the first project was funded by PHARE in Moșilor Land, the financing offered for the projects in the region surpasses 139 million RON, so an average of 9.9 million RON per year.

By mapping the number of projects financed per administrative unit in Moșilor Land (Fig.2.) we notice that again, the northern half of the region has a significantly bigger number of projects than the southern half, where just the town of Abrud, has more projects than the regional average of 9.4 projects per administrative units (minus the projects financed through EAFRD Measure 141). In fact, due to its 38 projects for which financing was obtained, it occupies the first place among the administrative units of Moșilor Land. In the northern half, most projects were done in Câmpeni-28, Bistra-11 and Albac-10, followed by Arieșeni -9 and Gârda de Sus-8. The least number of projects, just 2, (minus the projects financed through EAFRD Measure 141) were done in Poiana Vadului. The significant difference in the number of projects done by the authorities and by the communities of the administrative units situated in the south of the region, totalling 269 projects, and those situated in the north of the region, totalling 568 projects, so twice as much, is the result of several causes like: the stagnation in economy and the 10-years uncertainty created by the mining project proposed by RMGC that deferred those that wanted to invest in tourism and agriculture areas for fear of bankruptcy in the event of the mine being opened, the poor involvement of the local authorities in what regards accessing funds for projects implementation (for example in Roșia Montană the local authorities only managed to accomplish two projects financed through the above mentioned funds and programmes) and also the aging of the population, and the high mortality connected to this that affect some of the local administrative units like Avram Iancu and Vidra both with over 24% of the population over 65 years old.

Concluding, in the studied region, in what regards the number of projects financed through the programmes mentioned above, the most active, and thus with the best chances for further development are the two towns Câmpeni and Abrud and the communes of Bistra, Albac, Gârda de Sus and Arieșeni.

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## OPERATIONAL GEOGRAPHY – GNOSEOLOGICAL, EPISTEMOLOGICAL, CONSTITUENT AND APPLICATIVE REFLECTIONS

I. MAC<sup>1</sup>

**ABSTRACT.** – **Operational Geography Gnoseological, Epistemological, Constituent and Applicative Reflections.** The objectives of geographic knowledge multiplied in time alongside of the interest of people for it, which increased as they became captivated with the surrounding reality. From the familiar, to the remote and vice versa, everything passed through daily life. The approach of knowledge was always completed through the particular, then through the general and, in the end, through the applicative. The cycle of scientific geographic knowledge received enactment and a normative character. Geography received the reward of those who understood its purpose, as a gift. From description to applicability, started the establishing of the entire way of approach and of anthropological practices. Operational approach opened the door to the applicable and to the practical.

**Keywords:** *geographical cycle, normative, operational, applicative, terron, terrology.*

### 1. INTRODUCTION

The management of information concerning objects, actions and deeds leads, in time, to setting in order, to editing and grounding of rules, theories, conceptions and laws. All these edify the systemic scientific knowledge.

The changes of paradigm are only part of the mutations within the scientific bases. The expressing of the essential elements of knowledge and of the applications of useful utilization takes place through gnoseological syntagms. Such a similar benefic situation (state) is offered by the **cycle of geographic knowledge** that operates through: identification, explanatory, normative, operational and applicative. This is the only way that leads towards the crystallizing of the chain of truth. Progressively, a transition takes place within the Earth Science (geosciences), from the geography of places and actions, to the geography of the profundity of procedures, of processes.

The operational stage expressed by operational geography it is not a singular novelty, since it enunciated itself from the syngenetic point of view, with other disciplines such as the analysis of systems, informatics and cybernetics.

### 2. SCIENTIFIC CONTEXT

The faith of the sciences is cut through, based upon the experiments undertaken by those preoccupied by the geographical fractal analyses. For the geographers the following terms were crystallized in time: the **knowledge of the ensembles**, which means the great governments

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(reflected by conceptions, theories, laws); the **knowledge (deciphering) of profundity** that led to specialization until the level of artifacts (Instrumental Geography, Technical Geography, even “ex-Geography”). In regard of other sciences, even the root (stem) of the fundamental unit of operation was forgotten, which I recently suggested, the term **Terron**. Let’s take into account the fact that other neighboring domains are already operating with specific terms such as: pedon in pedology, ecotone in ecology etc.

This root word named “Terron” implies a discussion and a broad presentation, since it entails a new formulae concerning knowledge, under the name of Terrology (the science of Earth) and not the one of geography. It is a matter of semantic changes hard to clarify and even difficult to admit, motivated by the bookish habits passed on for centuries.

Operational geography has in its primary and direct attention the cycle of the knowledge of terrology (geographic knowledge): it is not accidentally named a cycle, for the chain of knowledge self-creates and follows a coherent way. A short enunciation of the components of the cycle will be of a redoubtable chance for the perpetuation of logical knowledge.

The cycle of geographic knowledge is, by excellence, an operational one and must emphasized the fact that the first stage is the one of:

a. **Identification**. This stage has as starting ground the direct observation upon the phenomenon and the definite material world.

The second stage that imposes upon the cycle of geographic knowledge is:

b. **Explanatory**. To explain means, as a matter of fact, to know the causes, to establish connections between particular data and general laws.

c. The **normative** stage has the major purpose of orientation of knowledge, of tracing of certain directions of research in the field of geography. Normative geography remains permanently with its sight fixed at the transformations (transitions) within the curricular system of knowledge, as well as upon the changes as far as the practices followed by man are concerned, within production and consumption.

d. The **operational** phase assures the transition from idea to action. The operational stage became established progressively. The attempts in the field of operational research appeared towards the end of our century in relation with other disciplines such as informatics, cybernetics, the analysis of the systems, and so forth.

If we would try to give a short definition regarding the concept of operational research we could say that the method of operational approach is the process through which models are elaborated, especially the ones connected to mathematics. These will describe the stages that will stand at the foundation of decrypting of a segment of the geographic reality regardless of the nature of the existing matter: hydrographic basins, avalanches, plateau, mountain and so forth. The ensemble of the geographic structures can be regarded as a system, whose elements are interconnected by fluxes of matter, energy and information which together co-operate in the maintaining of the internal homeostasis, however with the specification of the fact that this model is operational only when the alignment is present, meaning the feedback, the intervention upon the incomings from within the system in order to maintain the outputs at the level of certain reasonable parameters.

The concept of **operational** was displayed alongside the apparition and methodological structuring of **operationalisation**.

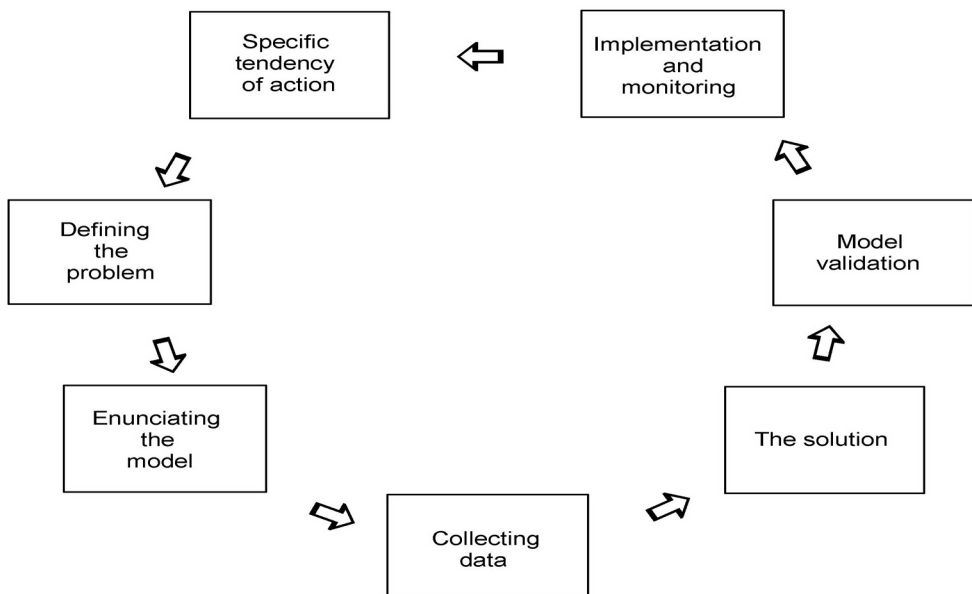
The operational stage came into view towards the end of our century in correlation with other disciplines such as informatics, cybernetics, system analysis or system analysis. The process of the operational approach is the one by which, models that have a predictable or an effective utility, are elaborated. The door towards applied geography is therefore opened.

e. The mission of the cyclic **applicative** stage is to provide the geographic demand with an effective answer. The fulfilling of the practical, under its diverse commands, confers substance to the geographic practice, therefore to the commands with veridical finality. The scientific study pursues a cyclic trajectory because the process of thinking and of acting is irreversible, without reference to the results of the research, to the confirming or infirming of the hypothesis. The cycle must be examined for several times. The applicative stage would end the approach of geographic knowledge, but the existing laborious palette of experimental techniques, developed in the laboratories and on field, must be taken into account as well. The informational geographic system provides access towards technogeography.

From the analyzed context, first and foremost centered around the operational stage, clearly results the fact that operational geography with its epistemic and constitutive connotations holds a major role in passing from descriptive geography to instrumental geography and, finally, to the applicative one. Therefore, in this way Terrology is provided with a guarantee, to serve knowledge and the practice of the **useful** modality of approach.

### 3. CONCLUSIONS

Current geography is trained, from many reasons by an exemplary palette of derivations that are auxiliary to the geofond. It is not the case to give here detailed arguments, but the reality experienced by the scientific discipline requires an appeal. The impulse comes partially from the geographic cycle, normative geography and geo-informatics. Systemic geography illustrates the transition towards operational geography and applicative geography. Operational geography aims unequivocally the contouring of certain theoretical and methodological backgrounds of research within the field of innovative geography.



**Fig. 1.** The model of research within operational geography can have, from the architectural point of view, the physiognomy stated above.

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## LANDSCAPE, CULTURAL LANDSCAPE, DELIMITATION OF CULTURAL LANDSCAPES

CAMELIA-INA GAVRA<sup>1</sup>

### **ABSTRACT.** – **Landscape, Cultural Landscape, Delimitation of Cultural Landscapes.**

Types of transformations and categories of determinant causes allow landscapes grouping into two major classes: natural landscapes and humanized landscapes, also called cultural or anthropogenic. In semantic terms, the association of the two terms: <cultural> and <landscape> was meant to clearly express the anthropogenic intervention in natural landscape transformation, thus recognising the increasing human capacity of modeling the natural landscape. These are more or less anthropogenic landscapes, arisen as a result of the civilisation progress, through the gradual transformation of the natural landscape. From the large variety of classification criteria, the analytical approach, based on causality research, allows assessing cultural landscape under functional criteria. Finding cultural landscape function involves the research of elements role and place, these determine and customize the structure and function of the entire entity. In other words, dominant elements function, provide that function to the entire systemic entity.

**Keywords:** *natural landscape, cultural landscape, delimitation*

### **1. INTRODUCTION**

Landscape, a highly disputed term, successively received different connotations according to some needs (specific to particular territories and epochs).

Over time there have been some different ways of understanding the term, each illustrating its own unique fragments of interpretation such as: view, art of gardening, an area of a state or region, image of the surface land, type of spatial arrangement, image of a major landform, etc.

Physiognomic diversity of surfaces, showing specific space systems, takes certain directions, intensity of exchange of matter, energy and information between natural and anthropogenic components of the complex. Thus, determining the causes and types of transformation, allows the action of grouping large landscapes into two classes: natural landscapes and humanized landscapes called anthropogenic or cultural landscapes.

### **2. CULTURAL LANDSCAPE AS PART OF GEOGRAPHICAL LANDSCAPE**

In semantic terms, the association of the two terms: <cultural> and <landscape> was meant to clearly express the anthropogenic intervention in natural landscape transformation, thus recognizing the increasing human capacity of modelling the natural landscape. These are more or less anthropogenic landscapes, arisen as a result of the civilisation progress, through the gradual transformation of the natural landscape.

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Thus, over time, both internationally and nationally, researching (defining, analyzing and classifying cultural landscapes) have stirred much debate. Many views expressed, came fully outlining theoretical and practical importance of the field.

According to various opinions, we can speak of cultural landscapes, called by some authors, artificial landscapes (which are more or less anthropogenic), arisen as a result of the civilization progress, through the gradual transformation of the natural landscape.

Natural aspects (physical) of the place includes local physical components such as: rock, relief, climate, soil, water, vegetation and fauna and represents the space in which people carry out various actions to meet needs. Its operations embodied in the territory as cultural elements, systemic relations and functions (expressed at various levels: between natural components, between human and natural components, etc.), constitutes the cultural landscape.

The internal hierarchical organization of the cultural landscape is based on three structural-functional hierarchical levels, from the lower level, represented by the cultural landscape element (as lower minimal structure, located at the base of cultural landscape), the middle level represented by the subassembly (is like organs that make up the human body, including elements characterized by common relationships and functions) and ending with the upper level, defined by the cultural landscape (includes assemblies with similar functions and sometimes disparate elements – i.e. rural cultural landscape includes farmland subassembly, household subassembly etc.).

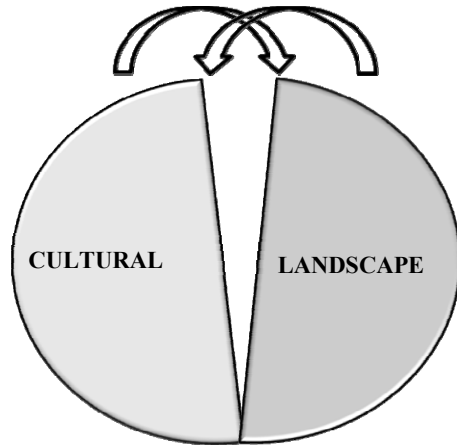


Fig. 1. Cultural landscape.

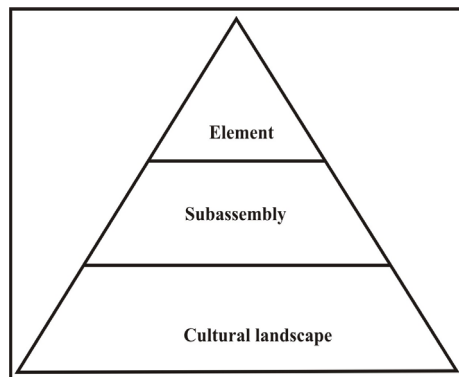


Fig. 2. The hierarchical organization of the cultural landscape

### 3. DELIMITATION OF CULTURAL LANDSCAPES

Global cultural landscape is composed of an infinity of unique cultural landscapes, resulting from the multitude of possible interactions (matter, energy and information), materialized in a given space and in a certain time.

Delimitation of existing cultural landscapes on the Earth's surface is a complex process, involving the choice of geographical scale and criteria for determining, according to the purpose and objective reality. Limits drawing is sometimes difficult, because limits most often do not take the form of continuous strips, visible, tangible and precise, but as areas of discontinuity, which marks the connection between two separate units and bearing the imprint (visible or not)

of the two. Choosing the scale at which cultural landscape research is carried out is essential, according to it being chosen as the appropriate criteria for delimitation (natural, administrative, functional, mental and complex).

**Criteria for cultural landscapes delimitation. Types of limits**

**Table 1**

<b>Criteria of demarcation</b>	<b>Type of limit</b>	<b>Characteristics of limit</b>	<b>Surface characteristics defined as a cultural landscape</b>
Natural	Natural	Irregular shape, stable, objective	Irregular shape, relatively homogeneous
Administrative	Administrative	Precise form, stable, subjective	Precise form of different sizes, heterogeneity
Functional	Functional	Irregular shape, unstable, objective	Irregular shape, relative homogeneity
Mental	Mental	Irregular shape, relatively stable, subjective	Irregular shape, subjective perceived, relative homogeneity
Complex	Complex	Irregular shape, objective, unstable	Irregular shape, relative heterogeneity

Delimitation of cultural landscapes by *natural criteria* is based on natural boundaries (landforms, water, vegetation, climate, etc.). Thus, for example, limits are high hills separating the valleys (when investigating the cultural landscape of a valley), a type of climate (for delimitation of a cultural landscape from a specific climatic zone).

Most commonly, over the territory, natural limits do not appear as continuous and precise bands, visible and/or palpable, but as areas of discontinuity, which marks the contact between two distinct natural units. In this case homogeneity degree of cultural landscape is defined as relatively high, depending also on the size of territorial area considered.

Delimitation based on *administrative criteria* is based on administrative boundaries (local, county, state, etc.), established by law. These are precise, stable and also widely accepted. Cultural landscapes defined according to this criterion, are characterized by a relative heterogeneity, derived from arbitrary administrative delineation, inappropriate to local reality (physical, economic, cultural, historical, etc.). It also finds that their heterogeneity increases with the geographical scale on which research is made (based on these criteria).

*Functional criterion* for delimitation of cultural landscapes, impose functional limits, drawn after determining the cultural landscape functions in a certain territory.

The shape and size of surface (representing the boundary) is variable in space and time. This can be altered due to elements changing function. Thus, cultural landscape can embrace new quantitative and qualitative connotations.

This type of separation is useful and necessary for highlighting the cultural landscape potential and its way of valorisation.

Delimitation according to *mental criterion*, introduced in Regional Geography by Cocean P., (2005), is highly subjective. For establishing the limits of cultural landscapes, the social components (culture and local history) and natural components, which are closely linked one to another, are taken into account. This type of limit is drawn in a manner that reflects through its elements, local cultural and historical heritage (unique and unrepeatable "genius loci").



The most frequent mental limits represent surfaces of discontinuity, which marks the contact between two different mental cultural landscapes.

The surface of discontinuity includes elements of two separate cultural landscapes. It has different shapes and sizes in the territory. Sometimes it can be also a distinctive cultural landscape (depending on the geographic scale at which it is investigated). Cultural landscapes, defined on this criterion, are characterized by a relatively high degree of homogeneity (depending also on the territorial area considered).

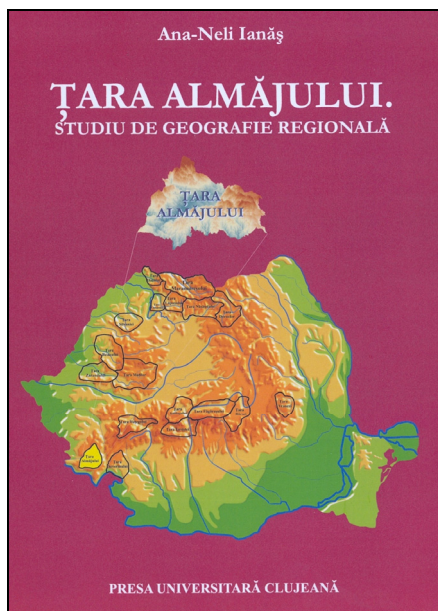
Criteria mentioned above lead to the delineation of some unique structures representing cultural landscapes that reflect, each as its own, fragments, more or less objective, of real cultural landscape. Thus, it is preferable delimiting cultural landscapes based on *complex criteria*. This last criteria includes all criteria (in various ways and proportions) examined so far. It is intended in this way the achievement of a maximum efficiency of cultural landscape delimitation by taking into account all factors involved in the cultural analysis (natural components, anthropogenic components, relationships, functions, technical requirements, etc.).

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## **RECENZII - BOOK REVIEWS**

**Ana-Neli Ianăș, *Țara Almăjului. Studiu de Geografie Regională [Almăjului Land. Study of Regional Geography]*, Presa Universitară Clujeană, 2011, 441 p.**



The activity, regarding the attempt to shape the content of this study, has started from several personal reasons, which have to be mentioned: the attendance of a very beneficial summer practical internship (10 days, in 1958, at the end of the 3<sup>rd</sup> academic year at the Faculty of Geography from the University of Cluj, under the competent guidance of the lecturers PhD Virgil Gârbacea and Grigore Posea); then, we frequently considered the interesting territory of Almăjului Land within the field applications performed with my students, land described in the synthesis *Romania's Carpathians and Subcarpathians (Carpații și Subcarpații României)* (Gr. P. Pop, 1<sup>st</sup> edition, in 2000 and 2<sup>nd</sup> edition, in 2006); the study made available to the readers by **Ana-Neli Ianăș**, analyzing, as a referent in the commission for defending her PhD thesis, *Almăjului Land. Regional Geography Study (Țara Almăjului. Studiu de Geografie Regională)*.

In addition, during the elaboration of the thesis, I was consulted several times by the author on different scientific and editing problems.

The quantitative evaluation of the study, referred to in this review, shows that it is extended on 441 pages, with 159 figures, 47 photographic images, 32 tables and 746 footnotes, as well as 4 content pages, 16 reference pages (with 345 reference titles), 12 institutions that have provided the statistical material and 6 Internet addresses, 1 appendix (4 page), etc. Moreover, this number of pages includes a *Summary* (27 pages, with 18 footnotes, 2 figures and 3 tables).

Before emphasizing the major content and structure features of the reviewed study, we have to underline, among others, two very important aspects, *the originality* and *the inclusion of all the issues according to the most specific aspects of each situation*.

Regarding the first aspect, we have to mention that the reviewed study, known more or less detailed on a multitude of geographic features in connection with other sciences as well, has not been approached in a very broad emphasizing context of the entire complex of issues of the regional system. The approach has been in direct relation with the proper determination factors, fact that has imposed the attention on this direction, thus resulting the elaboration by **Ana-Neli Ianăș** of the study "*Almăjului Land. Regional Geography Study (Țara Almăjului. Studiu de Geografie Regională)*" (the 10<sup>th</sup> "land" that represents a PhD thesis in 2010, from the total of those that have been studied through this system so far). The second aspect has benefited from a special attention of the author, who has managed to analyse, in the most suitable way, the variety of all the issues, taking into account the specific features of the theme in terms of the whole, as well as of the subunits forming the special and original unit from Banatul Mountains, Almăjului Depression, representing one of the "lands" from the territory of Romania, object of PhD theses conducted in the most competent manner by *Prof. PhD Pompei Cocian*, who has recently told me that it is the most valuable study so far in the category of the studies on the "lands" from the territory of Romania.

The entire study is drawn up following the *proper logic succession* and *according to the modern scientific research requirements in the analysed field*, the success being possible as a consequence of a large and profound field research, during which the author could gather, considering all the aspects, a very rich material that has been processed in the most adequate manner and, then, transformed into numerous cartographic representations. Moreover, we have to emphasise the thorough reference documentation, meaning the use of a very rich specialty literature from the fields of Geography, Geology, History, Sociology, etc., allowing the easy solution of the entire complex of issues, regarding the interpretation of the results found up to that moment, as well as the research methodology needed in the analysis and the elaboration of the study.

The thorough reading of the study reveals the inclusion, the analysis and the presentation of the entire material in a *balanced manner, in the proper logic succession of a scientific content*, all these making it easy to understand the multitude of components regarding *the geographic and regional specificity* of the depression from the Nera Valley, “Almăjului Land”, very well protected by Aninei, Semenicului and Almăjului Mountains and Cărbunari Plateau, the last two units hindering the “land’s” “access” to the Danube.

Using the most natural and appropriate procedure in the drawing up of any study from this category, the present study has synthetically taken into account, from the beginning, *the theoretical and methodological aspects* required by the elaboration of the study, followed by the issues of *the history of the territorial system research*, proved by the richness of the specialty literature consulted.

Special attention has been paid, through the scientific approach, to the dimensional consistency, the thoroughness, etc., to the component related to *The Delimitation of Almăjului Land*. We can state that the entire set of issues related to the definition and the geographic originality of the analysed space has been considered while elaborating the study. Without detailing the content of this chapter, we firstly mention the approach of the issues regarding *the concept of limit* (theoretical aspects and the limits of Almăjului Land) and, then, *the criteria used in delimiting Almăjului Land*, which are very diverse, such as: the mental criterion (identity

and mentality of people from Almăj, the folk culture reflected in the material and spiritual values, the uniqueness of the space in the vision of the local people, etc.), the historic evolution and the role of the political and administrative criterion in defining Almăjului Land (the Daco-Roman period, the Middle Ages, the Habsburg domination, the militarisation of the villages, the Austro-Hungarian ruling, the interwar period and the period of the Second World War, the socialist regime, the current political and administrative limits). The chapter ends with the synthetic presentation of the landscape and functional criteria, defining the personality and the originality of the geographic space corresponding to Almăjului Land.

Of course, as a specific component of Almăjului Land, as well as a factor of determining the human presence, under all its aspects, in the analysed territory, the study takes into account, according to the entire set of requirements of the current scientific research, *The natural component of the regional system of Almăjului Land*, following the adequate logic succession. Consequently, the analysis starts from the “splitting of hairs” of the issues regarding the landscape, respectively *the morphologic component*, which talks about the aspects regarding the paleogeographic evolution and the geologic structure, the role of the relief (orography) in the territorial shaping of the analysed space, the specificity of the morphometric elements of the relief and its genetic types, all these allowing the emphasis of the favorability and/or restrictiveness features of the space from Almăjului Land, as well as the regional aspects of the relief based on the economic functionality criterion.

The same thorough analysis, compliant with the requirements of emphasising the specific features of the intramountainous space located along the Nera Valley, is considered in the presentation of the other components of the natural environment: *climatic*, consisting of the general features and the main climatic elements (air temperature, sunshine duration, nebulosity, precipitations and wind), based on which aspects regarding the local climatic differences and the differences in terms of favorability/restrictiveness in the human presence and the carrying out of activities by the local people could be observed; *hydrologic*, brought into discussion through the presentation of the general features of the hydrographical network, of the water runoff features and of several aspects related to the

water on the territory of the unit, as well as *bio-paedo-geographic* (vegetation, fauna and soils). Each of the mentioned elements has been presented considering the most characteristic features on the territory of Almăjului Land.

Having solved two of the essential issues connected to Almăjului Land at a high level of profound scientific analysis, meaning the entire set of issues regarding the definition of the studied territory and the analysis on the geographical and physical component, the author has at hand the premises to observe the complexity of the second fundamental component of Geography, **the Human Geography**, which must be emphasized in its natural succession: *man*, then *household* and *activities* unfolded by the human being of the Earth. Systematically observed, according to the most natural logic, the author firstly considers the issues related to the *Geodemography of Almăjului Land*, as an essential element of any territory, within which the following have been analysed in normal succession conditions: the duration of the human inhabitancy on the analysed territory (Neolithic, metal age, Daco-Roman period, the Middle Ages, etc.), the evolution of the number of inhabitants in connection with the constituting elements (natality, mortality, natural growth rate, entries and exists of inhabitants and migration rate, the general rate resulting from the two rates) and the spatial distribution of the population (expressed through the density index), followed by the structural categories of the population (sexes, age groups, ethnicity, language, religion, households and social and economic status, professional status), the presentation of the entire set of components related to the inhabitants of the analysed space being performed through the emphasis on the main specific features.

In the most natural manner, the analysis of the geographic and human side of the intramountainous territory on the upper course of the Nera Valley is continued with the analysis, according to all the current scientific requirements, of the **Habitat Component**, taking into account the following: *determining factors in the occurrence, the shaping and the continuity of the settlements from Almăjului Land, the specificity and the typology of the 16 villages from the "land"*, located according to the relief forms, to the structure and texture, to the geodemographic dimension and to the role. This part of the study is concluded, in a very

comprehensive manner, with the observation of *quantitative indicators* that allow the emphasis of the features of the settlements and, then, the emphasis of the *types of rural landscapes* of the space subjected to research. Regarding this part of the study, without claiming that the appraisals on the author's entire activity are relevant, we underline the research accuracy and the presentation of the most specific features for the habitat component of Almăjului Land, including the panoramic manner of capturing the settlements.

The penultimate part of the study, the **Economic component**, which corresponds in fact to the main *activities* carried out by the population, has been carefully analysed, as well as the previous components, the presentation of the entire content being performed based on the well-selected references, the processing of a very rich statistical material and the intense field research. The result of such an analysis allows the inclusion in the study, according to the most professional conditions, of the specific aspects of the basic sectors from the component taken into account.

Of course, according to the territorial reality of Almăjului Land, the analysis starts from the primary sector – *Agriculture* – observing the natural, social and economic and organisational premises of the agricultural activities from the period up to 1990 and, after this date, for each of them, observing in a very comprehensive manner the plant culture and rearing.

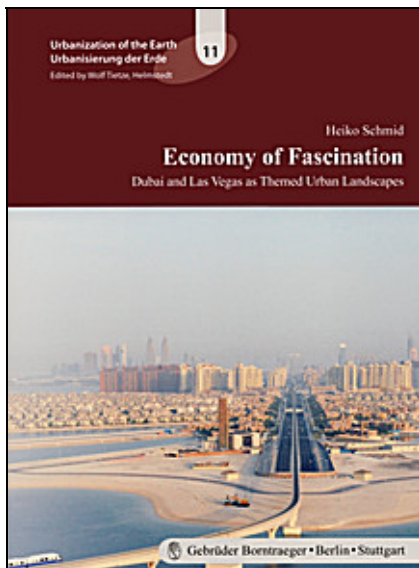
In terms of presence, degree of development and specificity, the study presents aspects related to: *the industrial activities*, emphasising the industrial types and revaluation forms during the period before 1990 and from this date up to the present; *the economic exchanges and relations, the communication and transportation ways*, as well as *the tourism* (natural and anthropogenic tourist resources, the tourist infrastructure and the SWOT analysis of the tourist phenomenon), this last activity being considered an alternative for the regional development of Almăjului Land.

The study drawn up by **Ana-Neli Ianăş** "*Almăjului Land. Regional Geography Study*" (*Țara Almăjului. Studiu de Geografie Regională*), as a PhD thesis and made available to the readers as well, ends, as a synthesis, with the specific features of the *Regional Chorotype of Almăjului Land. Aspects referring to the regional development*, emphasising the most necessary conclusions of any study of such dimension

and value: the originality of the theme referring to the territory analysed, the comprehensive reevaluation of the specialty literature, the detailed observation of the land and the careful processing of a very rich statistic material, the inclusion and the analysis of the entire complex of issues on the theme in the most adequate logic, etc. Besides all these, we have to underline the special quality and the richness of the visual material (graphics, maps, photographs), allowing accessibility while reading and understanding the present study.

**GRIGOR P. POP**

**Heiko Schmid, *Economy of Fascination. Dubai and Las Vegas as Themed Urban Landscapes*, Berlin, Stuttgart, Gebrüder Borntraeger, 2009, 272 p.**



59 figures, 3 tables, 2 appendices, 24x17cm, 840 g.  
 Language: English; from Series  
 “Urbanization of the Earth”, Volume 11.  
 ISBN 978-3-443-37014-5, bound

Regarding to the author’s statement in the preface, this current book is the result of a work originally conceived to be a research project on artificial constructed worlds, investigating two desert cities, Dubai and Las Vegas, under the title *Artificial Oases*, but with

time, it developed to be more. Experiencing the fast growth of these cities since 2003 – especially visible in the case of Dubai – the research project has developed too, and became to adopt much broader scopes, like the examination of almost all the aspects of life in these cities, in sectors like media, consumption, economy, urban development and recreation.

The book is structured into seven chapters, every chapter, on its turn, being divided in two or more subchapters. The first chapter, being defined in the same time as being *Introduction* too, has as title *The Themed City*, and contains the definition, in the terms given by the author, of two basic concepts around which the whole writing is built, urban governance and experience orientation, since – as the Author formulates – *In the Age of Globalization, theming and attractions have long since lost their status as rarities. An experience orientation and hedonistic lifestyle have become a norm.*

The second chapter, “*The Economy of Fascination*” as *Research Perspective* brings an inter- and multidisciplinary approach to the issue of “*attention economy*”, concept which covers the sum of information, services and goods in entertainment- and fascination industry. Through the very comprehensive analysis, the author is giving proof not only of his/her knowledge regarding Semiotics specific to this particular field of research, but also to an exhaustive research work produced in the fields of sociology, psychology and economic sciences too.

The third chapter, *Dubai and Las Vegas as Examples of Themed Urban Landscapes* is actually the first unit which is focusing practically on the two urban units. *The Rapid Rise of Dubai. From fishing village to commercial metropolis* consists in presenting the modern History of Dubai, its evolution from traditional fishing village through the boom of the oil value till a world metropolis having unprecedented rich, based now on luxury tourism and commerce, with all of its impressive buildings. The other subchapter is the introduction into the history of Las Vegas, having only with a few decades longer development story than Dubai, from a *railroad hub and gangster town* into the neon city and gambler’s paradise which is now (and also the fortress of adult entertainment industry).

The *Corporate-Driven Governance: Actors and Alliances* is the chapter in which the author is focusing on the role of actors involved in

entrepreneurial urban policies of the two cities, like corporations, politicians, and the managerial practices of urban-driven corporate governance, with a special accent on competition entrepreneurship in constructions, but also in entertaining industry. The fifth chapter, the *Attention-Binding Strategies and Media Staging* is perhaps the best part of the whole work, all the three of its subchapters – *Hit parade of Superlatives: Attractions that Draw Attention*, *Destination Management and Marketing* and *Theming and Media Spectacles* being a real masterpiece of presenting the values of the two cities in cause.

The sixth chapter, *The Dark Side of Success* is shadowing a bit the glamorous image, and describes negative effects of glory and glamour of the two urban units, starting from ecological destructions - like high water and energy consumption, with all of their secondary effects - societal gaps and segregation. Most of these problems are the same in the case of the two metropolis, but there are differences too: since ethnic segregation is pretty characteristic to Las Vegas – despite all the anti-racist policies promoted by most of responsible American politicians – in Dubai the major cause of social unrest is lack of democratic institutions of representation, unions, not being allowed to operate in Dubai, which makes most of the immigrant workers real or potential targets of exploitation from their employers. The conclusions of this chapter are synthesized under the title *The Vulnerability of Success*, which also examines the impact of contemporary global economic and financial crisis on the two city economies.

The relatively short closing chapter – consisting only of less than seven full pages – is the synthesis of this present research projects, but also the suggestion of some future work, available in this particular field of research, a special accent on the role and importance of staging being given through the whole idea, the author considering that political and cultural aspects are playing nowadays a secondary, subordinate role comparing to the practice of staging in urban development and service-centered urban economy.

The whole book is well-documented. Based on an exhaustive bibliography - 21 pages being occupied only by titles of books published in

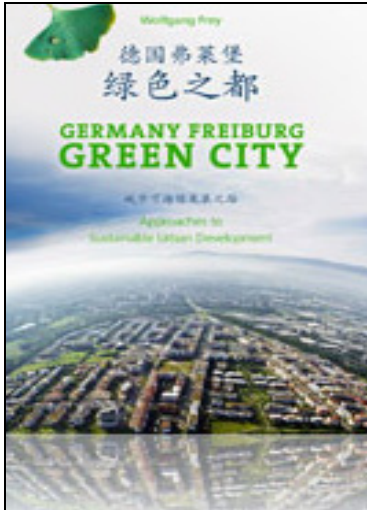
this specific field - surveys and representative interviews, well - illustrated with photos and graphics reproducing statistical data for a better visual understanding, it contains lots of valuable and often daring ideas. The analytical approach is built first on general trends and lines of development, to which the two case-studies are only some well-documented illustrations. With all these, we consider that even if this present book is a valuable and important contribution, worthy to be appreciated even in superlatives, this particular field of research has lots of other aspects which weren't completely exploited, yet. We just hope that this is going to happen in the nearest future, since they represent not just sums of empirical knowledge, but have lots of practical accents, which can bring to us for a better understanding of certain standards and phenomenon of our own contemporary society.

**Artur LAKATOS**

**Wolfgang Frey, *Freiburg green City, Wege zu einer nachhaltigen Stadtentwicklung, Approaches to Sustainable Urban Development*, Freiburg-Basel-Wien, Verlag Herder GmbH, 2011, format 18x23 cm, 208 p.**

This present, bilingual book represents a contribution to a relatively recent, but very important approach to urbanization processes, the issue of sustainable, eco-friendly processes in contemporary urbanization process.

The author is architect by profession, having strong ecological values in the same time and also a local-patriot. In this later regard, his shared values met a recent positive challenge for his home city: Freiburg was one of those 55 cities from around the world that were invited to present concepts related to the subject "Better City-Better Life", at the Expo 2010 in Shanghai and Wolfgang Frey was one of the members of the team who represented the German conception of sustainable urban development. This event also contributed to the publishing of this book, even if the author is using on its pages his previously gathered experience and knowledge.



Freiburg is a Green City in many senses. It is located right beside the famous Black Forest, the source of the Danube River, and one of its unofficial nicknames is “the ecosolar capital of Germany” because of its use of solar energy. But – the author argues – there is still a lot to be done until the city can be considered to be in its true sense, a Green City.

The book is well-illustrated with photos, maps and statistical data, and also by personal statements of currently living citizens of Freiburg. The whole structure having 204 pages is dominated, metrically speaking, by photos and illustrations, leaving less space for written texts. And even if the book is indexed under Wolfgang Frey’s name, he is not the only author of it: in case of certain chapters, other competent personalities contributed too, like Gerhard Kiechle, the mayor of Eichstetten, the well-known fiction-writer Annette Pehnt and several major public personalities, involved in activities like architecture or solar energy management, who contributed with short – at most two pages – writings on the diversity of this present book.

The structure of the book is simple. The preface is followed by Frey’s *Thoughts on Sustainability*, in which the author expresses his thoughts and knowledge about general characteristics of sustainable development, and the way how its values are related to architecture and urban planning.

The second chapter, *The Green City*, is a synthesis of why Freiburg can be considered to be today – of course, using not absolute, but contemporary European and global standards – to be a Green City, and what can still be done for the improvement of this current situation.

The third chapter is dealing with the presentation of the Rieselfeld project, a whole new-built suburb – when complete, it will encompass around 4500 apartments and offer housing for between 11 and 12 thousand persons – and which is built in a previously undeveloped large area of the city’s western border, the whole project being conceived on principles of sustainable development.

If Rieselfeld is still a project, the Vauban District, presented in the following chapter, is already a result, and illustrates the successful transformation by planned urban development. Probably the best written unit through the whole book is the chapter dedicated to the issue of energy potential in the particular case of the city of Freiburg. Starting with a statement regarding the limits of fossil fuels, it argues for the necessity of using renewable sources of energy, like holistic (wind), geothermal and solar energy.

The last chapter, *Life in Freiburg*, is created by the living citizens of the City itself, and contains their personal statements - among the interviewed ones being native Freiburgers, Germans moved from other cities and newcomers from other countries than Germany – Cameroon, Ethiopia, Italy. Even if we didn’t read their statements, we knew that all of them are happy in the city of Freiburg – since the author and his fellow editors has to prove a constructive approach.

If we want to discuss the issue from the point of view of rigid methodological principles, this pre-determined approach is damaging the quality of the whole initiative: but we also have to admit that this book, beside its Scientific value, has an important role in advertising and promoting some values too, so we consider these personal statements as being written illustration – beside the visual ones, which consists in beautiful, color photos – of Freiburg’s capacity of being a truly Green City.

We consider this present book, beside its promotional role, to be an important and valuable contribution for understanding of what



Green Urban Planning means today and what can and should mean in the future. Therefore, it should be just a beginning of a whole series of similar publications in the future. A series of publications, whose ideas should be put in practice, in the future.

**Artur LAKATOS**

**Greceanu, Olga, *Testimony in Word and Image. Vocabulary of Faith and Spiritual Life*, 2011, vol. 1 (A-E) – 419 p., vol. 2 (F-M) – 428 p., vol. 3 (N-Z) – 424 p., big format, with numerous drawings, maps and plans, The Bible and Orthodox Mission Institute, Bucharest.**



**Olga Greceanu (1890-1978)**

The publication under the aegis of the Bible and Orthodox Mission Institute of the massive manuscript of Olga Greceanu, which the author entitled “*Orthodox Bible Dictionary*” is a great act of culture. It is great because the work itself is great in extent, because it is very profound, being written and illustrated not only with the mind, but with the heart, too.

Why do I try to present it to the public, to the geographers in this case, with my modest means compared to the value of this brilliant work?

Because the “geography” of the holy places has been concealed from us for more than half a century of communist atheist darkness and because, after 1990, we have started to approach this geographic and cultural area of great importance in quite a frail manner. Another reason is that such an encyclopedic work itself has been concealed from us, only now having the possibility to discover what a treasure we own! Developed during 1933-1963, the manuscript, collected in eight volumes, treasured in the library of the Romanian Patriarchate, has 2250 pages: it contains over 1400 theological dictionary articles, illustrated with approximately 500 drawings, sketches of maps and plans depicting the topography of the holy places. The dictionary is encyclopedic, it has a strong interdisciplinary focus, being offered to us by the effort of a team, from which, Iuliana Mattescu as the editor of the book, Father Policarp Chițulescu, the director of the Holy Synod Library and Father Professor Ioan Chirilă from Cluj stand out, who, together with a group of doctoral students, have revised and updated the text “ensuring the maintenance of the speech in the sphere of Eastern theology”.

Olga Greceanu, author of the monumental work that has seen the light of day, modestly said, when she handed over the work, in May 1963 that “I was absolutely alone in compiling this book, which I begun 30 years ago, always revising and correcting it. I worked with much propriety, but with the same amount of zeal, knowing that it was the only work in this genre, but very useful to the believers who did not have at hand a volume in which they could search for the explanation of a word, name, place, date or symbolic meaning.”

After she visited Palestine and Jerusalem for several times with her husband, where she had intense spiritual experiences (see the book “*In your footsteps, Jesus*”), the author told us that “this work was born as a necessity for my soul” and because “her eyes were opened” she realized that the steps of the Son of God “must be followed, learnt, understood, explained” and thus “I have started taking notes, comparing and summarizing. In order to avoid losing the gathered material, I arranged it alphabetically



and thus the starting point of a theological dictionary was formed.”

Regarding the rich graphic material – drawings and original sketches, topographical plans, maps, the author tells us that “the illustrations had a starting point also: there, in Palestine, I took different topographical notes on the spot, which were unprecedented in our textbooks of religious teachings. In time, I added maps, plans and then, even drawings to refresh the viewing of the pages...”

Olga Greceanu, author of monumental works in the field of Romanian fine arts – in painting, fresco, hereby gives us an eternal theological work, confessing with the modesty of the genius she was that “this total of hundreds of articles can further be enriched and amplified in all fields regarding the text and the maps and the illustrations also, there is no doubt.”

Formed during the golden age of Romanian monarchy, in the days when thorough professional training was doubled by committing and living according to the Christian religious precepts, a moral foundation on which our country was built and through which it existed until its fall into the promiscuity of socialist atheism which haunts us to this day, Olga Greceanu was aware of the legacy she left to us: “my only merit is that of the effort inherent to a beginning and to the illustrations, the text being a compilation following our Orthodox teachings, but as it is formed, according to my weak powers, in the items presented, exegesis, symbolism, apology or historical authenticity are not missing.”

This theological dictionary illustrated with drawings, croquis drawings, sketches and plans of Olga Greceanu, in which the heroes, facts and biblical terms are arranged alphabetically and explained to us, has a real educational value. As it was well noticed by Iuliana Mateescu, the editor of the book, it has “a message of spiritual and national consciousness revival, which we desperately need.” It is written in a beautiful Romanian language, simple and inclusive, not perverted by the clichés of the wooden language. In this respect, we hope that the changes in the original text of the author were minimal...

We are dealing with a mirror of the biblical universe, simply and beautifully described; it is a revelation for us, laymen, to read this dictionary, which is full of lessons, dense in information and beautifully illustrated. I will not insist on the content because I am not in the best position

to do it, I only have superficial or common sense knowledge, as I would call it, but I can certainly say that the reading of the dictionary is full of content, information, dressed in a pleasant narration which creates an intellectual comfort for the reader through the spiritual experiences it generates. Also, as a geographer, I notice the richness of the cartographic representations which accompany the text, completing it in the most scholarly and well-balanced way, at the same time. Therefore, these qualities recommend the work to the ones interested in knowing the biblical universe, the information of historical and Christian nature, which contribute to the education of the young generation in Christian morality. The work can be studied in schools and universities, from whose libraries it should not be missing.

I will insist on Olga Greceanu’s personality because she is part of the “great ladies of Romanian culture” gallery alongside Maria Pillat-Brateș, Cecilia Cuțescu Storck, Milița Petrașcu, Henrieta Delavrancea Gibory, mentioning only the ones from the field of visual arts – painting, sculpture and architecture. The author was born in 1890 at Nămăiești Monastery, her parents – Ana and Henri de Skrszeszewsky, being of noble Polish descent. Shortly, her father died (1895); in the period 1896-1908, she attended primary and high school courses in Bucharest, then at Liège (Belgium) superior studies of physics and chemistry, confessing that “even today, I do not know why, because I did not like chemistry. But since our chemistry course in Romania was much more advanced than the one in Belgian schools, the dean of the Faculty from Liège registered me directly for candidature, so I graduated two years earlier.”

Taking advantage of the additional time due to the high level of the Romanian school, Olga Greceanu enrolled in the Academy of Fine Arts, too, “enjoying painting also”, striving “not to remain a mediocrity”.

In 1914, she civilly married engineer Greceanu at Liège, and a little later religiously at the Sturdza Chapel from “the wonderful resort Baden-Baden”. Then, due to the outbreak of World War I, the young newlyweds returned to Romania, where Olga Greceanu joined the feminist art movement, exposing works alongside other female artists. While all the men in her family were on the front, doing their duty to the country “we, the three sisters with our mother, what could we do?”

We were looking forward to hearing from the front. After we would receive a letter, I would start painting of joy. Such were the three years of 1915-1918.” She had her first personal exhibition at Iași because “every person has a career starting point”, which was a success!

In 1919, the family returned to Bucharest. Then, in the same year, she went back with her husband to Liège to finish her studies, stopping on their way in Venice, Milan, Paris to passionately visit museums. The aftermath of the war was visible, seeing the procession „des grands blessés” in Paris, she declared “I could not resist, I turned my head away.”

The spouses Greceanu resumed their courses. In addition, Olga started to work on “the biographies of female artists”, revealing another side of her complex personality, namely that of a tireless researcher: “looking into one life, I discovered the others, and from one to another, I ended up writing about the lives of thirty female artists, totally unknown today, but who enjoyed great glory in their time. I did not copy their lives from anywhere. I investigated churches, correspondence, graveyard stones, art galleries, museums’ attics, old archives and after 20 years, I managed to publish an unprecedented volume...”

In 1921 “having their exams passed and the engineer diploma in the pocket”, the two young people came back to the country, that period being prolific in terms of the easel work, the participation in exhibitions, in one word, in the artistic movement which was so glaring in a Romania fulfilled as a state.

In 1930, she studied in Paris the fresco technique with Paul Baudouin, field in which she excelled especially through popular works, which stood the test of time: the chamber of the Faculty of Architecture in Bucharest, the Town Hall of the green sector, the interior of the Royal Railway Station from Mogoșoaia, the exterior fresco of the Nicolae Iorga Institute and others.

In the years 1930-1933, she took several trips with her husband in Palestine, which touched her profoundly, and as a result of the spiritual experiences she had in the Holy Land, she started to write the Orthodox Dictionary, on which she would work for three decades.

At the same time, she painted, published, researched, the ‘30s truly being an auspicious period, rich in artistic accomplishments; in honors of her husband’s family, she painted and

published the work “*The tower from Măldărești*” (1937), while traveling to the centers of European and American culture. Other popular works are “*In your footsteps, Jesus*” (1940), “*The mural composition. Its laws and technique*” (1935; 1937 the French version in Brussels), “*The national characteristic in painting*” (1939), “*Femmes peintres d’autrefois*” (1930, republished in 2008). In 1939, Olga Greceanu recorded the success of the Official Pavilion and of Romania’s House at the Universal Exhibition in New York: “Each of them has a special distinction in their presentation, both overall and in the smallest detail. More than that: by visiting them, you can learn and understand what Romania is like, where it comes from, its origin, the language it speaks, the occupation and the clothes of the villagers, who the Romanian inventors are, how rich the soil is, the workmanship in sculpture, painting, mosaic, ceramics [...]. Queen Elizabeth of Great Britain told the Commissioner General of the Exhibition when she left: «I have seen beautiful architecture, I think it was the House of Romania.»” Auspicious times for Romania and its people... In April 1944, her entire personal exhibition from the Dallas Foundation is destroyed during the bombing, a period of “commotion”, when irreversible changes began, which led to the cessation of the economic, social and cultural expansion of Romania.

In 1949, she started working on the mosaics of Antim Monastery’s church and in 1960, she received the responsibility of executing the frescoes from the hall of the Synodal Palace of the Romanian Patriarchate, which she finished difficultly because she was troubled by her husband’s death, leading her to draw away in meditation. She started working again in 1966, painting a lot of churches until 1974. She died in 1978, leaving behind a work of art – frescoes, paintings, mosaics and many published books, all having a priceless value.

I presented several elements from Olga Greceanu’s biography out of an inner impulse, wanting to make known a role model at all levels: professionally, civically, from the point of view of her Christian Orthodox religion and ultimately, a role model in life.

The merit for bringing back into actuality the work and personality of Olga Greceanu goes, through this complex work of encyclopedic and artistic character, thanks to a female solidarity, to

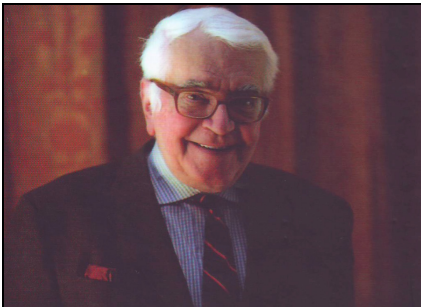
ladies Adina Nanu, professor, exegete in the field of Olga Greceanu's work and to Iuliana Mateescu, editor of the book who, with modesty and obstination, militates in favor of the rebirth of our authentic traditions.

I warmly recommend this book to geographers, whose reading, I am sure, will captivate them, giving them the opportunity of many lessons and reflections, which will help them surpass more easily the far too many trials of today's world.

**Alexandru PĂCURAR**

**Mihai Dim. Sturdza, coordinator and coauthor, *Boyar Families from Moldavia and the Romanian Country. Historical, Genealogical and Biographical Encyclopedia*, vol. II, Simetria Publishing House, Bucharest, 2011, 724 p., A4 format.**

During this year, the grandiose and elegant second volume of the encyclopedia with a triple functionality - historical, genealogical and biographical – was published, being dedicated to the boyar families from Moldavia and the Romanian Country, whose tireless coordinator and coauthor is Mihai Dimitrie Sturdza, great-grandson of Mihail Sturdza, ruler of Moldavia (1834-1849).



**Mihai Dimitrie Sturdza**

The work was first brought forward in the auditorium of the Romanian Academy, being presented by Mr. Dan Berindei, Vice-President

of the Romanian Academy and by Mr. Neagu Djuvara, the well-known historian. The room was filled with a numerous public, editors, students, work colleagues of Mihai Dim. Sturdza and former colleagues of his from the American station "Radio Free Europe".

It is a vast and complex work, great in scale and scope, touching all spheres of life in the principalities – the economic, social, cultural and mindset sphere, being a veritable monument of culture with an obvious recuperatory tendency towards genealogy, identity and our collective memory. The volume describes, in an alphabetical order, fifty-seven boyar families, ranging from the name Boian to Buzescu, being, as the team of authors desired, as in the previous volume, illustrated with numerous period documents, maps, photographs, coats of arms, flags, dowry acts, letters, documents etc., which brilliantly complement the dense text, composed of varying fragments in scale, proving, if proof were needed, the role of founders the Romanian boyar families had, who, over time, have managed to raise themselves to the top of society through meritocracy.

This book, as part of a whole, is a collective work. The authors - fifty-three in number - of this volume are outstanding personalities from various fields, such as historians, jurists, philologists, generals (belonging to the Romanian royal army, who used to be both intellectuals and military people!), politicians (belonging to the royal period, who, above all, used to have a thorough higher education and a profession!), art historians, priests, doctors, journalists etc., scholars in their field and above all, having a deep civic conscience. That is the reason why for them the country with its identity and fulfillment was above all! About identity and a nation's tradition, George Matei Cantacuzino, an illustrious representative of his noble family, said: "the history of a country is a contract, a great collective contract which creates permanent obligations for each citizen [...]. And historical monuments (the work which I present is replete with images of them, s.n.), among others, have the purpose to remind everyone of this contract with its inherent obligations and rights" (1993, *Introduction to research texts of Vitruvius. Letters to Simon*, Meridiane Publishing House, Bucharest, p. 91).

Being such a complex work, it is not hard to imagine the numerous editing problems; that is the reason why its coordinator would like to thank the collaborators – institutions and individuals, without which its almost flawless materialization would not have been possible. The reader thus owns a real jewel, the result of a collective work done with determination, passion and dedication. Printed in only 600 copies, it will soon become a bibliophilic rarity!

The volume begins with a study of judicial history of the Romanian Country and Moldavia (each treated separately), the author, “the high magistrate Constantin Sărățeanu, future regent of Romania” undertaking a brilliant synthesis of the history of Romanian law.

The boyar families are presented monographic ally, the authors choosing “forays” in the history of their becoming, with more or less extensive biographical sketches of the most important members of their family, at the same time presenting their family tree (sometimes spread across multiple pages!) updated!, a result of permanent documentation efforts. Different aspects are exhibited, sometimes unusual, from the lives of these great families, well-documented and proved by photographs, documents etc., such as “*Settlements in the Brâncovenesc style*” (Academician Constantin Bălăceanu-Stolnici), “*The historian Gheorghe Brătianu*” (Academician Dan Berindei) and others, or “*Buczaki (Buceați)* – a family of magnates from the old Podolia and their missions in the history of Moldavia” (Constantin Rezachevici).

The themes of the articles treat:

- the highlighting of prodigious biographies or the clarifying of hidden aspects, in other cases: “*Elena («Ena») Brătianu*” (Andrei Brezianu), “*The great treasurer Ștefan Bou*” (Dumitru Ciurea), “*A boyar of Ștefan cel Mare: Duma Braevici*” (Lucian Valeriu Lefter), “*Ioana Brătianu. Evocation*” (Alexandru Niculescu), “*A Bessarabian destiny: General Brăescu*” and “*A daughter of the Orient: the Countess of Noailles*” (Mihai Dim. Sturdza), “*Constantin Brăiloiu, the jurist*” (Laurențiu Vlad) etc;

- the evocation and description of charity and social activities which were a constant in these great boyar families “*Settlements in the Brâncovenesc style*” (Academician Constantin Bălăceanu-Stolnici), “*The foundations of Brădești*

- family*” (Constantin Fortunescu), “*The Brătianu Settlements*” (Gheorghe Fotino), “*Churches, monasteries and hermitages from Oltenia: the foundations of Buzești family*” (Petre Vasiliu-Năsturel), “*The Saint Spyridon settlements from Iași*” (Mihai Dim. Sturdza), “*The Docolina Fair of Nicolae Buhuș*” (Gheorghe Ghibănescu) etc.;

- their conventional life, with its inherent trips, visits and receptions: “*A visit to the Neamț Monastery*” (Nicolae Hodoroabă), “*A visit to Budeasa*” (Radu D. Rosetti), “*A visit to Șopârlița*” (Ion Rusu – Abrudeanu), “*The son-in-law of the ox*” (Mihai Dim. Sturdza) and others;

- original aspects, knowingly concealed by the communist historiography with the intention of erasing our memory and identity: “*The Bibescu-Brâncoveanu Tomb from Paris*” (Gabriel Badea-Păun), “*The Brăiloiu Mansion from Vădeni-Gorj*” (Ștefan Balș), “*The Stana Tomb from Brâncoveni*” (preot Marin Braniște), “*The Brătianu Tomb from Florica*” and “*The Tomb from Budeasa under the popular democracy régime*” (Dorin Narcis Ion) etc. We are dealing with a permanent exercise of reminding, of memory, which, as G. M. Cantacuzino (1993, *op. cit.*) noted “is not linear and is not chronological”, to memory only “the spirit has a central position”;

- the original side of the lives of these families’ members, such as “*The letter of a boyar to his son*”, “*The testament of the tax collector Vasile Botez from Roman*”, “*The Greek letter of the Great Ban Grigore Brâncoveanu to the father of his future son-in-law Dumitrache Bibescu*” (translated from Greek by Nicolae Șerban Tanașoca) or “*The expenses of steward Niculachi Role – the gifts received by boyars in 1628 «to favor me»*” and others.

The “testaments” and “dowry sheets” carry us in such a Romanian atmosphere, from which at least two ideas can be produced: the ubiquitous Christian spirit and moral of the members of these families, which is materialized in the numerous donations offered to the monastic establishments, to hospitals and churches, as well as the less rigorous style, characteristic of us, in which they were managing their properties.

There are memorable pages in this book, some of them being real life lessons, tender because of their blunt sincerity, such as “*The*

*testament*” of tax collector Vasile Botez from Roman, dated April 17, 1833, which begins this way:

“Because the future event (death s.n.) is invisible and unknown even by angels, because only God knows everything, in the same way, I, tax collector Vasile Botez, born here in the town of Roman, being in a state of frail health and fearing that the end of my life might catch me by surprise, I have decided, while I am still in my right mind, to dispose of my belongings by this testament in the following way...”; seventeen positions with donations follow, from which eleven are for churches, monasteries and poor families!

Out of the numerous biographies, most of them being exemplary, I chose the one of Maria Brăescu (1902-1990), which seems to be intertwining with the avatars our country experienced, being synthetically presented by Mihai Dim. Sturdza. After secondary (Paris) and superior studies (chemistry) at Cluj and Iași, Maria Brăescu dedicated herself to the medical and charitable work in hospitals and, later, during the Second World War, to the Red Cross, “when she organized military hospitals and ambulance services, both on the Eastern Front and the West”, moving from Bucharest to the Kuban Steppes and then to Prague.

At the beginning of the Romanian Sovietisation, she managed to leave the country in March 1948, dedicating herself in the free world to helping Romanian refugees. Behold “a great character, a great lady and a great patriot”, as Neagu Djuvara described her in the obituary he wrote for her. How many personalities such as her are awaiting the recognition of their value and what an obligation we have in recovering their work and memory!

We also learn that “the memory of Grigore Brâncoveanu is preserved to this day in Switzerland. He is the only Romanian whose bust still stands on the shores of Lake Léman” (p. 327); I do not wish to hide that knowing this comforts me intellectually, after too many moments of embarrassment caused by the deplorable conduct of some compatriots abroad. It is also true that they were formed in a different Romania...

I was impressed by the end of the last vestryman and administrator of the Brâncovenesc

Hospital and Settlements established by Safta Brâncoveanu in 1835, Constantin Basarab Brâncoveanu (1875-1967). He too would get acquainted with the “violent threats made by proletarian elements selected from the scum of the town” that would rob him and his entire family of all their property, including the great social work built in time, dedicated to fellow men in need (p. 351). In highlighting the personality of Ion C. Brătianu, the coordinator of the book, Mihai Dim. Sturdza, chooses the characterization of the old liberal made by I. G. Duca: “his only goal in life was Romania and Romanianism. He was the apostle and slave of a single cause: the rebirth of modern Romania. [...]. His patriotism was not only passionate, but it was creative, communicative and overcoming. It was not limited to words, not satisfied with declamations, it was eternal, tireless movement and lasting achievement”, his patriotism “did not end at the temporary borders of the Danube Kingdom, but it embraced all the lands inhabited by Romanian people”... (p. 423).

Here we have such memorable pages, so diverse in their profile, length and dramatic load. The different personality of the authors, their texts belonging to different historical periods, chosen with professionalism by Mihai Dim. Sturdza, makes reading entertaining, even exciting. The book can be easily read, as a fresco novel of the Romanian society, whose leading class understood and fully assumed its civilizing mission, working tirelessly for the country.

The text is supplemented felicitously – as I said before – with pictures: facsimile documents, including signatures, documents, letters, escutcheons and armorial bearings, maps, plans, engravings and above all, photographs... an entire gallery which illustrates an era. They represent a revelation for the reader, for the one who is passionate about beautiful images, because they are the undeniable proof of a normal, prosperous society, known by Romania until the moment of its communization...

I will not dwell on the papers, documents, written evidence etc., there are others more competent in doing so, I will stop for a moment only on the pictures. There are hundreds of pictures which illustrate the text, from the ones

in the nineteenth century to the ones from nowadays, having a diverse theme, chosen with great care by the coordinator of the work; they themselves could be the subject of a study of their symbolism, by deciphering their components. Some of the photographs remained stuck in my visual memory, the ones representing Nicolae and Smaranda Boicescu (p. 43), Zoe and Athanasie Bolintineanu (p. 64), Constantin Bonachi at his wedding (p. 71), Borănescu from Vâlcea (p. 78), the Bossy family (pp. 82-83), Maria Brăescu (p. 181), a Romanian military unit in Chişinău (p. 183), the funeral of Ana Brâncoveanu (p. 340), the Proclamation of the Greater Romania (p. 438), A meeting in the Little Entente (p. 447), Elena Sturdza (married name Brătianu) with her children (p. 449), Marin Butculescu and his wife Lileta Popp on the road in 1931 (p. 638) and others.

The volume concludes with an important auxiliary device: index of authors, index of cited names, thematic index, as well as a series of boards with color images.

The effort of coordinating this monumental work, the search, selection and presentation of the immense iconographic material, reveals the quality of a keen observer, true “knight of sight” under the sign of beauty that is Mihai Dim. Sturdza, paraphrasing Mirela Duculescu, who used to characterize in the same way another Moldavian genius, George Matei Cantacuzino. This quality is matched by the depth and the extensive coverage of the scientist, thus having in front of us a boyar of the spirit who honors his race abundantly.

Mihai Dimitrie Sturdza was born in 1934 in Bucharest, where, after primary education followed in Iaşi (1940-1944), he returned for high school (1944-1952), attended the High School „Dimitrie Cantemir” and followed superior studies – philologic (1954-1959) at the prestigious University of Bucharest, capital city. Immediately after graduating from high school, he was arrested for “being hostile to the communist regime and not denouncing treason”, knowing as a teenager the brutality of the communist prison regime (1952-1954).

After he received his licence (1960) and worked as a school teacher and translator, he left the country in 1963, settling in France, where he attended the Institute of Political Sciences

from Paris (1964-1968). After graduation, he was employed at the French Ministry of Foreign Affairs (1968-1985), becoming the official interpreter for Romanian of presidents Charles de Gaulle and Valéry Giscard d’Estaing.

During 1985-1995, he was political editor at the Romanian Department of the Radio “Free Europe” from Munich. In 1991, he came back to Romania.

His activity as a publicist is prodigious; from his studies and books we cite: “*La Russie et la désunion des Principautés Roumaines 1862-1864*”, “*Haute Banque et Sublime Porte. Préliminaires financiers de la Guerre de Crimée*”, “*Dictionnaire Historique et Généalogique des Grandes Familles de Grèce, d’Albanie et de Constantinople*”, “*The communist historiography as seen by the Radio «Free Europe»*”, “*Romanians between fear of Russia and love of France. Collection of studies*”, “*The new liberal boyar people: Alimăniştenii*” and others.

The usefulness of the work reviewed is obvious, there is no need to highlight it further. It will have a major impact on the Romanian cultural environment as a whole, particularly in the areas of history, geography, literature, art, ideas, mindsets, building and strengthening the self-consciousness of our nation, because after a far too long “cultural drought”, we can realize what excellent predecessors we had. Our country was not born out of smoke, there has been intense experience in this area, sometimes with remarkable achievements. Therefore, the book is recommended to all specialists, the general public and especially young people, so they can find strong roots in the soil shaped by our ancestors; it should be in every school and university library, in public institutions, the professors having the civic duty of popularizing it.

I recommend it even more strongly to geographers, because it is the honest reflection of a social class under whose leadership, for 700-800 years, the geographic landscape of this country was moulded: the formation and typology of the settlements (both rural and urban); autochthonous ways of exploitation of land, agricultural, wood resources and raw materials; the appearance and development of commerce and, subsequently, the formation of the great trade routes; the materialization

## BOOK REVIEWS

of the relations between the natives and the foreigners etc. The study of geography is incomplete without history elements, proving that the Herderian assertion based on which “history is geography moving” is true.

The work coordinated by Mihai Dim. Sturdza increases the appetite for interdisciplinary approaches which involve history, memoirs, geography, art history, the evolution of mindsets, imagery, paleogeography and others, being a unique work in the Romanian cultural landscape.

**Alexandru PĂCURAR**