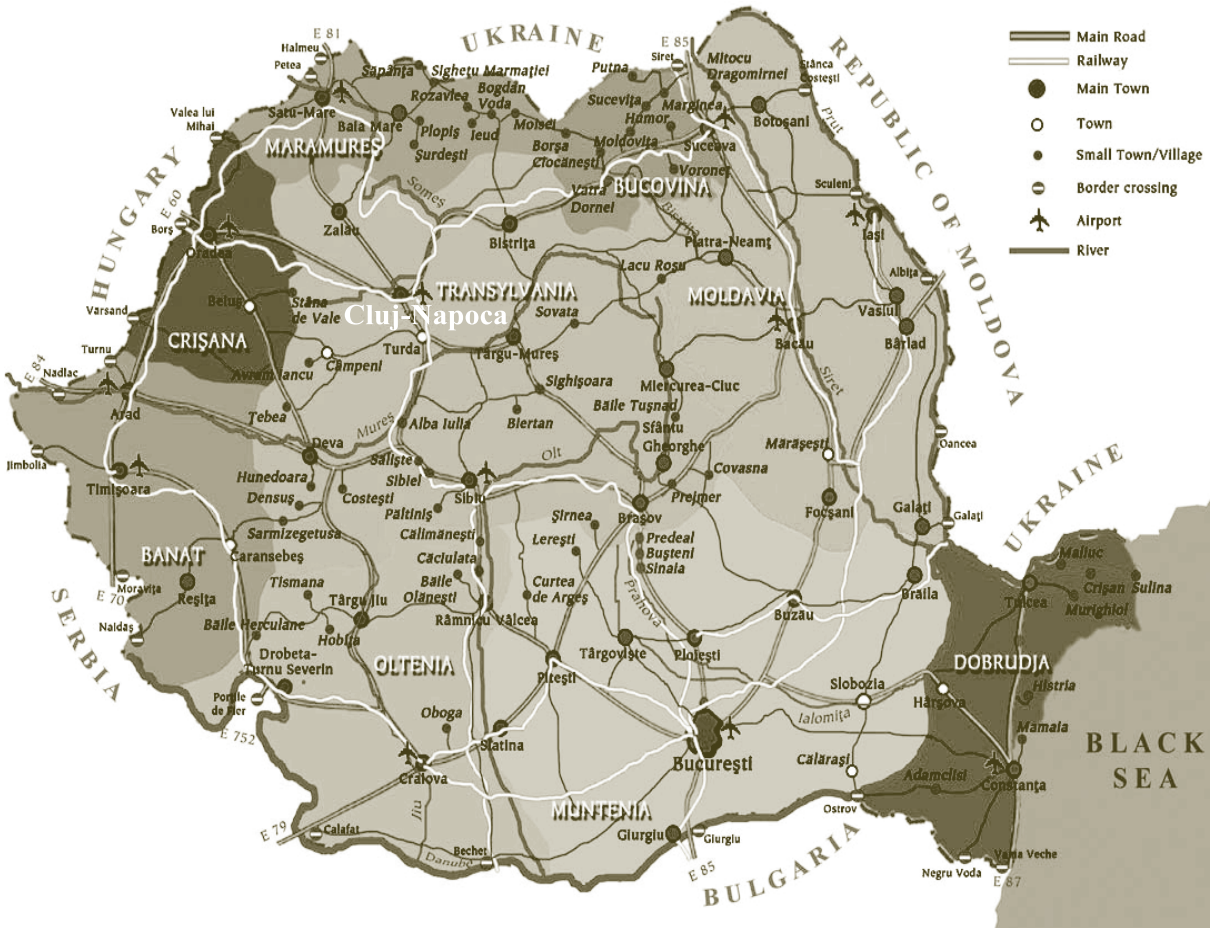
STUDIA UNIVERSITATIS
BABEŞ-BOLYAI



GEOGRAPHIA

2/2009

ANUL LIV **2009**

S T U D I A

UNIVERSITATIS BABEŞ – BOLYAI

GEOGRAPHIA

2

Desktop Editing Office: 51ST B.P. Haşdeu, Cluj-Napoca, Romania, phone + 40 264-40.53.52

CUPRINS – CONTENT – SOMMAIRE – INHALT

NOTE ŞI RECENZII – NOTES AND BOOK REVIEWS

GEOMORPHOLOGICAL FEATURES OF HOLOCENE LANDSLIDES IN THE PLIOCENE-QUATERNARY STRATOVOLCANO MASSIF OF SANCY (FRANCE)

O. POP [1], J. - C. THOURET [2], V. SURDEANU [3]

ABSTRACT. – Geomorphological Features of Holocene Landslides in the Pliocene-Quaternary Stratovolcano Massif of Sancy (France). During the entire Holocene period, the morphological changes of the Sancy stratovolcano were caused by various geomorphological processes and especially by landslides that affected mostly the slopes of the Pleistocene glacial valleys. The morphological features of three of the most important landslides situated in the stratified volcanic and sedimentary deposits have been analysed and described here using the aerial photo-interpretation, field observations and GIS treatments. The resulting map presents the geologic-geomorphologic settings in the areas affected by this type of process. In the case of Sancy, the morphological evidence suggests that a combination of certain factors such as the steep glacial valleys, decompression on slopes associated with the retreat of the Pleistocene glaciers, fractured lava flows, unconsolidated pyroclastic materials, hydrothermal alteration, etc. might have caused these landslides, in the absence of volcanic activity. In certain areas of the stratovolcano, the reactivation of such landslides may produce severe damage for the neighbouring human communities, as did happen, for example, in 2004 in the Mont Dore mountain resort.

***Keywords**: hollocene landslides, morphometry, dendrochronology, Mont Dore, Sancy stratovolcano (France).*

1. INTRODUCTION

Volcanoes are the result of both constructive and destructive forces and possess all the geomorphic processes, which are here exacerbated due to certain factors (Thouret, 1999, 2004). In the case of inactive volcanoes situated in temperate zones the landslides, debris flows and fluvial erosion are the main processes of landscape formation.

The Sancy stratovolcano situated in the French Massif Central (fig. 1) was active between 0.9 and 0.25 M.Y. (Cantagrel and Baubron, 1983). After this period, the Pleistocene glaciers and the periglacial processes have intensely eroded the primary volcanic surfaces.

[1] *„Babeş-Bolyai" University, Faculty of Geography, 400006, Cluj-Napoca, Romani; „Blaise Pascal University, Maison des Sciences de l'Homme, laboratoire CERAMAC, Clermont-Ferrand, 63000, France, e-mail: olimpiu_p@yahoo.com*

[2] *„Blaise Pascal" University, Maison des Sciences de l'Homme, laboratoire CERAMAC, Clermont-Ferrand, 63000, France, e-mail: thouret@opgc.univ-bpclermont.fr*

3 *„Babeş-Bolyai" University, Faculty of Geography, 400006, Cluj-Napoca, Romania, e-mail: surdeanu@geografie.ubbcluj.ro*

The end of the glacial morphologic system has brought changes in the erosion processes. During the Holocene period it seems that the landsliding was one of the major geomorphologic processes in Sancy. In this study, we have focused on the morphologic and morphometric analysis of three of the most important landslides that affected the slopes of the ancient glacial valleys.

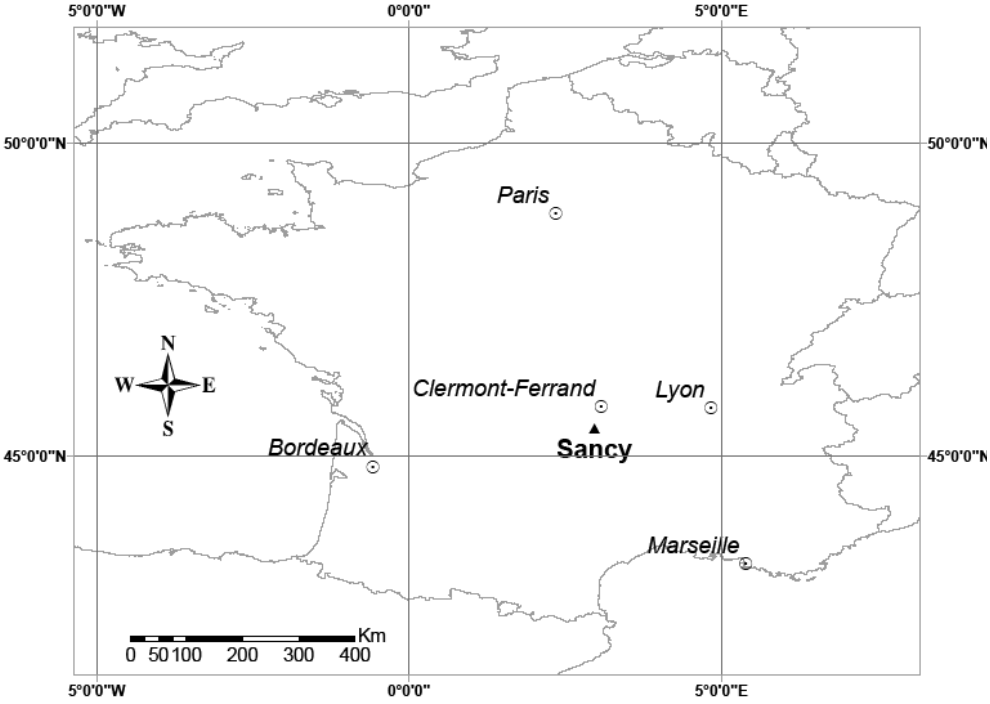


Fig. 1. Localization of the Sancy stratovolcano.

2. GEOMORPHOLOGICAL SETTING

In the studied area (fig 2), the landslides affect Pliocene-Quaternary trachyandesite lava flows, tuffites, pyroclastic, hydroclastic, moraine and periglacial deposits, overlapping a fractured Hercynian granitic basement. The glacial activity left traces that are still present: cirques, moraine deposits, steep slopes in some areas of the glacial valleys.

In the eastern glacial valley of Sancy (Vallée de Chaudefour), two lakes have been formed after the retreat of glaciers as a result of the two landslides produced at different times during the Holocene. The ages of these two landslides were obtained by Macaire *et al.* (1992) using C^{14} method:

a) the ***Montagne de la Plate*** landslide (8.29 ka B.P.) has determined a dam effect and the formation of a lake, now filled by sediments (fig. 4);

b) the ***Saut de la Pucelle*** landslide dam formation (2.585 ka B.P.), followed by the *Lake Chambon* formation.

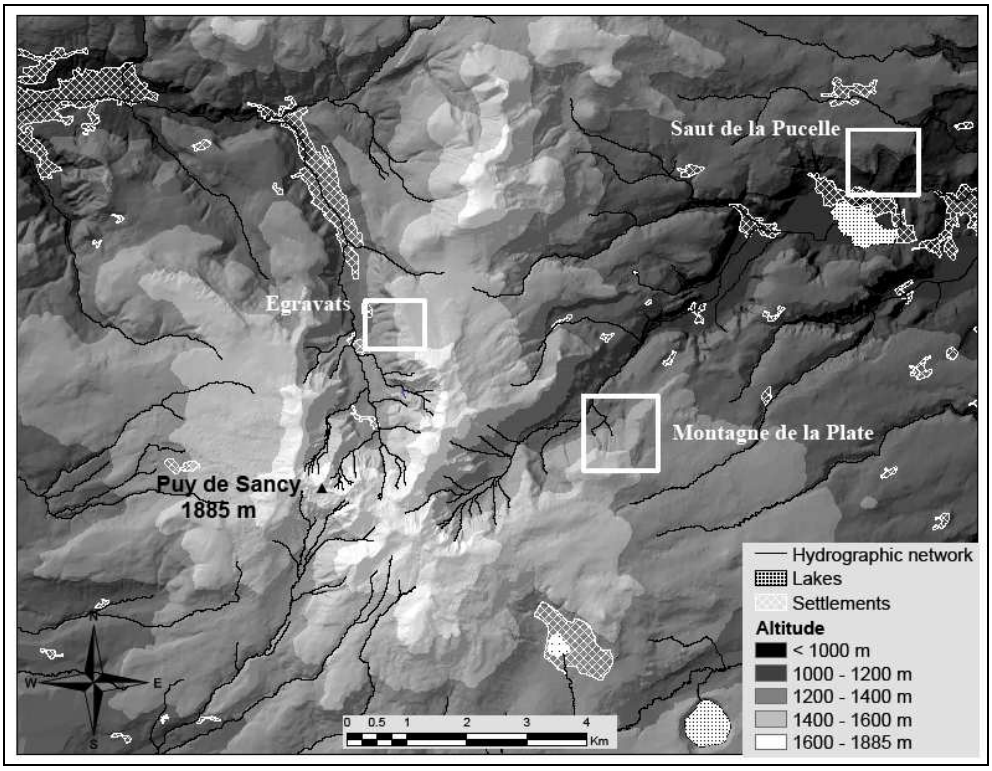


Fig. 2. Localization of the study area: the white squares delimit the three landslide areas analyzed.

The third landslide, ***Egravats,*** located in the Mont Dore glacial valley has an undetermined age (fig. 6). The two other landslides are now stabilized, except for the ***Egravats*** landslide. Its reactivation several times during the 20th century generated landslides overlapping the ancient deluvial deposit and debris flows reaching the inhabited zone of the Mont Dore resort and the departmental road.

In all three cases, the landslides have been initiated on the upper slope and cut the fractured lava flow overlapping the other deposits. The pyroclastic deposits having poor cohesion and low strength facilitates such failures.

The presence of mineral springs at the valley bottoms may indicates that the hydrothermal alteration of the deposits traversed by the water was intense and contributed probably to slope weakening.

3. METHODS

Our study is based on data obtained from the analysis of the aerial photographs (the mission 1999 and 2004 of the Institut Géographique National), DEM (digital elevation model), field investigation, dendrochronology, archives and text references.

The 10 m spatial resolution of the DEM was obtained by digitizing the contour line on the topographical maps at scale 1:25 000 of the Sancy massif.

Fieldwork allowed localizing and recognizing of the morphological characteristics for the three zones of each landslide (detachment, track and accumulation zones). Lithological and geomorphological maps of the landslide areas were finally obtained using the ArcGIS 9.0 software.

All the morphometric measurements (distances and areas) have been obtained by the GIS analysis. The landslide volumes were calculated by the following formula (Surdeanu, 1998):

$$\mathbf{V= [0.785 * H * L * (L – A)] * N}$$

Where:

H = the height of deluvial deposits;
L = the width of deluvial deposits;
A = the length of deluvial deposits;
N = number of landslide steps (see fig. 8).

In the case of Egravats landslide, the archives mention events in the past. In this area, the local press confirms some reactivations of the landslides and debris flows in 1900, 1944, 1951 and 2004. But there aren't any texts mentioning the time when the landslide occurred.

Because of the presence of the forests, we have used dendrochronology in order to determine the tree colonization period of this area. On this purpose, 13 increment cores and 3 stem discs were obtained from fir trees (*Abies alba*) growing on the landslide body that we have visually estimated to be the oldest trees. Sampled trees were chosen so as to avoid those affected by the anthropic activities (e.g. the firs lining the forest road). After drying and sanding of the samples, we have counted their rings and obtained their ages. Because not all the increment cores reached the pith, we have approximated the missing rings using a pith locator.

4. RESULTS

The lithological and geomorphological map of the three landslide areas are represented in the fig. 3, 5 and 7.

Table 1 presents the values of the main morphometrical parameters of the three landslides calculated on the DEM. By comparing these data we can observe that the largest landslide is the one affecting the slope of the glacial valley situated below the Montagne de la Plate scoria cone and lava flow.

In the case of Egravats landslide, the minimum age colonization of the trees sampled and determined by dendrochronology is between 1840 and 1940.

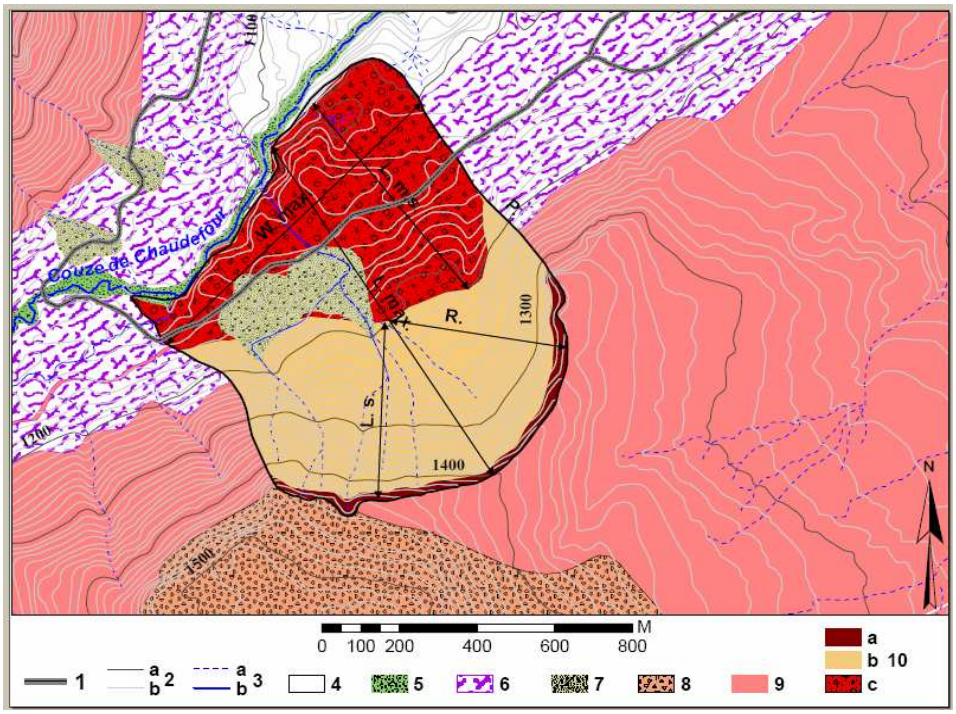


Fig. 3. Lithological and geomorphological maps of the Montagne de la Plate landslide area: 1–road; 2–contour line; 3–drainage system: a–temporary river; b–permanent river; 4–granitic basement; 5–alluvial deposit; 6–moraine deposit; 7–alluvial fan; 8–scoria deposit; 9–lava flow plateau; 10–landslide: a–detachment zone; b–track zone; c–accumulation zone.

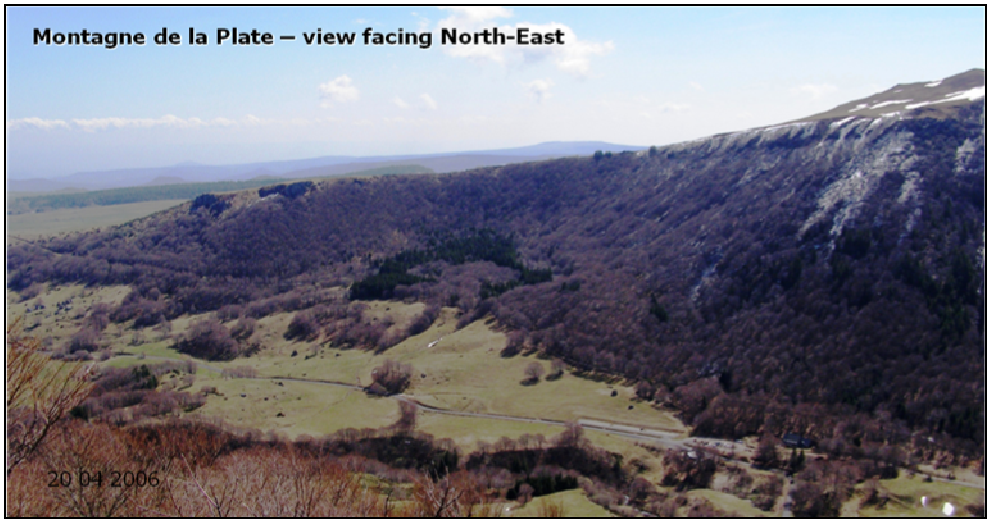


Fig. 4. The landslide area situated below the Montagne de la Plate.

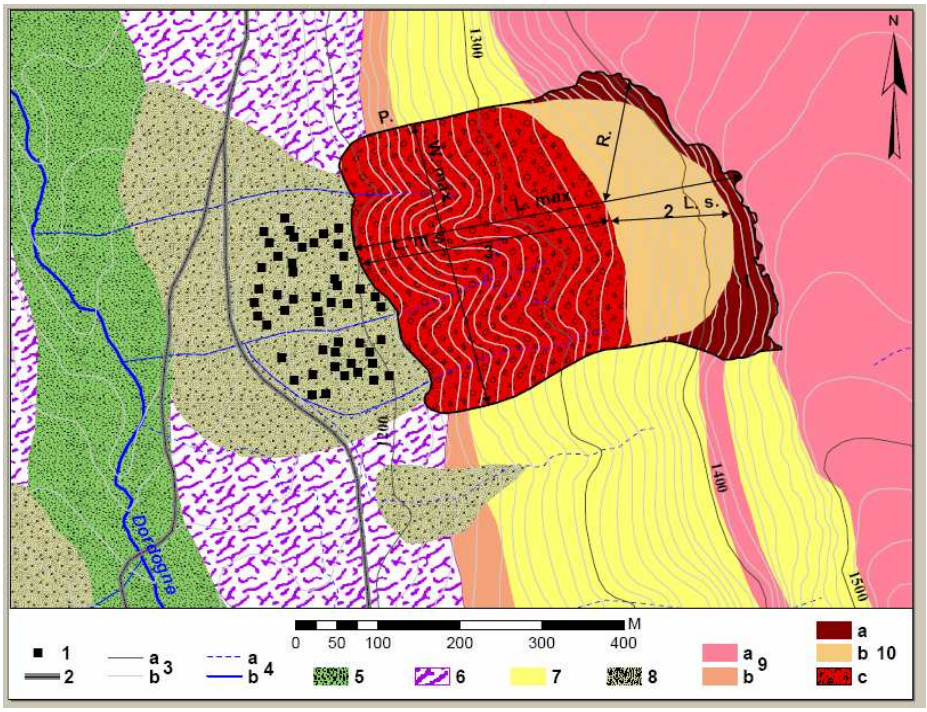


Fig. 5. Lithological and geomorphological maps of the landslide area Egravats:
1–Chalet; 2–Road; 3–Contour line; 4–drainage network: a–temporary river; b–permanent river; 5–Alluvial deposit; 6–Moraine deposit; 7–Pyroclastic deposit; 8–Alluvial fan; 9–Trachyandesitic lava plateau; a–Quaternary lava flow; b–Pliocene lava flow; 10–Landslide: a–detachment zone; b–track zone; c– accumulation zone.

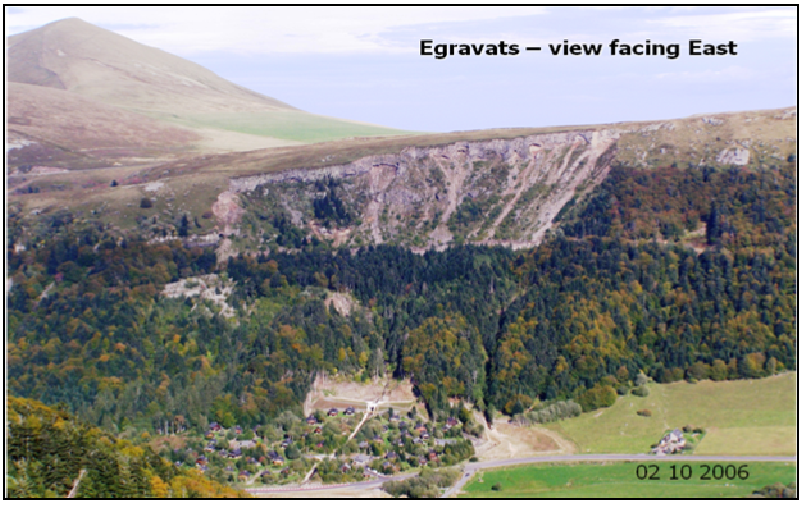


Fig. 6. The Egravats landslide area.

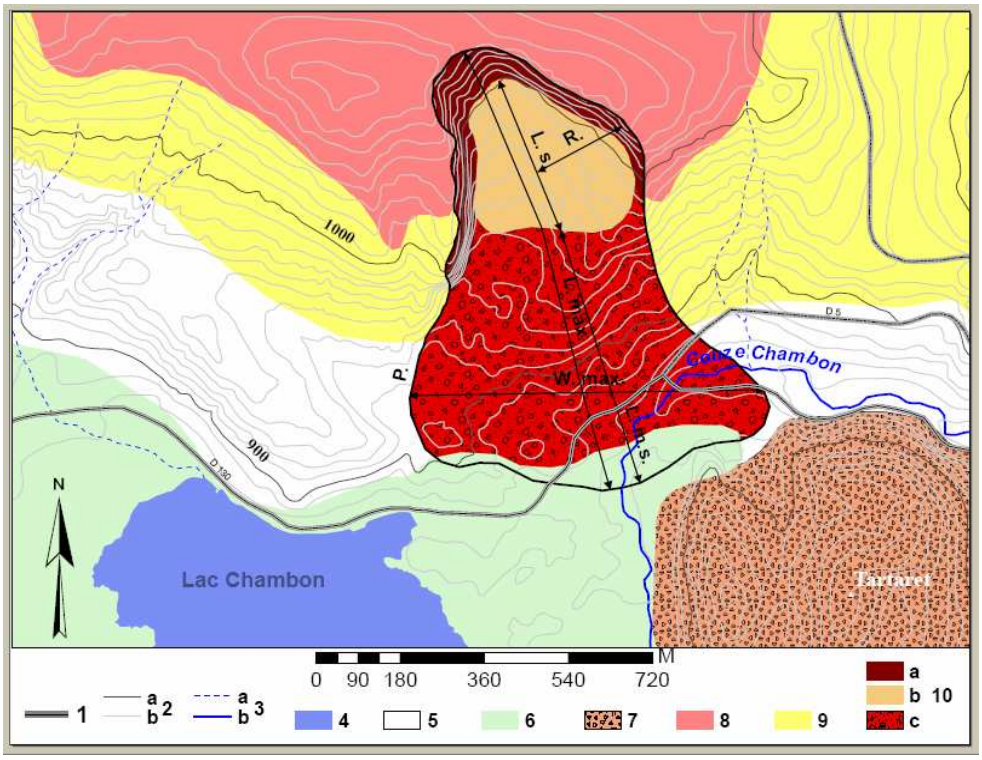


Fig. 7. Lithological and geomorphological maps of the Saut de la Pucelle landslide area: 1–Road; 2–Contour line; 3–Drainage system: a–temporary river; b–permanent river; 4–Lake; 5–Granitic basement; 6–Lacustrine deposit; 7–Scoria cone; 8–Basaltic lava flow plateau; 9–Cinerites; 10– Landslide area: a–detachment zone; b–track zone; c–accumulation zone.

5. DISCUSSIONS

The lithological and geomorphological map obtained for each landslide area suggests that in all three cases the detachment zone is situated in the margin of the lava plateau.

Steep slopes maintained by the trachyandesitic lava flow alternating with unconsolidated pyroclastic materials characterize the detachment and track zone. The initial surface of each landslide keeps traces of later remobilization of materials from the deluvial deposits. For this reason, our calculations of morphometrical parameters underestimate initial distances, surfaces and volumes affected by landsliding.

Morphological evidence obtained from field work suggests that the three landslides are rotational. The theoretical sketch of this landslide type observed in Sancy is represented in the fig. 8.

The morphometrical parameters of the three landslides analyzed

Table 1

Morphometrical parameters	Saut de la Pucelle	Montagne de la Plate	Egravats
Maximum length **L. max. (m)**	1,027	1123	554
Maximum width **l. max. (m)**	762	926	394
Maximum height **H. max. (m)**	210	360	250
Maximum length of track zone **L. s. (m)**	355	547	174
Maximum length of deluvial deposit **L. m. s. (m)**	584	662	336
Maximum height of deluvial deposit **H. m. s. (m)**	110	120	150
Height of track zone **H. d. (m)**	60	280	110
Radius of detachment zone **R. (m)**	119	451	220
Perimeter of affected area **P. (m)**	2996	3851	1889
Landslide surface S. (m^2)	455356	850943	167713
Landslide volume V. (m^3)	26780071	33059867	10206570

In the case of Egravats, the different tree-age determined using dendrochronology can be explained in two ways:

a) the firs colonized progressively the stabilized landslide surface, depending on ecological factors (concurrence between tree species, soil presence/absence and characteristics, substratum instability, etc.); therefore the colonization time gap can vary depending on these ecological factors (Pierson, 2007);

b) the anthropic influence (e.g. tree-cutting) can also play an important role in the selection of trees that remain in the study area.

The position of the roots and the absence of tilting trees suggest that the colonization occurred some years after the landslide stabilization. This is also confirmed by the presence of moss and lichen cover on the surface of the blocks. The presence of large blocks downstream the non-tilted trees also suggest that they were mobilized before the colonization period and they did not damage the trees. Therefore, using the dendrochronological approach, we can only say that the last landslide event affecting the entire area occurred 3-5 years before 1840 (the age of the oldest sampled tree).

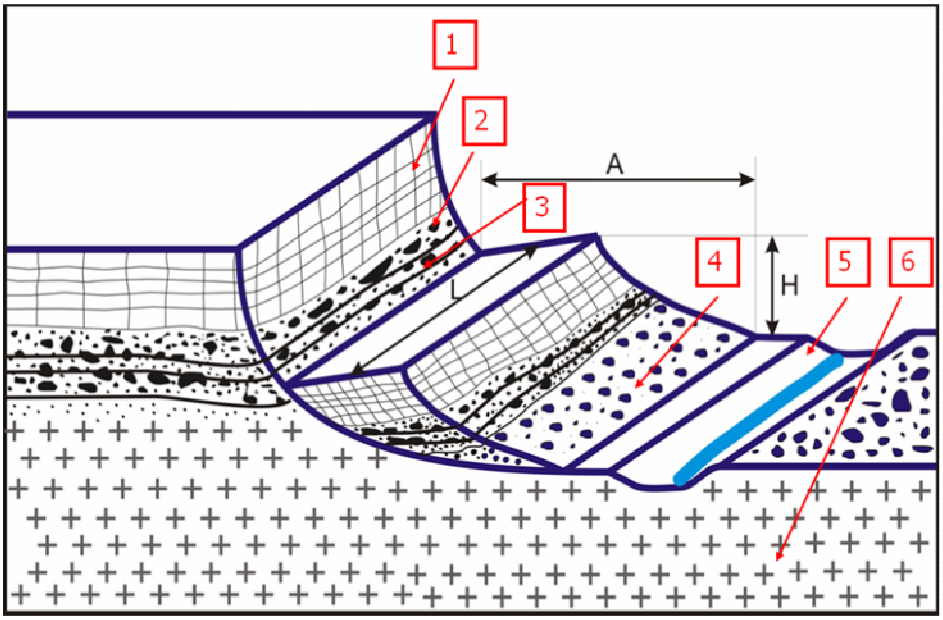


Fig. 8. The sketch of Holocene landslides in the Sancy: 1–fractured lava flow; 2– unconsolidated pyroclastic deposits; 3–tuffite and cinerite deposits; 4–moraine and periglacial deposits; 5–river bed with alluvial deposits; 6–granitic basement; A– deluvial deposit length; H–deluvial deposit height; L–deluvial deposit width.

The reactivation of some small landslides in the Egravats area was observed in 2004, but these were of reduced amplitude as compared to the event that occurred before the tree colonization. The possible reactivations of this landslide may induce hazards for the people living below (49 chalets) and can cut the nearby departmental road.

6. CONCLUSIONS

The morphological characteristics of the three landslides analyzed here suggest that we are in the presence of deep landslides not associated with volcanic activity; their formation must have been due to a combination of several factors that do not occur today.

In Sancy, the major modifications of the volcanic landscape induced by deep landslides have influenced the local slope profile, hydrographic and hydrothermal systems. These changes may occur in a very short period of time and be followed by long periods of slope stability.

The minimum age of the Egravats landslide determined by dendrochronology indicates that probably at the end of Little Ice Age the landslide events were more important than today.

These deep landslides can facilitate the manifestation of other geomorphological processes, such as debris flows and rock falls. This type of study can help us assess the importance of geomorphological processes like landslides that affect the slopes of inactive stratovolcanoes, a long time after the cease of volcanic activity.

REFERENCES

1. Besson, J.-C., de Goer de Herve, A., Vincent, P. (1977), *La Dent du Marais et la structure de Farges: éruptions de type maar - diatrème sur les marges orientales des Monts Dore*, Revue des Sciences Naturelles d'Auvergne, vol. 43, pp. 19-26.
2. Cantagrel, J.-M., Baubron, J.-C. (1983), *Chronologie des éruptions dans le massif volcanique des Monts-Dore (méthode potassium-argon). Implications volcanologiques*, Géologie de la France, vol. 2, n° 1-2, pp. 123-142.
3. Macaire, J.-J., Cocirta, C., De Luca, P., Gay Isabelle, de Goer de Herve, A. (1992), *Origines, âges et évolution des systèmes lacustres tardi- et postglaciaires dans le bassin du Lac Chambon (Puy de Dôme, France)*, Comptes Rendus de l'Académie des Sciences Paris, tome 315, série II, pp. 1119-1125.
4. Macaire, J.-J., Bossuet, G., Choquier, A., Cocirta, C., De Luca, P., Dupis, A., Gay Isabelle, Mathey, E., Guenet, P. (1995), *Effets climatique et anthropique sur l'érosion mécanique en montagne cristalline de région tempérée pendant le Tardiglaciaire et l'Holocène. Un exemple, le bassin du Lac Chambon (Massif Central, France)*, Comptes Rendus de l'Académie des Sciences Paris, tome 320, série II a, pp. 579-585.
5. Pierson, T. C. (2007), *Dating young geomorphic surfaces using age of colonizing Douglas fir in southwestern Washington and northwestern Oregon, USA*, Earth Surface Processes and Landforms, vol. 32, pp. 811-832.
6. Surdeanu, V. (1998), *Geografia terenurilor degradate - alunecările de teren*. Presa Universitară Clujeană, Cluj-Napoca, 273 p.
7. Thouret, J.-C. (1999), *Volcanic geomorphology – an overview*, Earth-Science Reviews, vol. 47, pp. 95-131.
8. Thouret, J.-C. (2004), *Geomorphic processes and hazards on volcanic mountains*, In "Mountain Geomorphology", Philip N. Owens, Olav Slaymaker (eds.), Oxford University Press Inc., pp. 242-273.

STUDIA UNIVERSITATIS BABEŞ-BOLYAI, GEOGRAPHIA, LIV, 2, 2009

MORPHOMETRIC CHARACTERISTICS OF THE RELIEF IN THE SOUTHERN PART OF THE SOMEŞAN PLATEAU

V. SOROCOVSCHI[1], W. SCHREIBER[2], ŞT. BILAŞCO[3], CS. HORVATH[4]

ABSTRACT. – Morphometric Characteristics of the Relief in the Southern Part of the Someşan Plateau. Premise in the Generation and Evolution of Geomorphic Risk Phenomena. The relief morphometric characteristics were calculated directly on the topographic maps derived DEM. The main computed parameters were height, inclination, slope exposure, fragmentation depth and density, as well as the plan and the profile curvatures. In order to distinguish as detalied as possible the change values in the studied region, the above mentioned morphometric parameters were calculated on a grid support, with a pixels' dimension of 10 x 10 m. The study aims at an exact evaluation of the relief morphometric parameters as primary attributes of the geographic individuality of this hilly region in the North of the large intracarpathian area, known under the name of the Transylvanian Depression. At the same time, a differentiation of the parameters' values at the level of the region's geographic subdivisions was also approached. The relief morphometric characteristics, together with the substrate features, represent important premises in the generation and evolution of risk geomorphic phenomena that endanger the rural settlemens in the Southern part of the Someşan Plateau.

Keywords: *Someşan Plateau, morphometric characteristics, inclination, fragmentation depth, fragmentation density.*

1. INTRODUCTION

Integrated to the Transylvanian Basin, the researched region covers the Southern part of the Someşan Plateau, territory that owes its individuality, together to other geographic factors, to its morphometric and morphologic relief features. The morphostructural complexity of the region is determined by the geologic evolution, manifested through a diversity of the dominant sedimentary formations (grit, sand, clay, limestone) disposed over crystalline blocks that appear at different depths. This particularity is reflected in the configuration and typology of the relief (predominantly structural and lithologic) and in the rivers network organization. At the same time, the morphometric and morphologic characteristics were an important criterion in dividing the studied area into three geographic subunits (Figure 1).

Şimişna-Surduc Hills are bounded in North – Northeast by the Someş Corridor (near Vad and upstream of Jibou), at South by the watershed between the Şimişna-Vad, Şimişna - Olpret, and Luna – Brâglez Rivers. To the West it expands to the Brâglez-Almaş watershed. The evolution of this subdivision is strongly correlated with the block uplifting of a crystalline horst from the Hercynian fundament and by the local subsidence in Jibou.

[1] *Academia Română, Filiala Cluj-Napoca, România, e-mail: svictor@geografie.ubb.cluj.ro*
[2] *"Babeş-Bolyai" University, Faculty of Geography, 400006 Cluj-Napoca, Roumanie, e-mail: wilfried@geografie.ubbcluj.ro*
[3] *Academia Română, Filiala Cluj-Napoca, România, e-mail:sbilasco@yahoo.com*
[4] *Academia Română, Filiala Cluj-Napoca, România, e-mail:hcs1000@yahoo.com*

The altitudes increase from the Someş Valley (the 200 m contour penetrates till Răstoci) to the Southern and Southwestern watersheds, where they remain at 500-600 m, only in some areas overpassing 600 m (Nadiş, 644 m, Mărului, 622 m, Râpa Şimişnei, 612 m etc.).

The relatively high altitudes and especially the fragmentation density(52,7% from the total surface is described by values between 1,3 and 3 km/km^2) and depth (with dominant values between 100 and 150 m – 45,7% from the total surface and between 150 and 200 m – 30,6%), determined a particular way to organize the geographic space.

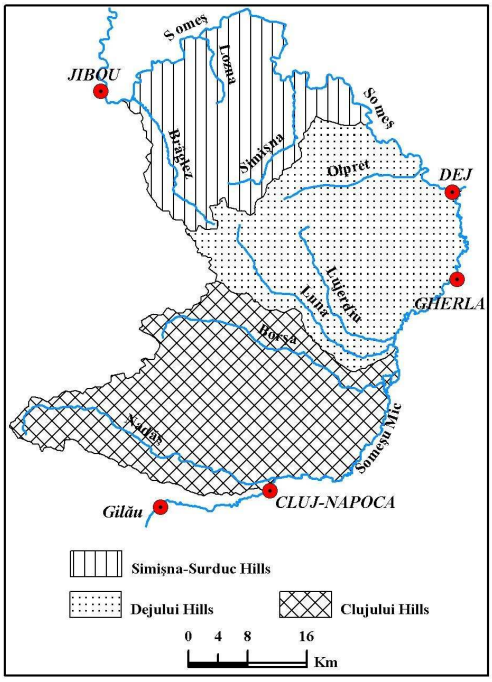


Fig. 1. The Geographic Subunits of the Southern Part of the Someşan Plateau.

The radial-divergent orientation of the river network has repercussions on the road network configuration and on the settlements distribution in this subunit. The population density is reduced (20-30 inhab./km^2) and the settlements are situated along the main river valleys and rarely on the watersheds.

Dejului Hills represent the central compartment of the studied area, lying between the watersheds of the Şimişna - Vad rivers, respectively Olpret to the North and Luna - Borşa to the South. To the East and Northeast it is bordered by the Someşul Mic Corridor, continued with the Someş valley between Dej and Vad, while to the West they come into contact with the central compartment of the Almaş – Agrij Depression. Within these boundaries, Dejului Hills occupy more than 34,9 % of the studied area. The maximal altitudes correspond to the structural remains preserved on the Dej tuff layers (the Hills of Bobâlna, 693 m, Făgetul, 602 m, Horgău, 595 m).

The presence of the volcanic tuff is also underlined by the narrowing of some valleys (Lujerdiu, Mărului, Olpretului etc.), upstream of which different sized depressions have developed, facilitating the apparition of many small-sized settlements. From the Northern central part, the peaks decrease in altitude to East and Southeast where they remain frequently between 350 and 400 meters. The 350-450 altitudinal interval occupies almost half of the subdivisions (45,7 %) area.

The main valleys are directed towards East and South, and the watersheds are larger than those in the Şimişna-Surduc Hills. The horizontal fragmentation values are reduced, grading between 0,5 and 2 km/km^2 (58,8 %). The vertical fragmentation values are also reduced, not exceeding 150 m in more than three quarters (83,4 %) of the subdivisions area.

Clujului Hills, situated in the Southeast of the Someşan Plateau, develop between the Luna and Nadăş Valleys and represent 40,3 % of the studied area. The altitudes are generally decreasing from West to East and from South to North. The highest peaks, over 600 m, correspond to the cuesta that dominates the Nadăş Valley (Lomb 682 m, Morunu, 647 m, Gurgueţu Mare, 639 m).

The relatively unitary and uniform peaks have a general orientation from Northwest to Southeast in conformity with the main valleys (Popeştilor, Chintenilor, Feiurdenilor, Borşei). The frequency of cuestas orientated towards South and Southwest are conditioned by the layers inclination from Southwest to Northeast. The horizontal fragmentation of the relief is moderated, with most of the values lying between 0,5 and 2,0 km/km^2 (57,8 % of the area), while the vertical fragmentation (88,9 %) has values between 50 and 150 meters in the most part of the subdivision, an exception in this respect being the small gorge sectors cut in the Dej tuff layers, with values exceeding 200 meters.

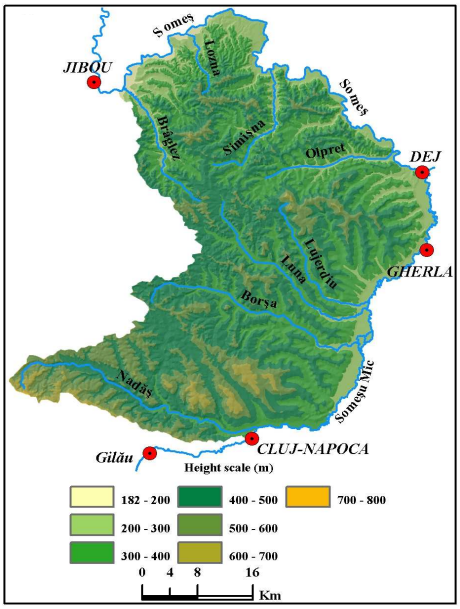


Fig. 2. Main altitudinal intervals.

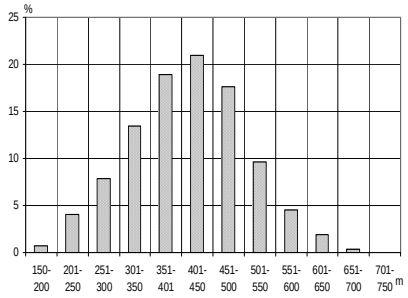


Fig. 3. Main altitudinal intervals percentage from the area surface.

The small and middle-sized rural settlements are situated, in most of the cases, along the major river valleys, on some of their tributaries or in the basinets formed at their origin. Exceptionally, there are some cases when settlements developed on peaks, along the main saddles.

2. RELIEF MORPHOMETRIC CHARACTERISTICS

2. 1. Relief Altitude

This morphometric parameter plays a major role in the appearance and evolution of risk geomorphic phenomena, determining the vertical zonation of the main climatic or hydrological elements (runoff etc.).

The relief altitudinal decrease toward the Someş and Someşul Mic corridor is explained by the crystalline fundament uplifting in the central part of the analyzed region, as well as by the presence of a high sector that marks the transition to the Apuseni Mountains (Figure 2).

At the same time, a general altitudinal decrease is noticed from the Central and Southern parts to the lower areas corresponding to the Olpret, Luna and Borsa valleys. From the Olpret valley to the North, the heights decrease from centre and Southwest to North and Northeast, respectively from 600 m to less than 200. This tendency, determined by the block uplifting, is also underlined by a radial arrangement of the hydrographic network.

From Olpret valley to the South, the altitudes decreases generally to East and Southeast, the main hydrographic network following also this direction.

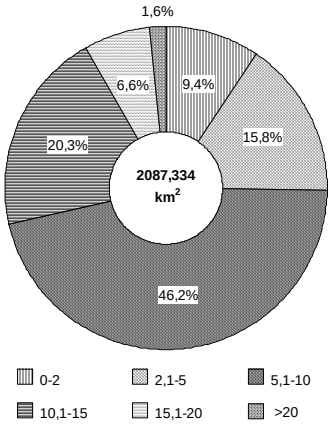


Fig. 4. Weight (%) of the territories with various inclination classes.

If analyzing the weight of the main altitudinal levels throughout the region, it can be remarked that the 401 – 450 m interval represents 20,9 % from the total surface (2087,3 km^2), followed by the 351 – 400 m interval (18,9 %) and by the 401 – 450 one (17,6 %). The low (under 250 m) and high areas (over 600 m) represent less than 4,5 % from the region's total surface (Figure 3).

In comparison to this general situation, many differences were identified between the main geographic subunits. Thus, in Clujului Hills, the major weight corresponds to the 451 – 500 m interval (23,9 %), while in Dejului and Simişna – Surduc Hills to the 350 – 400 m interval (23,3%, respectively 21,6 %).

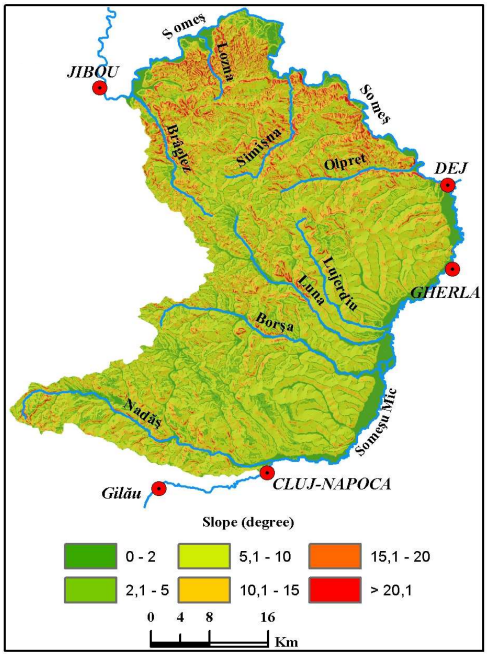


Fig. 5. Map of the inclination categories in the Southern part of the Someşan Plateau.

Inclination is one of the variables that determine the transformation of the potential energy into kinetic energy. The determined values for these parameter were reclassified taking into account the thresholds that contribute to risk geomorphic processes triggering or evolution. As a result, six inclination classes were identified, the major weight belonging to the class 5,1 - 10 ^{0} that represents 46,2% from the total surface. The succeeding classes are 10,1 - 15^0 and 2,1 - 5^0 (Figure 4). The areas with reduced inclination (under 2^0) are rather extended (9,4 % from the studied territory), while those with values over 20^0 represent only 1,6 %.

The analysis undertaken at the level of the three subunits points out that the best represented inclination class is 5,1 - 10 ^{0} in Clujului Hills (52,4%), Dejului Hills (48,4%) and Simişna-Surduc Hills (33%).

In Dej and Simişna-Surduc Hills, the succeeding class in that with values between 10,1 and 15^0 (21,5 %, respectively 27,7% from the total surface of the mentioned subunits). In Clujului Hills, the following met category is 2,1 - 5 ^{0} (19,8 % from the total surface).

If analyzing the inclination map, an important remark should be done: the relatively horizontal areas (a slope between 0 and 2^0) describe, in general, the alluvial plains along the major water courses, stimulating floods and over-humectation phenomena during spring, or after summer convective or frontal rains.

An interesting category is that with values between 2,1 and $5^{0,}$ characteristic to areas that lacks geomorphic risk phenomena, located especially in the third inferior sector of monoclinal slopes. Usually, these areas are the most favorable for agriculture or built human structures. There are also cases in which this territorial category is affected by allochton material accumulation (torrents' dejection cones, deluvial materials from land slides). This inclination category also describes some interfluvial areas in Dejului or Clujului Hills that were used in the implementation of some roads that afford connection between settlements located in Someşul Mic basin with those in the Almaş basin. As mentioned before, the most frequent inclination class is 5,1 - 10^0. The inclination values in this category stimulate landslides on cuesta slopes and on the third upper sector of monoclinal slopes. The areas with more than 15^0 inclination appear sporadically in Clujului Hills (2,7%) and much more frequent in Dejului (6,9%) and Simişna-Surduc Hills (19,4%). Landslides and intense erosional processes were identified in these areas.

2. 3. Relief Energy. Fragmentation Depth

This morphologic parameter is strongly related to the petrographic structure and reflects the various rivers' deepening stages as a result of base levels changes.

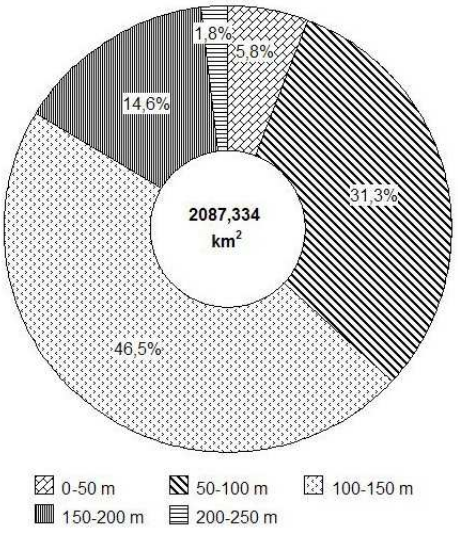


Fig. 6. Weight (%) of the various relief energy levels.

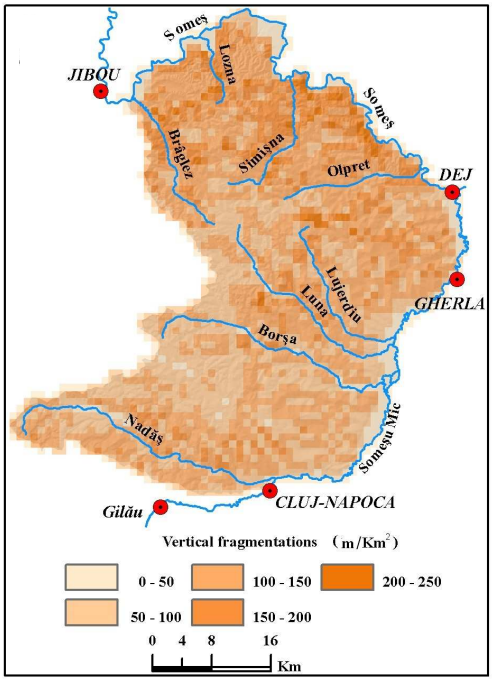


Fig. 7. Relief energy map in the Southern part of the Someşan Plateau.

As a result of the drainage network deepening, the relief energy represents a parameter that describes the altimetric amplitude on which the actual geomorphic processes could develop.

Fragmentation depth is a determinant factor in the transformation of potential energy into kinetic energy. The values of this parameter are extremely variable within the analyzed geographic space.

The maximal values, grading between 200 and 250 m describe small areas in Dejului (2,1%) and Simişna-Surduc Hills (4,4%) and represent only 1,8% from the region's total surface (Figure 6). These values are determined by the closeness to the Someş low base level and to Dej and Jibou local subsidence (Figure 7). The increased relief energy renders difficult the inhabitants' or goods' access or evacuation in case of disasters. The values between 100 and 150 m are the most frequent in all the geographic subunits, reaching 46,5% from the studied territory. The human settlements are located in areas with decreased relief energy, between 0 and 100 m, category that represents 37,1% from the total surface and 51,9% in Clujului Hills, with a higher settlements density than in Dejului and Simişna-Surduc Hills, where this relief energy category describes only 32,6%, respectively 18,3% from their territory.

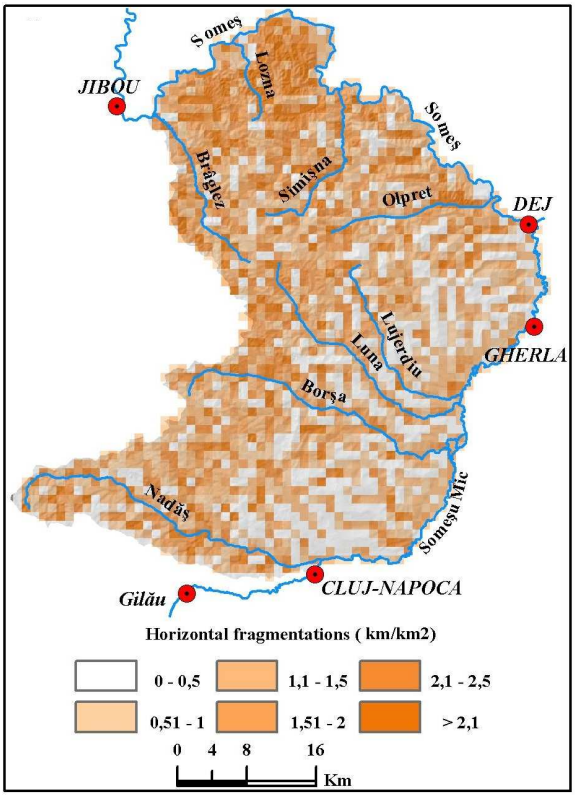


Fig. 8. Relief fragmentation density map in the Southern part of the Someşan Plateau.

2. 4. Relief Fragmentation Density

The petrographic differences impose variations of the relief fragmentation density and determine different mechanisms in relief modeling. The distribution of the horizontal fragmentation classes is very mosaicked, a large specter of values, with very close weights, being identified (Figure 8).

The maximum weight belongs to the class with values grading between 0 and 0,5 km/km^2 (22, 3%), succeeded by that of 1 – 1,5 km/km^2. Similar weights (17,1 %) are characteristic for the classes of 0,5 - 1 km/km^2, respectively 1,5 - 2 km/km^2.

The horizontal fragmentation maximal values (over 2,5 km/km^2) have a quite similar distribution in Clujului (7,5%) and Dejului (6,1%) Hills, while in Simişna-Surduc Hills they are rather high (18,4%), contributing to the triggering of ravines, torrents or landslides.

The horizontal fragmentation minimal values (under 0,5 km/km^2) appear more frequently in the Eastern part of Dejului and Clujului Hills, occupying around 26% from the total surface of these subunits. As a result of the low values in fragmentation density and relief energy, the two mentioned subunits benefits from a higher density of rural settlements and agricultural activities than the Simişna-Gârbou Hills.

2. 5. Slopes Exposure

Together with geodeclivity, slope exposure is a very important factor that induces differentiations in insolation duration, contributing to the formation and differentiation of the caloric regime and influencing in this way the vegetal layer and soil features, the suitability to certain land uses, types of the actual geomorphic processes etc. On the whole, the radiative, caloric or humidity regimes mirror two major slope orientations: Northern and Eastern, with a decreased level of insolation, Southern and Western, with a higher caloric regime values.

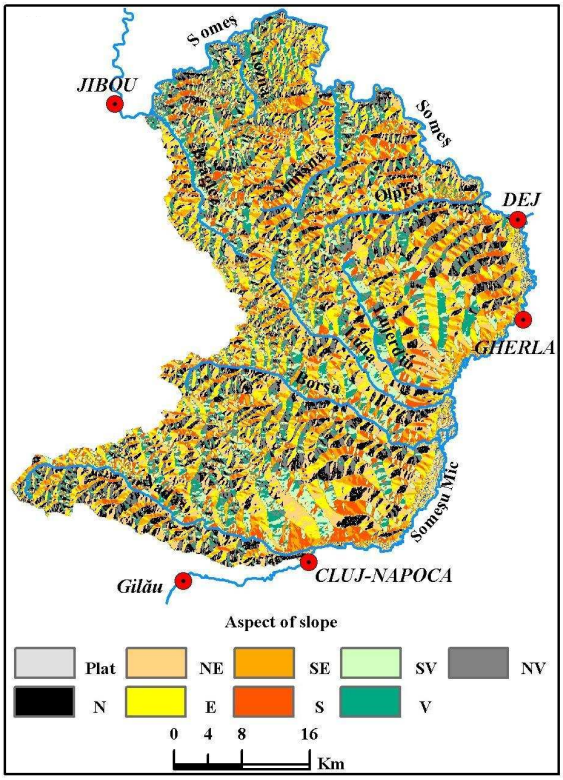


Fig. 9. Slope Exposure Map in the Southern Part of the Someşan Plateau.

The slope exposure map emphasizes the mosaic character this parameter's distribution (Figure 9). The horizontal surfaces cover only 1,6% from the total surface of the region. If following the territorial repartition of the various categories of slope exposure, one can notice that the analyzed area is quite uniform.

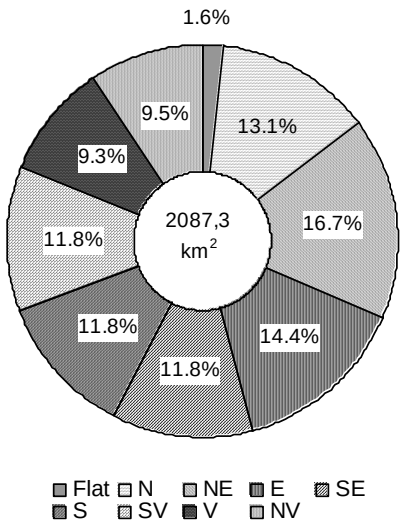


Fig. 10. Weight (%) of the territories with various slope exposure.

The relief with Northwestern exposure is the most frequent (16,7%), while that with Western exposure has the minimal weight (9,3%). The slopes with Southern (11,8%), Southwestern (11,8%) and Western (9,3%) exposure are affected the most by geomorphologic processes. The phenomenon can be explained by the presence of some factors whose cumulative effects contribute. The large areas with Northern exposure (39,3%) explain the suitability to the cultivation of some forage plants or cereals requiring less caloric energy. Another aspect to be mentioned related to slope exposure is that the sloped exposed to North and East represent 53,7% from the total surface, while those exposed to South and West 44,7%. This explains why almost half of the studied territory is suitable to fruit trees cultivation.

REFERENCES

1. Irimuş, I. A., Vescan I., Man T. (2005). *Tehnici de cartografiere, monitoring şi analiza GIS.* Edit. Casa Cărţii de Ştiinţă Cluj-Napoca.
2. Mac, I., Sorocovschi, V. (1977), *Aspecte complementare ale relaţiei de organizare: reţea hidrografică – morfostructură în Depresiunea Transilvaniei*. în vol. Lucrările celui de al II-lea Simpozion de Geografie Aplicată, Cluj-Napoca.
3. Mac, I., Sorocovschi, V. (1978), *Relaţii morfodinamice în Depresiunea Transilvaniei*, SUBB, Geol.-Geogr., 1, Cluj-Napoca.
4. Mac, I., Sorocovschi, V., Maier, A. (1979), *Forme ale conexiunii geografice în structura peisajului Podişului Someşan şi a zonelor sale de bordură***,** SUBB, Geol. – Geogr., 2, Cluj-Napoca.
5. Morariu, T., Posea, Gr., Mac, I. (1980), *Regionarea Depresiunii Transilvaniei*, SCGGG, Geografie, t XXVII, nr.2, Edit. Academiei, Bucureşti.
6. Pop, Gr. (2001), *Depresiunea Transilvaniei*, Edit. Presa Universitară Clujeană, Cluj - Napoca.
7. Savu, Al. (1980), *Depresiunea Transilvaniei (Regionarea fizico-geografică). Puncte de vedere*, SUBB, Geol. - Geogr., XXV, 2,Cluj-Napoca.
8. Sorocovschi, V., Schreiber, W.(1986), *Relaţii morfohidroclimatice în nordul Transilvaniei*, SUBB, Geol. – Geogr, XXXI, 1, Cluj-Napoca.
9. * * * (1987), *Geografia României, III, Carpaţii Româneşti şi Depresiunea Transilvaniei*, Edit. Academiei Republicii Socialiste România, Bucureşti.

STUDIA UNIVERSITATIS BABEŞ-BOLYAI, GEOGRAPHIA, LIV, 2, 2009

DIFFERENTIATION OF THE GEOMORPHOLOGIC ENVIRONMENTAL STATE IN OAŞ MOUNTAINS

I. MAC[1], N. HODOR[1], MARIA HOSU[1]

ABSTRACT. – **Differentiation of the Geomorphologic Environmental State in Oaş Mountains**. The Eastern Carpathians develop to the Transylvanian Depression a long chain of Neogene volcanic mountains that continues much over the Romania's bounds. The Oaş Mountains, part of their Northern group, represent a very complex geologic and geomorphologic area, with a polycyclic magmatism, with a large variety of volcanic structures (intrusive bodies, effusive volcanic forms with central eruption, volcanic cupolas, isolated volcanic bodies, plateaus, calderas etc.), high degree of fragmentation and reduced altitude (Piatra Vişcului, 823 m). The geomorphologic environmental states display on a large specter: temporality states (relicts, inherited, actual, of aggradation etc.), critical environmental states (tectono-physical polyphasic, tectono-magmatic, talaso-denudational, morpho-sculptural, critical human-made – physical), of conflict between the geomorphologic system and the external factors (fragility, environmental decline etc.).

Keywords: *environmental geomorphology, palimpsestic character, increased sensitivity, induced dysfunctions.*

1. INTRODUCTION

The Oaş Mountains present a palimpsestic character within which the volcanic structures and forms reveal successions of morphostructures on different evolution stages, with increased sensitivity induced by the mass and energy inputs into the system (polycyclic volcanism, marginal subsidences, pluvio-denudational, fluvial or human-induced stress). The specific nature of the structural and functional relations between the different involved elements (volcanic – sedimentary, permeabil – impermeabil, biotic – abiotic, natural – artificial) determined an increase in vulnerability. The development of a human-made environment (mining, agricultural, habitational) is a constant within the Oaş Mountains geographic landscape.

2. LOCATION AND SPATIAL EXTENSION

The Eastern Carpathians develop to the Transylvanian Depression a long chain of Neogene volcanic mountains that continues much over the Romania's bounds. Among these we could mention mountainous units as Tokay, Slansky, Vihorlat, those in the Beregovo area, Oaş, Igniş, Gutâi, Văratec, Ţibleş, Toroiaga, Bârgău, Călimani, Gurghiu, Harghita etc.

Within the Northern group of the Eastern Carpathians, the morphostructural volcanic unit includes three distinct subdivisions: Oaş Mountains, Gutâi Massif and Toroiaga-Ţibleş Mountains.

[1] *"Babeş-Bolyai" University, Faculty of Geography, 400006 Cluj-Napoca, Romania, e-mail: mac@geografie.ubbcluj.ro; hodor@geografie.ubbcluj.ro; mhosu@geografie.ubbcluj.ro*

The Oaş Mountains stretch from the Huta Pass (587 m) and the western slopes of the Igniş Massif to the South, up to the large Tisa Valley at North and Northwest. Towards West and Southwest, because of the interference of the volcanic structures with the Western Plain sedimentary ones, the bounder follows a sinuous course along, the hummocks and the volcanic ridges alternating with gulf depressions. However, the line linking the localities Seini, Medieş-Vii, Turlung-Vii şi Halmeu-Vii may be considered as the limit between the two tectono-structural units.

The volcanic structures cover around 178 km^2, among which 97 km^2 represent lava flows, 41 km^2 rooted bodies and 40 km^2 pyroclastic accumulations. This situation is unusual for a „pacific type" volcanic area, but it may be explained through the vigorous and long erosion that determined a drastic reduction of the pyroclastic formations and lava flows.

3. SPECIFIC GEOLOGIC AND GEOMORPHOLOGIC FEATURES

In comparison to the other volcanic mountains in the Eastern Carpathians, Oaş Mountains are individualized by some specific features:

a) petrographic diversity: rhyiolites, dacites, microgranodiorites, microdiorites, andesites (pyroxenic, amphybolic, quartzite, basaltic, with a prevalence of the pyroxenic ones);

b) polycyclic magmatism, the most evident cycles being the Badenian – Bassarabian, the Pannonian and the Pontian-Romanian;

c) structural variety: intrusive bodies (laccolites, dykes, necks), effusive volcanic forms with central eruption, associated volcanic bodies, volcanic cupolas, isolated volcanic bodies, rooted bodies etc;

d) differentiation in the way the volcanic structures fit up into the region's geologic system:

– subvolcanic bodies developed on the Pannonian sedimentary structures through secondary uplifting mechanisms (of diapir type – Geamăna Massif);

– volcanic bodies sized through negative isostasic movements (postvolcanic collapse - the Cămârzana caldera, developed between Geamăna, Cetățeaua Mică and Holmurile Hummocks);

– volcanic bodies at the intersection of several faults (magmatic nuclei);

– isolated (singular) magmatic bodies, as the western hummocks or the Măguriciu one, near Bixad;

e) high degree of fragmentation and prevalence of the negative landforms - depressions, corridors, differential erosion saddles. The lowest areas follow the main river channels:

– Oaşului Depression, developed on the crustal fracture that separates the Pannonian domain from the Carpathian one (Tur River inferior course);

– Târşolț channel – on a graben;

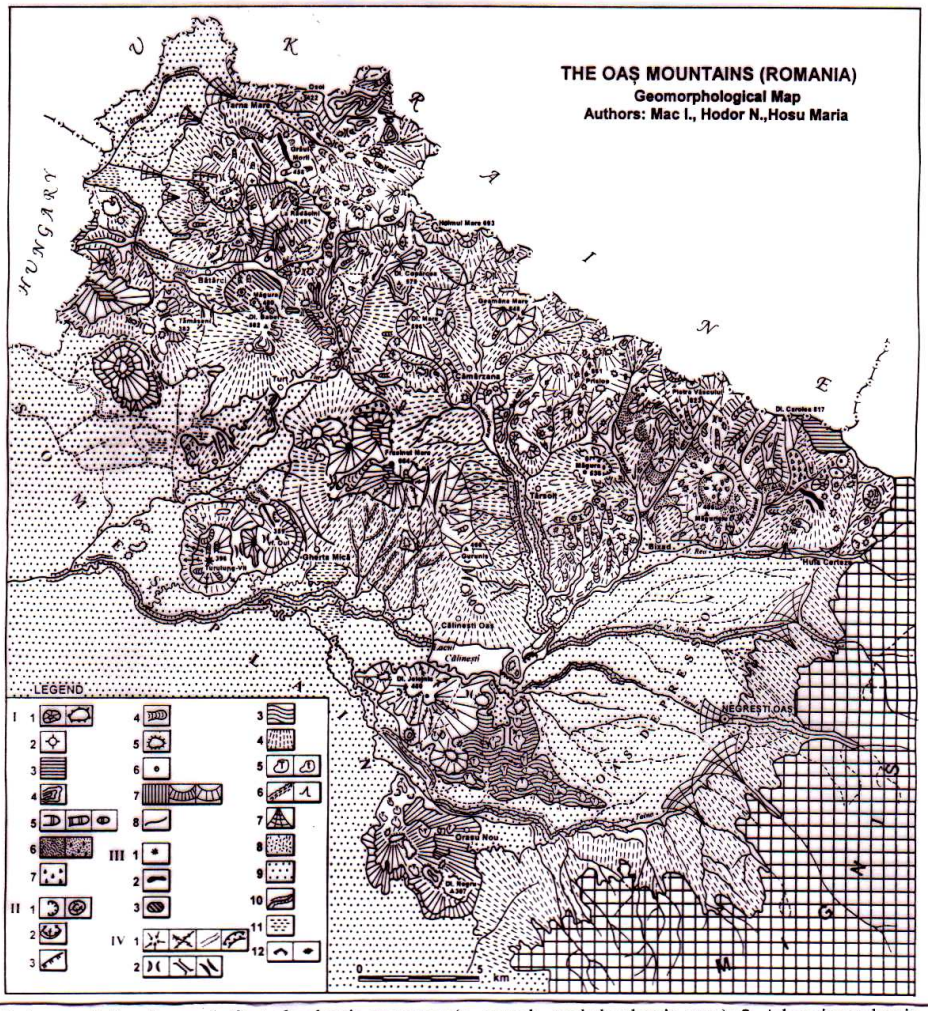
– Lechincioara – Cămârzana passage channel;

– Tămăşeni– Bătarci – Bocicău passage channel.

Positive morphostructures with various genetic conditions and preservation degrees stretch between the above mentioned river channels and depressions:

– Călineşti-Fraşin tectono-magmatic horst (SSV – NNE);

– Sirlău – Dealul Viilor – Oul – Târlung-Vii knolls microhorst;



I. Accumulation forms: 1. Central volcanic structures (a. cone; b. eroded volcanic cone)**;** 2. Adventive volcanic cones; 3. Lava plateaus; 4. Planezes; 5. Lava flows (a. lens-shaped; b. spur-shaped; c. apophysis-shaped)**;** 6. Pyroclastic accumulations (a. volcanic debris; b. breccias); 7. Debris accumulations.
II. Destructional forms. Differential erosion forms on effusive structures: 1. Craters (a. simple; b. composite); 2. Erosional volcano-tectonic depression**;** 3. Erosional scarp; 4. Valley steep slope (replat); 5. Erosional remains; 6. Peaks; 7. Surfaces (a. interfluve areas; b. slopes; c. taluses); 8. Ridges.
III. Destructional forms. Differential erosion forms on intrusive structures: 1. Neck; 2. Dyke; 3. Laccoliths.
III. Other forms:1. Hydrographic network (a. concentric convergent; b. concentric divergent; c. epigenetic valley; d. gorge); 2. Saddles (a. structural; b. erosional; c. erosive-structural); 3. Hilly morphology on sedimentary rocks; 4. Glacises; 5. Terraces (a. high; b. low); 6. Torrential erosion (a. torrents; b. gullies); 7. Gravel fans; 8. Colluvia; 9. Plains, floodplains; 10. Erosion through Holocene alluvial deposits; 11. Plain swampy areas; 12. Human-made relief (a. open pits; b. waste dumps).

- Bixad – Kubler tectono-volcanic horst (along the country's border);
- the isolated volcanic structures in the South on the Oaş Mountains.

f) low altitude (maximum 823 m in Piatra Vişcului peak and minimum 200 m at the contact with Someş Plain);

g) increased geomorphologic complexity due to the geologic background features;

h) aggressive modeling through differential erosion, fostered by the structural and petrographic variations;

i) closeness to the regional base level (Tisa Valley) that encouraged an accelerated regressive erosion;

j) the possible development of the modeling processes on more temporal phases, if considering the Mio-pliocene age of this volcanic unit;

k) the significant human impact upon the natural components.

4. ENVIRONMENTAL GEOMORPHOLOGIC STATES

In general terms, the environmental state is considered as an outcome of the „quality and depth of the environmental functional processes" (I. Mac, 1996). A state is defined as a way in which a system develops in time and space under the impulse or motion of input and output variables. In the case of the Oaş environmental volcanic system, the environmental states compose a large specter, a differentiation being possible on criteria as location, geologic-geomorphologic features and, in subsidiary, hydro-atmospheric factors and the biotic component (especially the phytomass).

4. 1. Temporality states

They appear under the form of some geologic-geomorphologic memories and are mirrored in three main territorial types:

– states and forms with increased stability, within which the resistance forces (rocks, structures' youngness) contributed to the preservation of some Pliocene-Pleistocene volcanic structures in their original form (Osoi, Fraşin and Sivoki stratovolcanos in the Northwestern part of the Oaş Mountains and the lava plateau in the South of the Turţ Gulf). Many of these structures still keep the complete volcanic apparatus, being thus very well preserved;

– residual forms and states, represented by intensely eroded volcanic structures (necks) as the two twin hummocks (Geamăna Mare -648 m and Geamăna Mică – 553 m) or the Frăsinaşu Volcano near the locality of Cămârzana;

– relict forms and states, conditioned by an active evolution in Prepontian when the modeling processes destroyed almost completely the existing structures and forms, conditioned by an active evolution in Prepontian, when the modeling processes up to their root, while the subsequent transgressions partially flooded them (for example the Măguriciu knoll, near Bixad). Nowadays, this kind of structures are not easily to be identified, but only hinted;

– inherited states and forms within which the geographic conditions and processes keep the same geomorphologic direction. The most explicit example in this respect is provided by the glacises developed at the base of the volcanic structures. Although they are intermediate landforms between the volcanic structures (cones, plateaus etc.) and the local base levels (channels, river flats), their continuous, never-ceasing evolution determines their development to the detriment of the first mentioned landforms (volcanic);

– actual states and forms that could be described by two main manifesting directions: (1) degradation (denudation) by various agents, processes and mechanisms (specific forms of

weathering, pluviodenudation, gully erosion, fluvial erosion, clinotrop processes); (2) aggradation, by a large scale of processes as deluvio-coluvial or alluvial-lacustrine accumulations (Călineşti Lake). At least two accumulation series with eterogene petrographic structure were identified, probably corresponding to two morphoclimatic cycles (Pliocene – Pleistocene and Holocene). If considering the longitudinal profile between the volcanic structures and the river channels, more structural sequences can be distinguished: proximate rough deluvial deposits, made especially of debris; composite diluvia (debris and fine materials); terminal diluvia, made of fine materials only (loam-sandy). The evolution of these forms is ascendant and they continuously grow against the structural slopes.

4. 2. Critical Environmental States

Critical states got successively in, being determined by the conflicting geomorphologic rapports. Such conflictual states developed on various bases, and their manifestation took various forms as physical/physical, physical-chemical/biological or natural/human/made. The evolution of Oaş Mountains geomorphologic system is described by more critical state phases:

– the polyphasic tectono-physical environmental state (Badenian, Inferior Pannonian and Pontian), when the earth shell resistance was outrun by the magmato-volcanic inducting forces, resulting in intrusions or extrusions (laccolites, necks, dykes, effusive edifices – volcanic cupolas, strato-volcanos, lava plateaus, pyroclastic plateaus);

– the tectono-magmatic and talasodenudational environmental state, within which the rapports between the two categories of processes contributed to the formation of abraded surfaces and of aggraded basins filled with Sarmatian and then Pannonian sediments;

– the environmental state imposed by the subaerian morphosculptural processes in Prepontian, when a regression of the volcanic processes is noticed, associated with an increase of the morphoscultural ones through clinotrop processes and fluvial erosion;

– the critical environmental state of anthropophysical origin, when the physical system is overcharged by through mining exploitations, overgrazing, forest clearings etc. The systems „alteration" is reflected in the human-made allogene landforms (waste dumps, spreading cones on slopes, riverbeds overloading with human-induced materials, extraction pits, circulation infrastructure, inhabited areas etc.). Some environmental areas are extremely explicit: Turț mining area, Certeze-Huta extraction pits, Călineşti limnic area.

Within the context of the geospatial conflicts between the geomorphologic system and the external factors (natural or socio-economic interventions), fragility states have set in. The decreased discharge of rivers (Tur, Lechincioara, Bătarci, Tarna Mare, Bixad, Turț) in association with a reduced drainage slope prevent the sediments' run off and determines a fragility state induced by floodplains' overmoisturing. The main effect of this phenomenon is represented by the morphohydric substitution from floodplain to marsh. Under such circumstances, the overgleisation process induces a decrease in the local pedologic potential.

The volcanic hummocks' increased slopes (Frasinu Mare, Băboi, Măgura Târşolțului, Geamăna etc.) associated with forest clearings and agricultural land uses (cereals cultivation, vine growing) induce slope fragility with soil erosion, gullies or torrents. On some areas, soil was totally removed, so that the volcanic structures are completely denuded (Târşolț Hummock, for example). The territorial degradation stage (with evident rhexystasic tendencies) is achieved in a very short time interval.

The regressing environmental states (environmental decline) get installed through:

– natural phenomena as clinotrop processes (land collapses or slumps, debris flows), overmoisturing, floodings, gully erosion etc.;

– mining activities, pits exploitations, overgrazing, unproper agricultural practices etc.

5. CONCLUSIONS

The interpretation of the „environmental memories" in this geomorphologic system, led us to the following conclusions:

– Oaș Mountains are described, in general, by a palimpsestic character within which structures and forms (from the relict to the actual ones) testify the succession of the various temporal-spatial states;

– the system's increased sensitivity might be explained by the permanent perturbations under the continuous inputs of mass, energy and information (polycyclic volcanism, marginal subsidences, pluvio-denudational and fluvial stress, human-induced stress etc);

– the specific nature of the structural and functional relations between elements (volcanic, sedimentary, marine, fluvial), the rapports permeability/impermeability or biologic activitiy /human-induced activity, contributed to a vulnerability state setting in and not to a robustness one, as registered in the case of other mountainous systems with evident complementary relations;

– the dysfunctions in this mountainous environment are both natural (geologic, geomorphologic – land slides, river channel overcharges, erosion, gleisation, pedologic processes etc.) and human-induced (material relocation by mining exploitations, constructions, interventions in the fluvial or slope landforms, various types of pollution – physical, chemical, thermic etc. -, space consumption for human purposes);

– a gradual establishment of a prevailing human-made environmental system, at least on the holarchic level of the epi-environment (geofund – weathering cover, edafund – soil, hydrofund – surface waters and biofund), is to be distinguished everywhere in the geographic landscape of the Oaș Mountains.

The Oaș Mountains distinguish by an increased geo-structural and morphologic variety and by landforms superpositions under the effect of the insertions of new structures into the old volcanic ones.

A main characteristic is represented by the increased relief fragmentation induced by the internal (tectono-volcanic) or external (especially of fluvio-denudational type) agents.

The relief's general aspect and morphometry individualize three distinct morphostructural units:

– the external unit, made of insular volcanic edifices (Jelejnic – 479 m, the hills of Remetea, Dealul Mare, Pleșcuța – 363 m and Dealul Viilor – 359 m, Oul peak – 356 m, Tămășeni hummock – 383 m, Măgura hummock – 328 m etc.), separated by gulf depressions that communicate through gates or passes with the Oaș inner depression (plane, with small volcanic bodies developed on fault lines and with marginal piedmonts and glacises). The most eloquent examples in this respect are: Tur Gate, Talna Gate, the saddle between Orașu Nou and Orașu Nou – Vii;

– the central ridge, characterized by the presence of complex, twinned or superposed structures, stratovulcanos, lava cones, exposed subvolcanic bodies (Frasinul Mare – 643 m, Pietroasa – 587 m, Cetățeaua Mică – 518 m, Cetățeaua Mare – 553 m) etc.

– the Northeastern ridge, quite unitary, with the most spatially extended structures and the highest heights, in some cases exceeding 800 m (Carolea, Piatra Vişcului – 823 m, Geamăna Mare, Geamăna Mică, Holmurile). Many of this structures are stratovolcanic, are very well preserved, but with large uncovered, exposed areas, especially at rivers' springs.

All types of volcanic edifices are to be found in Oaş Mountains: lava cones (Faţa Mare), stratovolcanos (Tămăşeni, Osoi, Frasin), subvolcanos (Piatra Vişcului, Dealul Pleşcuţa, Ursoi, Coasta Râtului), volcanic cupolas (Carolea, continues with the Pădurea Şes Plateau), necks (La Rădăcini), dykes (Măgura Sălăşimii, Tompa), lava plateaus (as those in Frasinul Mare – Corcea area), on various evolution stages, from the complete volcano (the main ridge, with barrancos and planezes) to the residual (Socea, Măgura Sălăşimii) or skeletal one (la Rădăcini, Grâul Morii, Măgura Tarna).

REFERENCES

1. Airinei, Şt. (1979), *Teritoriul României şi tectonica plăcilor,* Edit. Ştiinţifică şi Enciclopedică, Bucureşti.
2. Borcoş, M., Peltz, S., Stan, N., Udrescu, C., Vasiliu, C. (1979), *Consideraţii petrochimice şi geochimice asupra vulcanitelor neogene din Munţii Oaş-Gutâi*, Studii tehnice şi economice, seria I/6, Bucureşti.
3. Cooke, U., Doornkamp, C.J (1990), *Geomorphology in Environmental management. A New Introduction*, Second edition, Clarendon Press, Oxford.
4. Coteţ, P. (1970 a), *La genese de la Depression d'Oaş (Carpates Orientales),*Revue Roumaine de Geologie, Geophysique et Geographie, Serie Geographie, 14, 1, Bucureşti.
5. Kovacs, M., Pecskay, Z., Crihan M, Edelstein, O., Gabor, M., Bernard, A. (1997), *Study of Neogene Volcanic Rocks from the Oaş Mountains (East Carpathians, Romania),*Revue Roumaine de Geologie, t. 41, Bucureşti.
6. Mac, I. (1976), *Legea modelării selective şi formarea reliefului*, Studia Univ. „Babeş-Bolyai", Cluj-Napoca.
7. Mac, I. (1981), *Geomorfosfera, conţinut, structură şi extindere (Geomorphosphere, Contents, Structure and Extension),* Memoriile Secţiei Ştiinţifice, Academia R.S.R., Seria 4, t. IV, 2.
8. Mac, I (1989), *Formarea munţilor prin mecanismele tectonicii globale*, în Terra XXI(XLI), 3-4/1989.
9. Mac, I (1992), *Geomorfologia vulcanitelor neogene din estul Munţilor Oaş*, Studia Univ. „Babeş-Bolyai", Geographia, XXXVII, 1+2, Cluj-Napoca.
10. Mac, I., Budai, Cs. (1992), Munţii Oaş-Gutâi-Ţibles, Casa Edit. pentru Turism şi Cultură „Abeona", Bucureşti.
11. Mac, I., Drăguţ, L. (2000), Formaţiuni muntoase – puncte de vedere, Revista de Geomorfologie, Nr. 2, Asociaţia geomorfologilor din România, Bucureşti.
12. Posea, Gr. (2001), Vulcanismul şi relieful vulcanic (Hazarde, riscuri, dezastre. Relieful vulcanic din România), Edit. Fundaţiei România de Mâine, Bucureşti.
13. Rădulescu, D., Borcoş, M (1969), Vedere de ansamblu asupra desfăşurării vulcanismului neogen în România, Anuarul Comitetului Geologic, XXXVI, Bucureşti.

14. Săndulescu, M., Visarion, M., Stănică, D., Stănică, M., Atanasiu, L (1993), Deep Structure of the Inner Carpathians in the Maramureş-Tisa Zone (East Carpathians), Romanian Journal of Geophysics, 16, Bucharest.
15. Schreiber, W.E. (1989), Volcanic relief in the Eastern Carpathians, Geomorphology and Geoecology, vol. II, International Conference on Geomorphology, Abstracts, Frankfurt am Main.
16. Seghedi, I., Szakacs, A., Mason, P.R.D. (1995), Petrogenesis and magmatic evolution in the East Carpathian Neogene volcanic arc (Romania), Acta vulcanologica, 7.
17. Szekely, A. (1989), Geomorphology of the Intra-Carpathian volcanic range, in Geomorphological and Geoecological Essays, Studies in Geography in Hungary, 25, Akademiai Kiado, Budapest.
18. Şileam, T. (1999), Prospecțiuni geofizice, în Sinteza datelor geologice, geochimice şi geofizice din aria Munților Oaş – Gutâi – Țibleş, vol. I, IPEG Maramureş.

CLASSIFICATION OF MUD VOLCANOES OF THE EASTERN AND CENTRAL PART OF THE TRANSYLVANIAN DEPRESSION

ANDREA GÁL[1]

ABSTRACT. – Classification of Mud Volcanoes of the Eastern and Central Part of the Transylvanian Depression. Mud volcanoes of the eastern and central part of the Transylvanian Depression have been studied by Bányai (1932), Bartkó (1944) and Vancea (1929) who suggested several different classifications depending on their observations on the mud volcanoes. Having these typologies as a starting point and using the information after studying approximately 60 mud volcanoes from 20 localities (Monor – Bistriţa-Năsăud county, Sânger, Vălişoara, Maia, Cându, Sângeorgiu de Pădure – Mureş county, Atid, Corund, Băile Seiche, Forţeni, Morăreni, Cobăteşti, Mihăileni, Goagiu, Porumbenii Mici, Filiaş, Dârjiu, Crăciunel, Sânpaul – Harghita county şi Băile Homorod – Braşov county) a new classification of mud volcanoes in the eastern and central part of the Transylvanian Depression has been established. The classification has been made from the point of view of morphology and the internal structure until the maximal depth of 8.5m. We distinguish four types: gryphon, mud mound, mud crater and mud pool.

Keywords*: mud volcano, types, Transylvanian Depression, Romania.*

1. INTRODUCTION

Mud volcanoes are one of the world's most dynamic and unstable phenomena. They differ from the igneous volcanoes in genesis, discharged material, forms and activity, all being of much smaller amplitude. Some of the mud volcanoes (mostly those from Azerbaijan) resemble igneous volcanoes in the fact that they erupt forcefully with very high flames (some thousands of meters), extruding/discharging million cubic meters of gas and tones of mud (Jevanshir, 1997; Dimitrov, 2002; Kholodov, 2002a, b; Kopf, 2002). Nevertheless most of them emit constantly or periodically mud under the pressure of gas without eruptions.

Mud volcanoes related to natural gas emissions are very widespread in the Transylvanian Depression. They appear in different geologic, tectonic and topographic settings, having very diverse surface expressions. These very dynamic phenomena have been mentioned for the first time in 1610 (Szabó, 2002 fide Wanek, 2008) and scientifically documented beginning with the 19th century (Binder, 1844; Andrae, 1853, etc.) in 65 Transylvanian localities. Some of these have ceased their activity or have disappeared as a result of humane interference (mostly the ones situated in populated areas). On the other hand some new mud volcanoes have been identified which have never been recorded before. In the eastern and central part of the Transylvanian Depression a total number of 60 mud volcanoes have been identified and studied from 20 localities.

[1] *"Babeş-Bolyai" University, Faculty of Geography, 400006 Cluj-Napoca, Romania, e-mail: gal.andi@yahoo.com*

The main purpose of this study is to present a new typology from the point of view of the morphology and internal structure of mud volcanoes from the studied area. As a starting point, Bányai's classification (1932) was used, which takes into account the morphology and some (supposed) internal aspects of mud volcanoes distinguishing four types: "bottomless mud pits" (selymék), "maybug" (bogárhátas), "stack" (boglya), "white mud mounds" (fehérszék).

2. METHODS AND CRITERIA OF THE CLASSIFICATION

The studied mud volcanoes have been analyzed directly on the field from the point of view of morphology, morphometry, evolution (in cases when they have been observed several times) and the characteristics of the discharged material. The manual shallow drillings provided not only the samples but useful information regarding the internal structure. Using this information, the drilling profiles have been drawn up leading to the establishment of a new classification.

The following criteria have been taken into consideration in the new typology: external morphology, morphometric elements, internal structure, intensity of activity, characteristics of the discharged material, the presence of vegetation (total, partial and lack of vegetation) and if the mud volcano has appeared on a flat or sloping surface.

As far as the surface morphology is concerned, the shape of the mud volcanoes has been analyzed: flat, cone, truncated cone, dome, and the curve which describes the best the respective form. The outline curves have been drawn on the basis of the photographs and the morphometric information. Regarding the subsurface morphology, the form and dimensions of the feeding channel and the presence or lack of near-surface mud chambers have been examined.

Five intensity levels have been defined: 1. active mud discharge and/or bubbling of gas, 2. fresh mud without active discharge (in the case of positive shapes) and bubbling mud not covered by vegetation (in the case of negative forms) 3. mud volcanoes covered by vegetation which can be reactivated if the vegetation which blocks the vent is removed 4. covered by vegetation which can't be reactivated, but quakes under one's feet 5. inactive, with no signs of activity, only the shape or the references in bibliography alludes to the existence of a mud volcano.

3. CLASSIFICATION OF MUD VOLCANOES

After studying all the 60 mud volcanic features, despite of the diversity in surface expressions (shape and activity), some characteristic features have been recognized in morphology and evolution which allow us to establish a new classification. We propose to separate four types: gryphon, mud mound, mud crater and mud pool.

3. 1. Gryphon

The term gryphon has been defined by Kopf (2002) as a small cone (up to 3 m) off the crest or on the flank of a large mud volcano. In this study the term gryphon is used in a similar meaning, with the difference that it will not denote a secondary feature (the ramification of the main conduit) but the mud volcano itself.

Gryphons are represented by those positive mud volcanic features which result from the deposition of mudflows extruded through a narrow feeder channel on the preexisting topographic surface. The gryphon is built predominantly by the addition of material to the

edifice's outer slopes, heightening and/or widening it continually without any alteration in the subsurface. Depending on the viscosity of the material, the cone becomes higher and narrower or lower and wider. If the emitted mud is very fluid the resulted cone will be very flat, reaching only a few centimeters above the surface. The vent of the conduit can appear on the crest or on the flanks of the volcano.

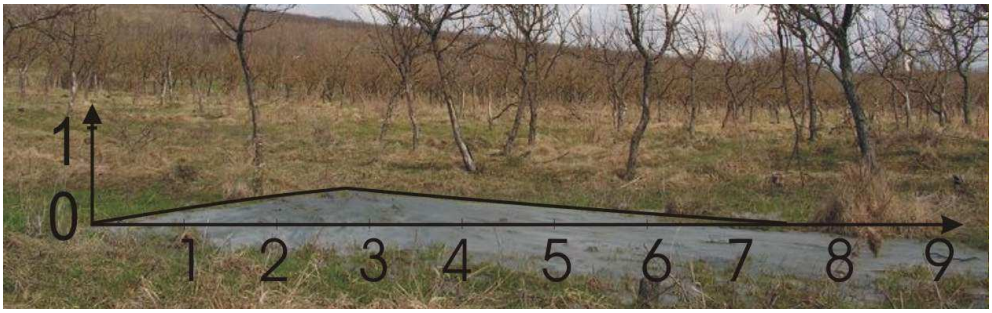


Fig. 1. Gryphon (Cobăteşti1).

If the topographic surface where the gryphons appear is plain the resulted shape will be a cone (usually a flat cone), if the gryphon appears on a sloping surface it will result in a fan or a sectioned cone – depending on the inclination angle – and if the human factor interferes there will be just a mud flow.

In a cross section the gryphon has the form of an idealized triangle. The intersection with the topographic surface is materialized in an angle (usually an obtuse angle), the flanks of the cone are represented by straight lines, with no inflections.

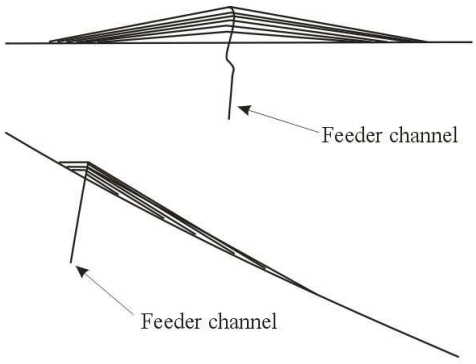


Fig. 2. Idealized sketch of a gryphon.

Gas bubbling can only be seen if the cone has a small crater where the expelled fluids gather. This kind of mud volcanoes may come into being in underwater conditions as well, in pools or shallow lakes.

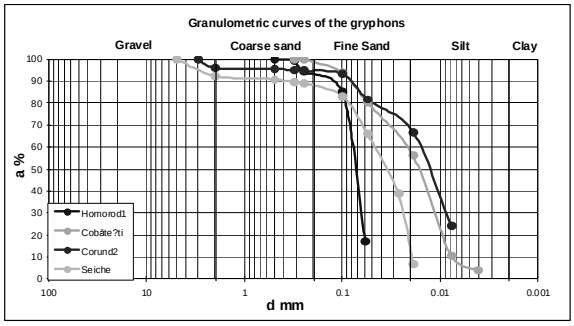


Fig. 3. Granulometric curves of the gryphons.

The results of the grain-size analyses performed on the samples gathered from some of the gryphons show a quite high external contamination. The contamination of the samples Corund2 and Seiche has already been observed while the samples were collected (the gryphon Seiche is placed near a road, the mudflow being drained, Corund2 appeared in a pit on the territory of an

aragonite mine and Homorod1 is located near a road on the territory of an old bath). The material discharged by the mud volcano is represented by the steep part of the cumulative granulometric curve – which is a relatively well sorted material, probably originating from one source layer.

3. 2. Mud mound

The term mud mound is borrowed from Brown (1990) who uses it to describe those positive features that don't have any obvious main vent structure. In this present study the term mud mound will be used to mark all the dome- and mound-shaped mud volcanic edifices regardless of the vent structure.

The external morphology of the mud mound differs from that of the gryphon firstly because the mud mound has a shape of a dome and the intersection with the topographical surface is realized through a circular arc.

Fig. 4. Mud mound (Filiaș3).

Mud mounds have a solid crust of about 20-60 cm, under which the liquid and sometimes viscous mud accumulates in a mud chamber from where it will be expelled under the pressure of gases through the vent.

The vent of the mud mounds can be a small opening or in extreme cases it can be represented by a small crater (approximately 60 cm) or it can be sealed by vegetation. In the proximity of the surface the feeding channel is almost as wide as the active part of the mud volcano. The flanks of the cone consist of water-logged, gleyic material.

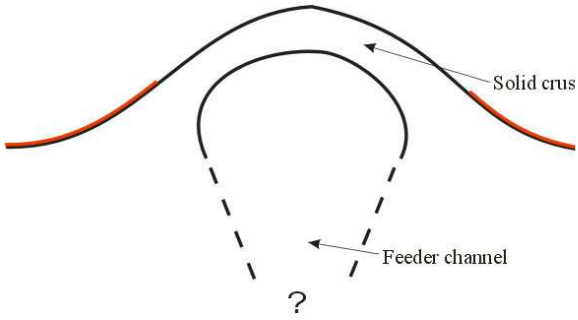


Fig. 5. Idealized sketch of a mud mound.

The results of the grain-size analyses of the samples collected from the mud mounds (Fig. 6.) show the best sorted material. The small percentage of fine sand and gravels points to a very small amount of external contamination that can be in relation with the formational mechanisms of these microforms. The formation of these forms is (presumably) similar to that of the mud diapirs: namely that the muddy material rises through the sediment sequences, it deforms the superficial strata but it does not pierce it, so it will not be contaminated or influenced by outer sources. Their vent is very small so there is no significant input of other material.

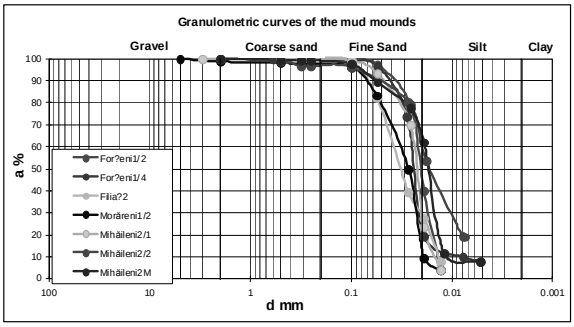


Fig. 6. Granulometric curves of mud mounds.

3. 3. Mud crater

This category includes mud volcanoes with the shape of a truncated cone, the small base of the cone being represented by the crater of the volcano. Mud craters are the largest mud volcanic structures.

Fig. 7. Mud crater (Filiaş1).

In cross section, the mud crater resembles a mud mound, the reason for it being that the intersection of the flanks with the topographic surface is materialized through a circular arc.

The mud inside the crater is generally viscous and the flanks are usually represented by a soil layer covered with herbaceous or even dendritic vegetation. Depending on the viscosity

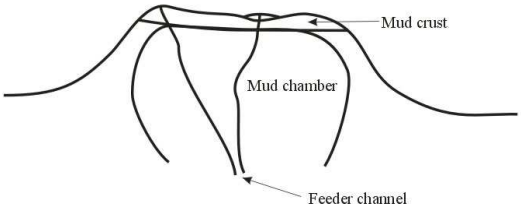


Fig. 8. Idealized sketch of a mud crater.

of the material accumulated in the crater, this may be covered by a semisolid or partly solid crust which usually quakes under one's feet, especially if covered by vegetation.

One of the studied mud craters (Filiaș1) came into being through an eruption that seems to have been triggered by an accumulation of gas (whose way to the surface was blocked by mud) in 1913.

The samples collected from the mud craters are poorly sorted from grain-size point of view, indicating a mixed origin of the material. Due to the open mud crater, the chance for an external contamination is high, but at the same time we can suppose an internal contamination resulting from the liquefaction of the surrounding rocks.

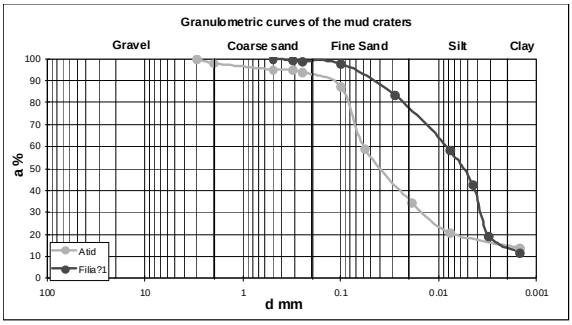


Fig. 9. Granulometric curves of the mud craters.

3. 4. Mud pools

Mud pools usually appear as puddles filled with a very soft, liquid and in some cases viscous material. Mud pools include all the negative and plain structures, even those that have a small secondary and temporary cone (approximately 10 cm).

The mud accumulated in the pools may or may not be covered by vegetation. When covered by vegetation, this quakes under one's feet without visible gas bubbling. Gas emissions are visible only after removing the vegetal cover, this having a dynamic evolution and changing its density frequently, sometimes even disappearing for short periods.

The dimensions of a mud pool vary from less than 1m until approximately 15m, and their depth ranges from 3 to over 8.5m. Any depth below this value remains unexplored because of the lack of a drilling set longer than 8.5 m. The drilling samplers have "submerged" 8.5 meters in the liquid mud which obviously was deeper than the equipment. The mud pool is bordered by the water-logged surrounding sediments.

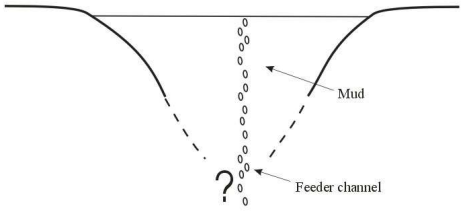


Fig. 10. Idealized sketch of a mud pool.

Generally the fluid mud is bubbling and the emitted gas can be lit, nevertheless the quality and the origin of the gas are not certain. Its color and the fact that it can be lit alludes to methane, but it is unknown if it originates from the gas structures or it is just the result of the decomposition of organic material (plants). Still, due to the semi-permanent flux of the gas we can assume that it is related to the underlying gas structures.

In the studied area, as well as in the whole Transylvanian Depression, mud pools are the most widespread features being known under several local names usually regarded as "bottomless mud pits".

Fig. 11. Mud pools (Gloduri 1).

The results of the grain-size analyses of the samples collected from the mud pools indicate the presence of more populations in the granulometric curves, proving this way the mixed character of the material. Taking into account the mechanisms of their formation – the liquid mud rising through a feeding channel widened by the liquefaction of the surrounding rocks – the mixed origin of the material makes sense. At the same time, the open shape of the mud pools enhances the external contamination which is represented on the granulometric diagram by the low percentages of coarse sand and gravel.

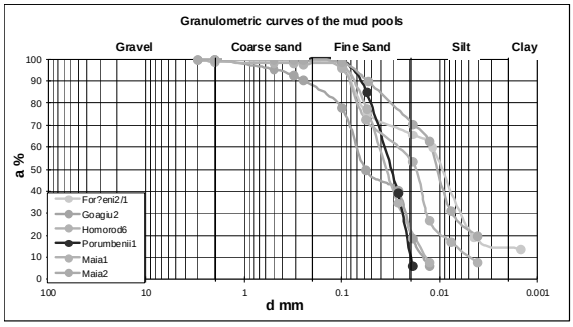


Fig. 12. Granulometric curves of the mud pools.

4. CONCLUSIONS

In the eastern and central part of the Transylvanian Depression mud pools are the most widespread structures, making up 52 % of all the studied mud volcanoes, and the remaining 48% is shared by mud mounds (28%), gryphons (15%) and only 5% of mud craters.

The drilling information and the drilling profiles provide clues regarding the internal structure of the mud volcanoes until 8.5m depth. Based on these drilling profiles which allude to the dimension and the shape of the feeding channel, the presence or lack of near-surface mud chambers, a new classification for the mud volcanoes in the eastern and central part of the Transylvanian Basin has been established. Four types of mud volcanoes have been distinguished: gryphon, mud mound, mud crater and mud pool.

The results of the grain-size analyses confirm the existence of these types through the degree of sortedness of the discharged material which offers clues about the origin of the mud (from one or several layers) and the degree of contamination with other materials.

The material discharged by the mud volcano appears to be represented on the granulometric diagram by the steep part of the curves. Usually the expelled mud is included in the fine sand and silt granulometric classes. The degree of contamination depends on the formational mechanism of the different mud volcanic types and on the contact surface with external factors (e.g. the mud craters and mud pools have the largest contact surface on which they can be contaminated with other type of material).

REFERENCES

1. Andrae, C. (1853), *Bericht über die Salsen bei Reiszen,* Jahrbuch der Keisler Königlichen geologischen Reichsanstalt, 4/1, Wien.
2. Bányai, J. (1932), *Udvarhely vármegye iszapforrásai*, Erdélyi Múzeum, 17/1.
3. Bartkó, L, (1944) *Raporturile geologice din regiunea Odorhei-Homorodalmaş*, Dări de seamă a Inst. Geol. 1944/2.
4. Binder, J. Fr. (1844), *Die drei kochenden Hügel*, Transsilvania, Beiblatt zum Siebenb.
5. Dimitrov, L. I. (2002): *Mud volcanoes—the most important pathway for degassing deeply buried sediments* Earth Science Reviews, 59 (1).
6. Jevanshir, R. D. (1997), *All About Mud Volcanoes*, Inst. of Geol., Azerbaijan Acad. of Sci., Baku.
7. Kholodov, V. N. (2002a), *Mud Volcanoes, Their Distribution Regularities and Genesis: Comm. 1.*, Lithology and Mineral Resources, Vol. 37, Nr 3.
8. Kholodov, V. N. (2002b), *Mud Volcanoes, Their Distribution Regularities and Genesis: Comm. 2.*, Lithology and Mineral Resources, Vol. 37, No. 4.
9. Kopf A. J. (2002), *Significance of mud volcanism*, Reviews of Geophysics, 40, 2/May, doi:10.1029/2000RG000093.
10. Pop, P. Gr. (2001), *Depresiunea Transilvaniei*, Edit. Presa Universitară Clujeană, Cluj-Napoca.
11. Vancea, A. (1929), *Observaţiuni geologice în regiunea de sud-west a Câmpiei Ardelene*, teză de doctorat (abstract).
12. Wanek, F. (2008), *Cunoştiiţele privind zăcămintele de gaze naturale şi ale semnelor lor de suprafaţă, după moartea lui Ferenc NYULAS, până la (re)descoperirea din 1908*, Műszaki szemle, 44.

THE ROLE OF RELIEF IN THE PLANNING OF ROADS AND IN THE ARRANGEMENT OF THE ROMAN CASTRA IN DACIA POROLISSENSIS

I. IRIMUŞ, FL. FODOREAN, D. PETREA, I. RUS, P. COCEAN, O. POP[1]

ABSTRACT. – The Role of Relief in the Planning of Roads and in the Arrangement of the Roman Castra in Dacia Porolissensis. The Transylvanian geographic landscape has been analyzed through the multitude of natural and anthropogenic variables, which define its functionality. The relation substratum-environment hydro – atmospheric - anthropogenic or biologic community claimed a specific investigation methodology with an interdisciplinary aspect. The geomorphologic investigation methodology assured the contemporaneous morphodynamic perception of the Transylvanian geomorphologic landscape. The reconstruction of their functionality in historic time represented a great challenge for the geomorphologist who had to use specific archaeological investigation methods to find and to motivate the existence of an geomorphologic process or the existence of an geographic event. This investigation is realized through the type of anthropogenic impact or through the use of the territory during the analyzed historical time. The placement of the Roman camps in Dacia Porolissensis, located at the Northern limit of the Roman Empire proves the strategic quality of the areas with gorges, canyons, or the panoramic view from the depression passages. The association of the defensive role of the Porolissum castrum with the morphology of the area, respectively the presence of the "Moigrad Magura", panoramic view that assured visibility over "Meses gate" towards Pannonia but also towards "the salt road" respectively "The Somes Valley" is not accidental. The presence of Dacian castra from Tihau or Rogna also motivates the strategically importance of the food transfer towards the Roman legions settled at Porolissum or Potaissa. The Roman roads served for the military strategy of the empire during its full development, respectively for provisioning the Roman legions camped in Dacia Porolissensis, but also for affording fast connections with other legions. Roman roads represent an argument for the articulation of Transylvanian landscapes, but their functionality should not be substituted nowadays, so it is on us to build a scientific movement that to motivate the necessity of their preserving today. The reconstruction of the Transylvanian paleo-landscapes through the impact of the infrastructure of the Roman roads on the development of these areas and the determination of the landscape functions represented some of the major arguments that interfered in the carrying out of the "Transylvania" highway project.

Keywords: *reconstruction, geomorphological paleo-landscape, Roman castra, Roman roads, Dacia Porolissensis, Transylvania.*

1. INTRODUCTION

Romans have built roads with a well-defined purpose, that of creating and organizing a network of connections with the discovered world, as a way to civilize them. Every discovered and conquered territory had to be connected to Rome. During the Imperial Age (under the Traian Emperor), there were 30 roads stretching from Rome, with a total length of 80.000 km (according to Hagen, 1968), practically "all roads were leading to Rome".

[1] *„Babeş-Bolyai" University, Faculty of Geography, 400006, Cluj-Napoca, Romania.*

The **roads** were mapped, the maps being intended to serve the following purposes: for the **army** (legions), by assuring the rapid movement of troops towards the threatened locations (rebellions or barbarian attacks); **provisioning** Rome and the other great towns of the Roman Empire; **trade and tourism** (exchange of cereal and animal products; procuring weapons, metals, salt; travels for games or treatment in balneal resorts, travels for acquiring information about the undergone activities within the Empire etc.) (according to Lascu, 1986, p. 151 – 206).

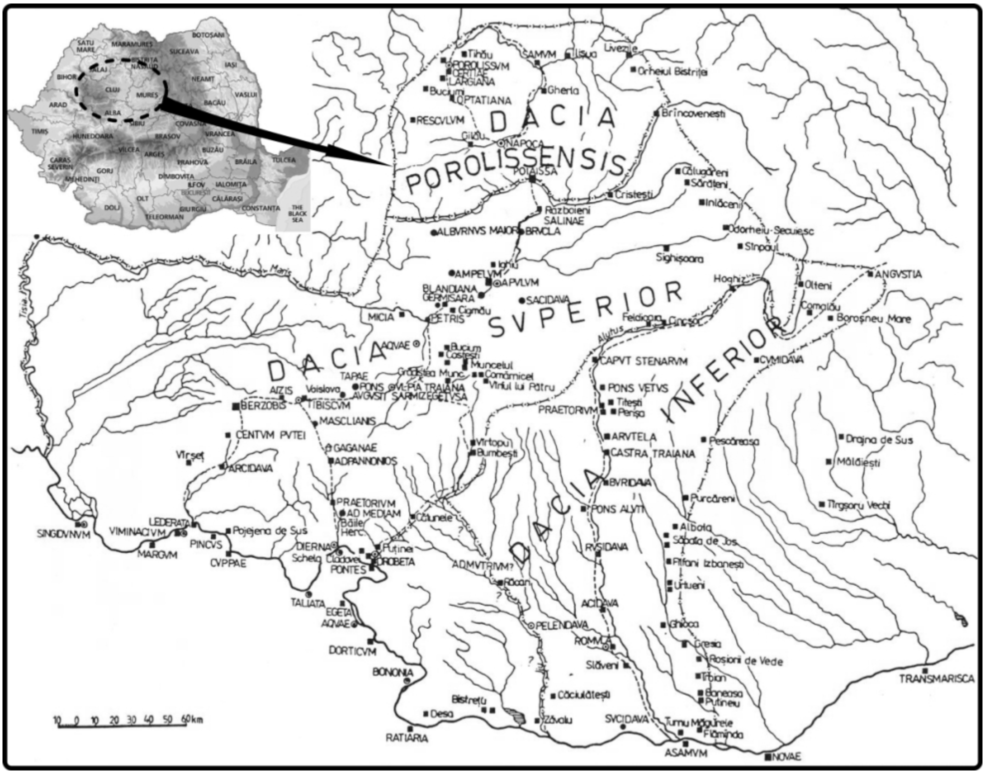


Fig. 1. The geographical location of Dacia Porolissensis.

The research of the Roman roads has begun during the XIX[th] century. In 1916, Miller elaborates the first methodological approach in a scientific study, starting from the existing cartographic, epigraphic and archaeological evidence. Pekary continued the scientific presentation of the Roman roads in 1968. Pekary's undergone research provides with a complete image of the Roman state politics to unify the Empire, the arguments stating in the public importance of the roads due to their costs and especially to their transportation and access function within the Empire, being considered as a factor of economic and cultural unity.

In 1974, Cason elaborated a chronological study of the Roman roads, arguing their importance through their vital implications in areas such as army, postal services, administration. In Romania, Lascu has developed scientific research in this direction (1985, 1986), his studies being but based mainly on literary evidence and to a less extent on epigraphic and archaeological proofs.

In Dacia Porolissensis (figure 1), the performed studies focused on the Roman Imperial Military Road Ulpia – Micia - Apulum – Potaissa – Napoca – Porolissum (Winkler, Blăjan, Cerghi, Ursuț, 1980-1993). A series of some inferior provincial roads are branching out from this major one: Napoca – Dezmir – Apahida – Jucu – Bonțida – Silivaş – Băița - Gherla – Buneşti - Dej; Turda (Potaissa) – Buru - Iara – Băişoara; Turda (Potaissa) – Roșia Montană (Alburnus Maior); Turda (Potaissa) – Bogata – Călăraşi – Războieni - Cetate; Sutor (Optatiana) – Bologa (over the Meseşului Mountains); Largiana (Românaşi) – the castrum from Buciumi (on the Agrijului Valley).

2. ROMAN ROADS CLASSIFICATION

Romans have also worked out the first classification of roads according to their strategic importance, way of construction, management or property. According to their administrator, roads were public (viae publicae), local (viae vicinales) and private (viae privatae). According to their importance based on their constructive features, roads were grouped into: roads of rank I, the Imperial Roman roads, paved with stones (silicae stratae); roads of rank II, with economic role, covered with gravels (glarea stratae); roads of rank III, earth roads, less circulated, with role of connecting the roads of rank I and rank II (terrenae or via terrenae). The public or imperial roads (viae publicae) were dedicated to long distance travels, being repaired and maintained by the authority in Rome. The viae vicinales were meant to afford access to villages and farms, to rural territories in general. The viae privatae afforded access towards private properties.

The construction of roads induced changes in land morphology (tunnels, bridges, viaducts that modified the river flowing regime, swamp draining, slope inclination correction etc.) in order to allow their linearity.

3. ROMAN ROADS CONSTRUCTION TECHNIQUES

A Roman road was generally formed by more layers of stone and bounded by two lateral ditches. The base structure provided with the necessary stability, representing the road nucleus. This structure was covered by a few layers of gravels and one of sand and topped with stone plates.

The Roman roads construction was indissolubly related to the evolution of the urbanization process within the Roman Empire. The Roman roads afforded the commercial relations between the various centers or civitas of the empire (Romans, Pre-Romans or Greek colonies), with obvious economic and commercial importance. The road projection was based on advanced knowledge of topometry, innovative surveying instruments being used. These technical conditions afforded, irrespective of the land morphology, the road rectilinearity by approaching large radius curves. In the case of the mountainous or hilly regions, the techniques were adapted to the land morphology and morphodynamics, the routes following, in general, level curves, coastal lines, interfluves, terraces treads or river meadows, and avoiding watersides, swamps or flooding areas.

The road route was established as to avoid watercourses crossing, sunny slopes with Southern or Southwestern orientation being preferred. At the same time, a reference element in roads construction was the presence of water. Generally, the road course avoided some natural obstacles as valley bottoms or swampy areas from reasons of construction duration and roads maintenance costs.

Fig. 2. Roads on paving stones (silicae stratae).

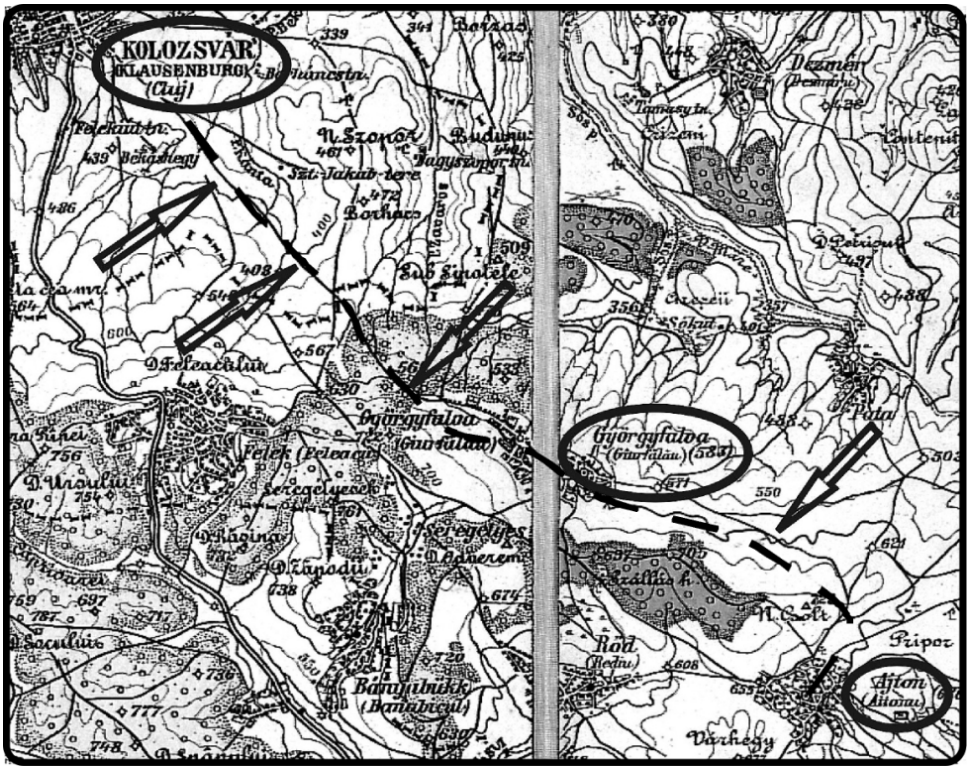


Fig. 3. The route of the imperial Roman road (in the hilly regions) between Cluj (Napoca) and Aiton (on the Austrian map, map scale 1 :75 000, 1895).

Among the main characteristics of the Roman roads, we could mention short alignments (30-150 m), large radius curves providing with increased visibility, avoidance of steep or swampy areas in order to benefit at maximum from the land's morphology.

4. ROMAN ROADS RESEARCH METHODOLOGY

The study of roads and of the Roman castra arrangement and projection techniques represents a scientific and methodological challenge and the acquired results could significantly contribute to the reconstruction of the geographical landscapes of Dacia Porolissensis. The diverse information sources (bibliographical and epigraphical sources, cartographic documents, geological and geomorphological information) require the implication of various specialists (archeologists, geomorphologists, cartographers). The research method was established according to the value of the documentation sources and to the available cartographic and archeological information.

The reconstitution of the Roman roads routes was undertaken based on the epigraphic (milliaria, tabula), toponimic and cartographic (military, topographic, botanical, pedological, geological, geomorphologic maps, cadastral plans) sources and through a careful analysis of the land's morphology by GIS techniques. For each analyzed route or road segment, the construction technique and the type and source of the used materials were identified. The dislocated resource volume was estimated as well as the induced environmental impact in relation with: number and succession of layers, technical characteristics (length, width, and depth), type and origin of the used materials (volcanic tuff, andesite, basalt, dacite, limestones, fluvial gravels and sands, clays).

In order to find out the arguments of Roman roads' orientation, the geological information was completed with climatic and hydrological data provided indirectly by the composition, texture and depth of the deluvial, coluvial or eluvial layers covering the Roman roads. The commercial exchange between the Roman provinces, castra or towns through the Roman custom-houses, provided us with useful indirect information about the land use types, as well as about the climatic conditions that afforded the agro-systems' development and productivity.

The relative altitude and position of the roads in relation to the level curves revealed information on slope stability and on the fluviatile morphodynamics. The role of the relief in projecting and arranging the Roman roads and castra, as well as its contribution in the development of a *civita* at the Northern *limes* of the Aurelian Empire is sustained by the artifacts found in the archeological digs ran at the Porolissum Roman Castrum and at the Bronze Age settlement of Sănduleşti (near Turda town).

5. DISCUSSIONS AND CONCLUSIONS

Dacia Porolissensis represented a challenge in trying to argue the Roman Empire superiority, mainly based on the roads and castra solid infrastructure. Each road segment was analyzed in relation to the substrate, the morphoclimatic context that afforded stability and many exploitation facilities, but also to the military or commercial purposes in order to maintain peace in the imperial provinces or to sustain the commercial flows. The analysis of the documentation materials (bibliographical, epigraphic, archeological, geographical), their indexation and reference to the climatic and morphological context, revealed a direct correlation between the Roman roads territorial functionality and the landscapes' structure and typology in Dacia Porolissensis.

The following types of Roman roads were identified in Dacia Porolissensis: 4 principal imperial roads, with a total length of 117 km, 15 secondary roads – *viae vicinales* -, with a total length of 658 km; the roads network of the Roman province totalized 775 km, its continuity being provided by 10 Roman bridges. We took as case studies in our research two segments of the imperial Roman road ***Potaissa – Napoca – Porolissum***: a) Cluj-Napoca (Napoca) – Gheorgheni – Aiton – Ceanu Mic – Tureni – Copăceni - Turda (Potaissa); b) Cluj-Napoca (Napoca) – Sutor (Optatiana) – Largiana (Românaşi) – Porolissum (Moigrad).

The Roman road ***Napoca – Gheorgheni – Aiton – Ceanu Mic – Tureni – Copăceni – Turda (Potaissa)*** follows the morphostructural contact of the Feleac massif with the friable Neogene deposits of the Transylvanian tectonic basin (clays, carbonated clays, marls, volcanic tuffs, hard or softer Eocene limestones - Leitha limestones-, sands, salt, gypsum, micro-conglomerates). The route of the analyzed imperial Roman road follows stable slope sectors and avoids swampy and flooding areas (Figure 2). The relative and absolute height and inclination do not prevent roads to keep linearity, while other aspects as slope instability due to landslides, rhythmical flooding of some river flats or land suitability to viticulture and tree cultivation influenced roads implementation decisions (Figure 3).

By correlating the information from antic and modern sources, we gathered sufficient morphometrical knowledge on the Napoca – Potaissa sector: length, inclination, relative height, deviation or correction angles. By using the available historical and geographical (especially geomorphologic) data, we can conclude that the following morphometric features described the analyzed Roman road: a) the relief energy or the relative height between sectors is of 70 – 100 m; b) road average inclination did not exceed 5-10 m / 1000 m, that is 5 – 10%; c) the accepted geomorphologic processes when establishing the road routes were the linear ones (rain-wash, gullies, torrents), while the areas affected by mass-movement processes (land collapses, land falls, land slides, solifluctions etc.) were avoided.

The alignments of the Roman roads that correspond to the above-mentioned characteristics are described by large curves, with angle values multiple of 30° (60, 90, 120, 150, 180), a link of short sections (30 m, 50 m, 125 m or 300 m), the longest one identified being of 500 m – in flat and large interfluves (plateaus or plains) with steppe vegetation. The road segments were projected as to afford good visibility and safety for travelers or military troops.

The course of the road in the sector between Napoca (Cluj) and Aiton (figure 4) followed the street texture of the town: *Universităţii Street* (starting from the antic centre, the Unirii Square) – *Kogălniceanu Street (*between the "Babeş-Bolyai" University, the State Archives and the Romanian Academy Library) – the court yard of the *Şincai National College – Avram Iancu Street – Cipariu Square* (the archeological digs ran after 1990 revealed the Roman road at a depth of 4 m, under a deluvial deposit; its width was of 5.6 m) – *Brâncuşi Street (Gheorgheni)*, leaving the town through the Borhanci colony; further on it follows the interfluve between the Faget Valley and the Hotarului Valley (Cluj Forest), then crosses the Gheorgheni village and finally reaches the settlement of Aiton.

While among the urban segments (from Cluj-Napoca) a single one is described by a large radius curve, the one between the Cipariu Square and the Avram Iancu Street (through the courtyard of the Sincai National College) and the average inclination did not exceed 5%, outside the built-up areas the large curve (160 – 175°) sections are much more frequent, while the road average inclination lies between 4.5% - 7.5%. Outside the settlement boundaries, the roads were avoiding the coastal springs, but they were identified and mapped because of their importance in supplying with drinking water, but also because of the induced risks to road construction - vulnerability towards mass movement processes.

After leaving the Cluj town, the relief energy increases from 75-80 m to 150-175 m in Gheorgheni and Aiton, also correlated with an increase of the fragmentation density from 0,9 km/km^2 to 3,4 km/km^2. These values prove the aggression of the tardi-glacial geomorphologic processes (the monticular landslides from Aiton – "glimee"), as well as of the contemporary ones, linear (gullies, torrents).

The sector between Aiton and Tureni, with a total length of 9750 m, is formed by a succession of road segments of 500-600 m, with large radius curves – 170 – 175°- and a general declivity of 5 – 6%. The road follows the 550 m isohypse, and then intersects the 625 m isohypse at the North of the Aiton village and the 475 m isohypse at the entrance into the Tureni settlement. In spite of the fact that this sector presents the highest altitudes, it is the best preserved one, mainly because of the hard materials used in its construction (limestones and sandstones), the road pavement being intercepted in the autumn of 2005, during some construction works undergone there. The Tureni-Turda section, almost linear, is described by an average declivity of 3.5% and it intersects under angles of 60-90° the isohypses of 475 m, 450 m and 350 m, when entering into the Turda municipality.

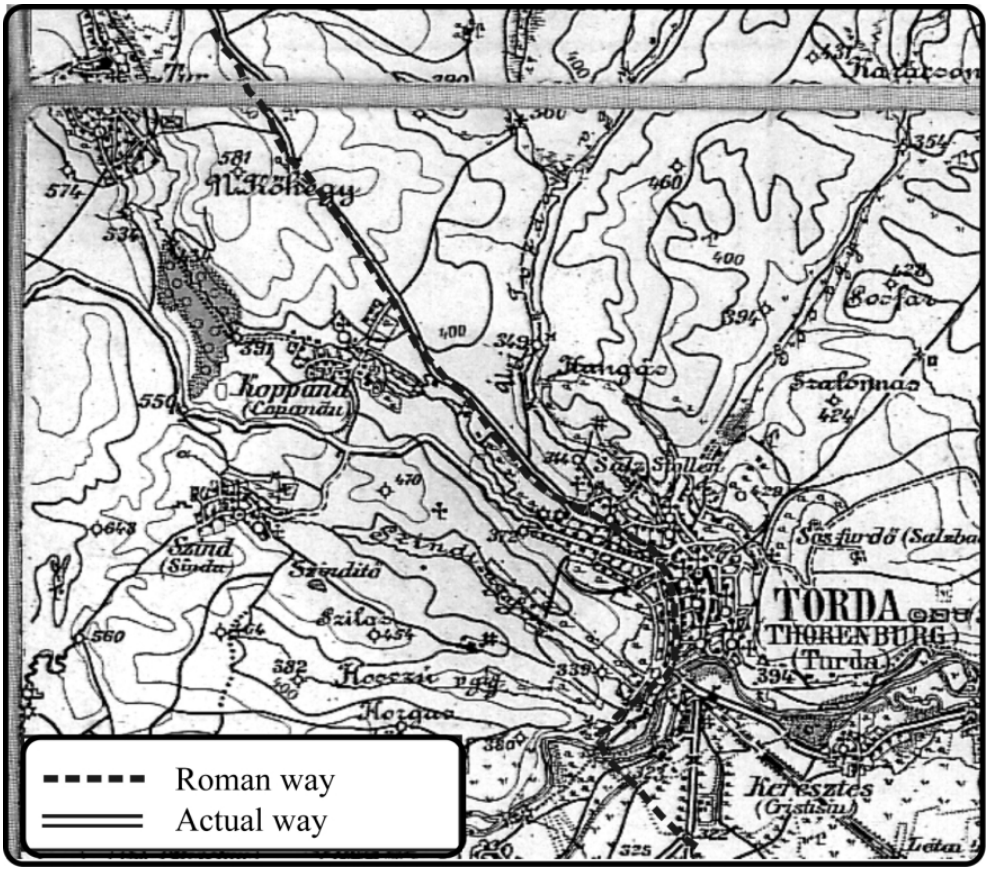


Fig. 4. The Tureni – Turda section.

The relatively moderated climate of the Turda Depression (T = 8.7°C; RR = 550 mm), the wide opening towards the Mureş Corridor or the Apuseni gold mines, explain the strategic position of Potaissa, the rapid development of the Roman settlement and the importance of this Roman castrum. The commercial exchanges between the "plainers" from the grain farming Transylvania and the mountain inhabitants from the upper basin of the Aries River, called "moți", will benefit from this strategic position.

Remaking the course of another Roman road, Cluj-Napoca (Napoca) – Sutor (Optatiana) – Largiana (Românaşi) – Porolissum (Moigrad), represented another scientific challenge when trying to correlate land morphology with the archeological traces (artifacts, epigraphical monuments, "milliaria" pillars, coins, villa rustica).

The following geographical aspects described the ***Napoca - Optatiana (Sutor) Porolissum (Moigrad)*** section (figure 5): the route follows the river flat and the inferior terrace of the Nadăş River up to the locality of Şard. Within the borders of Şard, the road is covered with the Nadăş River alluvial deposits.

Fragments of this road were revealed during the construction of the E 85 European road. Partially, at the level of the river flat, some sectors were damaged because of some natural or human-made processes as watercourse regularization works, natural watercourse catching or human activities (forestry road construction).

From Şard, the road crosses some less important localities (Stoboru, Cubleşu) and then continues along the Almaş and Agrij valleys, linking many important castra that are located on the Northwestern "*limes*" of Dacia Porolissensis (Românaşi, Romita, Porolissum). All along this sector, the Roman road was in many sites identified at surface, especially in the neighborhood of the above-mentioned castra (figure 6).

The route ends at Porolissum, Northernmost point of the Province, where the Roman road is on view even today, at the entrance into the Roman town, near the big fort on the Pomet Hill. In the local toponymy, this road is called "Traian road". From the ex-Roman town, Porolissum, the road turns westwards to Pannonia.

Fig. 5. The path of the imperial Roman road between Cluj (Napoca) and Sutor (Optatiana).

This Roman road, the "Traian road", crosses three geomorphologic units: Clujului Hills, Almaş - Agrij Depression and Meseş Mountains. The land morphology required on the behalf of the Roman engineers to find out solutions for some problems induced by the relief energy (150 – 350 m), fragmentation (1.8–3.6 km/km^2) and geodeclivity (3.5 -7%).

The short sectors (30 – 150 m) between Şard and Cubleşu, with angles of 160 – 177°, alternate in the segment Românaşi (Largiana) – Moigrad (Porolissum) with average length units (150 – 200 m or even 500 – 600 m), under angles of 120-150°. The Roman road is conform to the land's morphology (an average declivity with values of 4 – 5%, closeness to water sources, avoidance of swampy areas, closeness to building materials resources – andesites, limestones, sandstones). The road took advantage and exploited plane areas on terraces, river flats or interfluvial fields that afforded a very good visibility. Along the Roman road alignment, the relief horizontal fragmentation lies between 1.1 and 2.3 km/km^2. Even if some sectors of this Roman road are only 15-25 cm under the surface, it is very well preserved, mainly due to the hard materials (sedimentary, volcanic rocks) that were used in its construction.

Fig.6. Roman road covered with deluvial deposits (Porolissum).

The geographic landscapes induced by the analyzed imperial Roman road (Potaissa – Napoca – Optatiana – Largiana – Porolissum), mirror, through their functionality, the correlation between substratum and the territorial geomorphologic dynamics (landslides, solifluxions, riversides crashes, land collapses, linear erosion – gullies, torrents, furrows, ravines), on the one hand, and the land use types, infrastructure - villa rustica, civitas, municipium, castrum – or agricultural systems – cereal cultivation, grazing fields, ponds. As a result of the undergone research, it could be assessed that Roman roads allowed or stimulated the agricultural product exchange between the Roman provinces, covering the needs of the Roman Legions in Potaissa (Macedonica 5th Legion) and Porolissum (Gemina 13th Legion). At the same time, these roads facilitated the access of Roman troops to the Northern "*limes*" of the Empire, fact that argues their solid infrastructure.

The alignment of the Roman road provided us with indirect information about the slope and river channel morphodynamics of some watercourses as Almaş, Agrij, Arieş, Nadeş, Racilor or Tureni, but also about the social and economic structure of the population in the Dacia Porolissensis Roman Province.

REFERENCES

1. Adams, C., Ray, L. (2001), *Travel and Geography in the Roman Empire*, Editura Routledge - London / New York.
2. Fodorean, Fl. (2006), *Drumurile din Dacia Romană*, Editura Presa Universitară Clujeană, Cluj-Napoca.
3. Fustier, P. (1968), La *route. Voies antiques. Chemins anciens. Chaussées modernes*, Paris;
4. Gudea, N. (1989), *Porolissum. Un complex arheologic daco-Roman la marginea de nord a Imperiului daco-Roman.* Acta Museum Porolissensis, tom XIII, Zalău.
5. Gudea, N. (1996), *Porolissum II. Vama Romană - Monografie arheologică.* Editura Napocensis, Cluj -Napoca, România. Cap. III, p. 99.
6. Irimuş I. A. (1997), *La corrélation des glissements de terrain avec les types de dômes périphériques dans le Basin de Transylvanie, Geografia Fisica e Dinamica Quaternaria*, vol. 19, p. 245-248, Torino, Italia.
7. Irimuş, I. A. (1998), *Relieful pe domuri şi cute diapire din Depresiunea Transilvaniei*, Editura Presa Universitară Clujeană, Cluj-Napoca.
8. Irimuş, I. A. (2003), *Geografia fizică a României*,Editura Casa Cărții de Stiință, Cluj-Napoca, România.
9. Irimuş, I. A. (2006), *Hazarde şi riscuri asociate proceselor geomorfologice în aria cutelor diapire din Depresiunea Transilvaniei*. Editura Casa Cărții de Știință, Cluj-Napoca, ISBN 973-686-850-8, p. 287.
10. Lascu, N. (1965), *Cum trăiau Romanii*, Editura Ceres, Bucureşti.
11. Lazarovici, Gh., Maxim, Zoie (1995), *Gura Baciului. Monografie arheologică.* Coll. Biblioteca Musei Napocensis, Cluj-Napoca.
12. Mac, I. (1972), "*Bucium-Sălaj un sat din ţara de sub munte*", în vol. *Teritoriul şi utilizarea lui* (The territory and its use), pag. 107-179, Editura Academiei Române, Bucureşti.
13. Mac, I. (1987), *Geografia României*, vol. III, *Câmpia Transilvaniei*, (Transylvanian Plain), pag. 566-578, Editura Academiei Române, Bucureşti.
14. Pekáry, Th. (1968), *Untersuchungen zu den römischen Reichsstrassen*, Bonn.
15. Surd, V., Irimuş, I. A., Zemianschi, Sanda (1995), *Municipiul Turda.* Editura Potaissa, Turda.
16. Pop, P. Gr. (2001), Depresiunea Transilvaniei, Edit. Presa Universitră Clujeană, Cluj-Napoca.
17. Ursuț, D. (1982), *Ramificația drumului Roman imperial spre castrul de la Potaissa.* Cercetări topometrice, Potaissa, III, 1982, p. 20-22.
18. Ursuț, D. (1999), *Considerații privind drumurile de acces în Napoca*, în vol. *Napoca-1880 de ani de la începutul vieții urbane*, Cluj-Napoca, 1999, p. 234-238.
19. Ursuț, D. (1999), *Drumul Roman imperial din sectorul Aiton-Tureni. Caracteristici geografice şi topometrice*, Acta MN 31, vol. I, 1994, p. 209-214.
20. Ursuț, D., Petrică, P. (1982), *Scurtă analiză topometrică a sectorului de drum Roman cuprins între km 8 + 750 şi intrarea în municipiul Turda*, Acta MN 19, 1982, p. 591-592.
21. Ursuț, D., Petrică, P., Winkler, Iudita (1980), *Câteva considerații geotopografice privind traseul drumului Roman Potaissa-Napoca în sectorul Cluj-Napoca – Aiton*, Acta MN 17, 1980, p. 441- 446.
22. Winkler, Iudita, Blăjan, M., Cerghi, T. (1980), *Drumul Roman Napoca-Potaissa. I*, Potaissa. Studii şi comunicări, vol. 2, p. 63-73.
23. **** La politique édilitaire dans les provinces de l'Empire Romain.* Actes du I^{er} Colloque – Roumano-Suisse, Deva.

STUDIA UNIVERSITATIS BABEŞ-BOLYAI, GEOGRAPHIA, LIV, 2, 2009

DIURNAL VARIATION AND DURATION OF SIGNIFICANT SUMMER RAINS IN NORTH-WESTERN ROMANIA

T. TUDOSE[1], F. MOLDOVAN[2]

ABSTRACT. – Diurnal Variation and Duration of Significant Summer Rains in North-Western Romania. The diurnal variation and duration of significant rains were analyzed, based on climatic data from 11 meteorological stations located in North-Western Romania, in different landform conditions. We selected only the rains which meet the above-mentioned feature (maximal intensity higher than 0.04 mm/minute, and average intensity higher than 0.02 mm/minute, or an amount higher than 2.5 mm/m^2), recorded during the warm season (April-October) between 1975 and 2006, resulting a number of 20,567 such situations. The diurnal variation of the moment of start for the significant rains during the entire season indicates that the highest frequency is during the afternoon and the evening (between 2 p.m. and 9 p.m. Romanian summer time). A secondary maximum is recorded at the beginning of the night (10 p.m. – 11 p.m. Romanian summer time). Monthly, the highest frequencies are recorded in June and July, summing together 41.7% of all the situations. One should notice their "shift" from the mountain area to the surrounding areas, as significant rains are registered 2 to 3 hours earlier in the highlands than in the hilly uplands, depressions or lowlands. The duration of these rains is most frequently less than one hour (38.1%), taking place mostly during the afternoon and the evening, followed by rains lasting between 3 and 6 hours (18.6%).

Keywords*: diurnal variation, significant rains, frequency, North-Western Romania.*

1. INTRODUCTION

In specific scientific literature, the study of rainfall presents a real interest, and the methodology of approaching the issue is diverse. It is normal that a climatic element like rainfall constitute a subject worthy of a complex analysis, in the context of its high impact on environment, economy and society. Howard (1942), in its study on the diurnal frequency of rainfall in Kansas City over a period of 30 years, identifies a maximum around sunrise for the warm season, 88% of the measurable quantities being registered between 11 p.m. and 11 a.m. local time.

Wallace (1975), using the data from 120 meteorological stations in the Eastern half of the United States of America, between 1951 and 1960, indicates that the diurnal variation of rainfall presents its highest values late afternoon in the regions located South and East of Mississippi and Ohio during summer. At the same time, on the Eastern slope of the Rocky Mountains, the maximum appears around 6 p.m. local time. However, eastwards,

[1]*National Meteorological Administration, Northern Transylvania Regional Meteorological Centre, Romania, e-mail: t_traiant@yahoo.com*

[2]*„Babeş-Bolyai" University, Faculty of Geography, 400006, Cluj-Napoca, Romania, e-mail: moldovan@geografie.ubbcluj.ro*

in the Great Plains, a gradual transition to a maximum during the night is noticeable, while in the low plains, the maximum is recorded in the morning (at 6 a.m. local time).

Pavai and others (2007), using three-hourly messages from 174 Romanian meteorological stations for 17 summer seasons (1990-2007), determines the diurnal variations of the relative frequency of rainfall and lightning discharges. For North-Western Romania, he identifies a maximum of rainfall during afternoon in the hills, depressions and valleys, and during late evening in the plains.

This paper tries to establish the monthly and annual diurnal variation of significant rains, as well as their duration, setting a starting point for the identification of areas where this phenomenon happens more frequently, as well as for the future analysis of other parameters (average intensity, highest intensity, torrential nature).

2. DATA AND METHODS

Significant rains are represented by liquid precipitations, torrential or not, registered by the recording rain gauge during summer season, which meet certain conditions regarding the average and maximal intensity, and the amount of water fell (Instructions for meteorological stations, 1995):

- highest intensity > 0.04 mm/minute;
- average intensity > 0.02 mm/minute or a recorded amount of water > 2.5 mm/m^2.

Monthly frequency and summer amount of rainfall recorded at the analyzed meteorological stations (%)

Table 1

Month / Met. station	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Sum of period IV-X
Satu Mare	6.4	5.4	5.7	7.6	10.2	11.8	11.4	10.4	8.8	7.1	7.1	8.1	**67.3**
Supuru de Jos	5.5	4.5	5.3	8.7	10.4	14.4	12.1	10.9	8.5	6.1	6.7	7.0	**71.0**
Baia Mare	8.1	5.8	6.6	7.4	8.9	10.8	10.0	9.2	8.1	7.1	8.3	9.7	**61.5**
Sighetu Marm.	6.2	5.0	6.0	7.7	10.1	12.0	12.5	10.4	9.2	6.8	6.5	7.6	**68.7**
Ocna Şugatag	5.7	4.8	6.1	7.7	11.1	12.9	13.3	10.6	8.1	6.6	6.2	7.0	**70.2**
Cluj-N.	4.6	3.7	4.8	9.3	11.2	14.8	15.3	10.9	8.4	5.5	5.8	5.6	**75.5**
Dej	6.6	4.7	5.9	8.7	9.7	13.1	11.9	10.4	8.2	6.1	7.0	7.7	**68.1**
Zalău	5.3	4.3	5.4	8.5	11.5	14.6	12.4	10.7	8.6	5.6	6.6	6.7	**71.9**
Bistrița	6.4	4.5	5.3	8.8	9.9	12.9	13.3	9.8	8.9	6.5	6.4	7.3	**70.1**
Vlădeasa	6.4	5.1	5.6	7.1	9.9	14.2	13.4	10.6	8.9	6.0	6.1	6.7	**47.1***
Iezer	5.6	4.9	6.6	8.7	10.4	12.3	12.1	9.4	8.9	7.9	6.8	6.5	**42.6***

*Sum of period VI-IX

For the study, we used data concerning significant rains from TM 13 annual table from 11 meteorological stations in North-Western Romania: Satu Mare and Supuru de Jos (in the plain), Baia Mare, Sighetu Marmației and Ocna Şugatag (in Baia Mare and Maramureş

Depressions), Cluj-Napoca and Dej (North-East of Apuseni Mountains, on Someşu Mic Corridor), Zalău and Bistrița (in the hilly area), Vlădeasa 1800 (Vlădeasa Mountains) and Iezer (Rodna Mountains), in the mountain area.

The analyzed period is 1975-2006, and we have taken into account the significant rains during the warm season (April-October). Yet, the period of interest for the mountainous meteorological stations is June-September, due to the presence of snowfall during the other months.

We used a statistical method of analysis, by means of which we established the diurnal and monthly variation of the analyzed parameter and its duration.

North-Western Romania is a region characterized by annual average values of precipitations between 574.7 mm in the valley corridor East of Apuseni Mountains (Cluj-Napoca) and over 1200 mm in the high mountain area of Rodna Mountains (Iezer). There is a main maximum in June-July and a minimum in February. In the lowlands of the region, the amounts of precipitation during the warm season (April-October) totalize between 61.5 and 75.5%, while in the mountains these values are comprised between 42.6 and 47.1%, but there is a shorter warm season (table 1). The highest monthly frequencies are registered between May and August, when precipitation amounts are higher because of the increase of daylight convection.

The monthly frequency and the warm season average of the weight of significant rains out of the total amount of rainfall (%)

Table 2

Month/ Met. station	**IV**	**V**	**VI**	**VII**	**VIII**	**IX**	**X**	**Average of period IV-X**
Satu Mare	67.1	82.3	88.4	88.9	86.8	73.5	76.3	**80.5**
Supuru de Jos	62.8	85.4	92.7	93.0	94.3	78.7	63.3	**81.5**
Baia Mare	70.9	85.3	87.8	89.0	90.2	81.2	79.4	**83.4**
Sighetu Marm.	68.9	82.7	84.6	90.3	88.6	77.8	70.2	**80.5**
Ocna Şugatag	58.0	79.4	82.4	83.7	82.3	80.4	65.3	**75.9**
Cluj-Napoca	56.6	71.4	83.0	80.5	83.8	68.6	60.0	**72.0**
Dej	62.5	77.4	85.0	86.4	90.5	75.1	68.9	**78.0**
Zalău	66.2	86.3	90.2	91.1	90.5	80.8	70.9	**82.3**
Bistrița	67.7	80.7	86.1	89.1	90.4	78.4	74.3	**80.9**
Vlădeasa	-	-	72.7	79.8	86.3	46.7	-	**71.4***
Iezer	-	-	65.3	77.0	86.0	39.3	-	**66.9***

*Average of period VI-IX

The analysis of the water amounts recorded during significant rains out of the total amounts of summer rainfall indicate average season values between 66.9 and 71.4% in the mountain area, and between 72.0 and 83.4% in the lowlands (table 2).

The monthly analysis of these frequencies sheds light on a number of aspects:

- the Gauss-type distribution, with the highest percentage values in July and August (86.0-94.3%);

- the fast increase of frequencies at the beginning of the warm season and their decrease at the beginning of autumn, due to the higher heat convection between May and August, while the lower percentage values at the beginning of autumn and the end of spring are explained by the long-lasting insignificant rains, specific for these periods.

Taking into account all of the above, as well as the effect of significant rains, often torrential in nature, registered especially in the latest years, we consider the knowledge of some of their features as very important.

3. RESULTS

Monthly, the structure of the diurnal variation concerning the starting time of significant rains presents a series of peculiarities, depending on the season. For instance, 9.2% of the significant rains are recorded in April (fig. 1). The highest weight belongs to the afternoon rains (between 2 p.m. and 8 p.m. Romanian summer time) and the first part of the night (9 p.m. to 11 p.m. Romanian summer time). The highest frequencies of significant rains are recorded in Maramureş and the hilly area of the North-West. It is noticeable that the maximum in the plain area (Satu Mare) is delayed up to 6 hours compared to the other parts of the region.

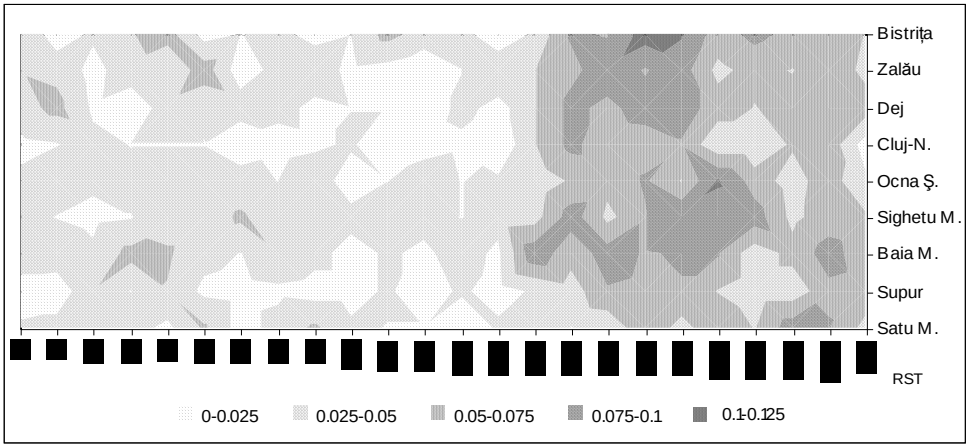


Fig. 1. The diurnal variation of the frequency of significant rains in April (%).

In May, as a consequence of the increase of solar radiation intensity, the ground active surface becomes warmer and the convection is more important. The weight of significant rains reaches 13.9% out of the total. The highest percentage values are recorded during the afternoon, but there are differences between the areas: in Maramureş Depression between 2 p.m. and 9 p.m. Romanian summer time, in the hilly area and along the valleys between 3 p.m. and 7 p.m., and between 5 p.m. and 8 p.m. in the plain (figure 2). At the same time, one may notice a second maximum of the frequency, more obvious in the case of Maramureş (Ocna Şugatag, Sighetu Marmaţiei) and the Eastern hilly area (Bistriţa).

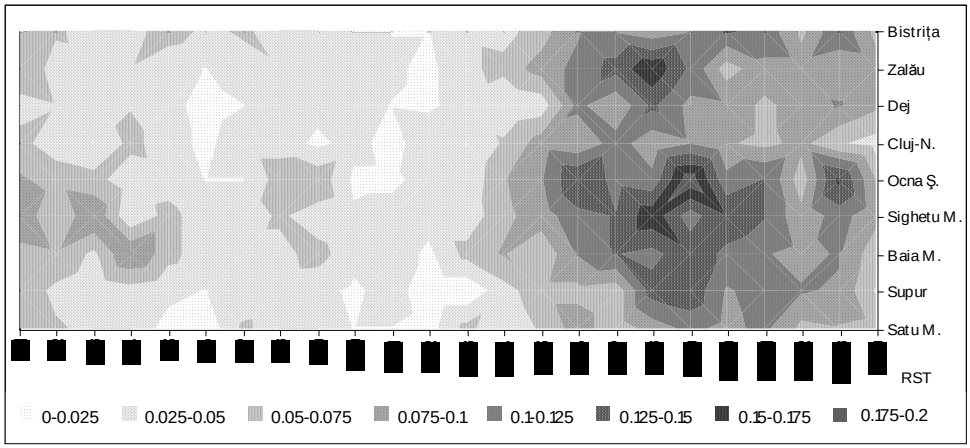


Fig. 2. The diurnal variation of the frequency of significant rains in May (%).

The months of June and July sum up 41.7% of the total of significant rains. During both months, the highest number of cases is recorded in the mountain area and in Maramureş Depression.

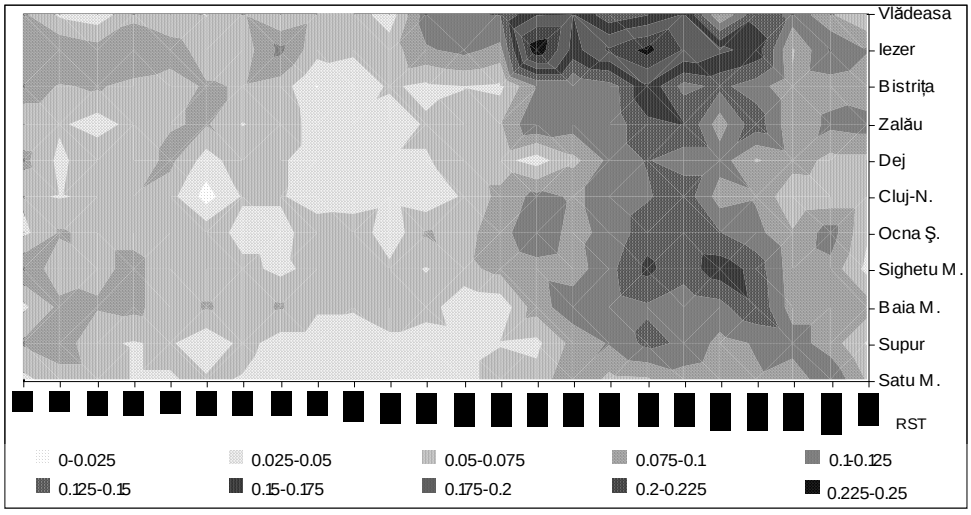


Fig. 3. The diurnal variation of the frequency of significant rains in June (%).

In June, like in the previous months, the highest frequency of these rains is during the afternoon. In the mountains, they fall mostly between 11 a.m. and 9 p.m., the highest percentage values being recorded between 2 p.m. and 3 p.m., and between 4 p.m. and 7 p.m.

Romanian summer time. This situation corresponds with the results presented by Pavai and others (2006) concerning the frequency of appearance of radar echoes with intensities higher or equal to 50 dBz, used for establishing the location of areas with mature convection storms. The authors remark the intensification of convective nuclei in Vlădeasa Mountains area, reaching the maximum of frequency around noon, and their presence until around 7.30 p.m. In Maramureş and the hilly area, the highest frequency of emergence of significant rains is between 2 p.m. and 9 p.m., while along the valleys and in the plain, the moment of emergence of maximum frequency is delayed by 3 to 4 hours (figure 3). At the same time, the secondary maximum of frequencies, hardly noticeable, is present in the mountain area, in the hilly area and in Maramureş, around 10 p.m. – midnight (Romanian summer time).

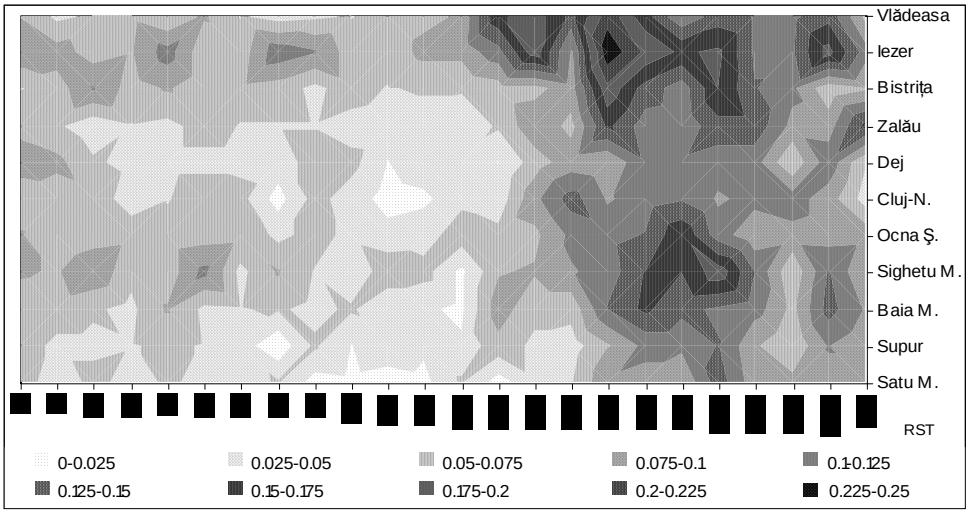


Fig. 4. The diurnal variation of the frequency of significant rains in July (%).

In July, the highest frequency of emergence of significant rains is during the afternoon and the evening, except for the mountain area, where they begin 3 to 4 hours earlier (figure 4). In Maramureş, as in the hilly area and along the valleys, the highest frequencies are recorded between 3 p.m. and 9 p.m. (Romanian summer time), with a maximum between 5 p.m. and 8 p.m. in Maramureş and between 4 p.m. and 6 p.m. and between 7 p.m. and 9 p.m. in the hills. One should notice the presence of a secondary maximum, late evening (between 10 p.m. and midnight, Romanian summer time), obvious in the mountain area, the hilly area and along the valleys.

In August, the significant rains, totalizing 16.9% of the total, are most frequent between 3 p.m. and 8 p.m. Romanian summer time, with a clearer maximum in the mountain area (figure 5). Except for the plain, where the emergence frequencies are low, in the lower lands the maximum of the starting point of these rains is between 3 p.m. and 7 p.m. Romanian summer time. The highest percentage values are recorded in Maramureş.

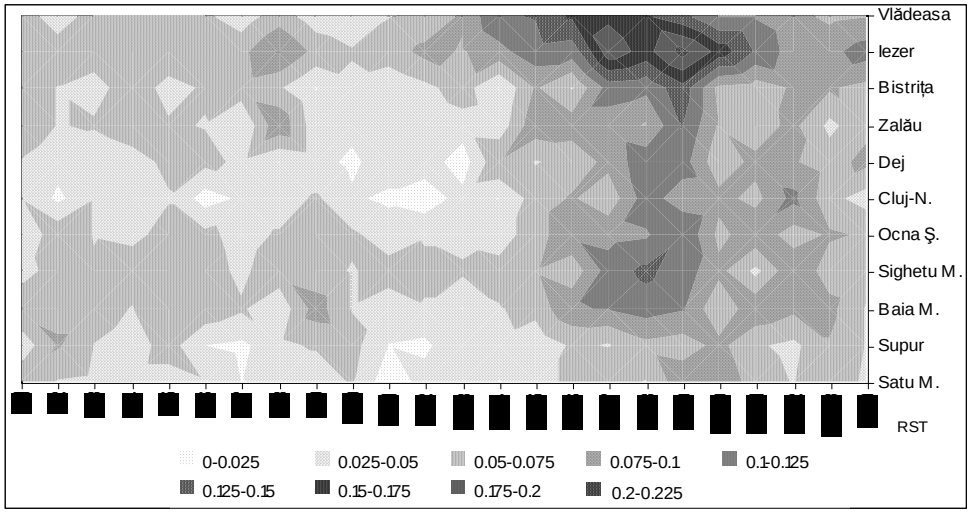


Fig. 5. The diurnal variation of the frequency of significant rains in August (%).

The months of September and October amount to 18.3% of the total of significant rains. They present a different diurnal variation compared to the previous months (figures 6 and 7).

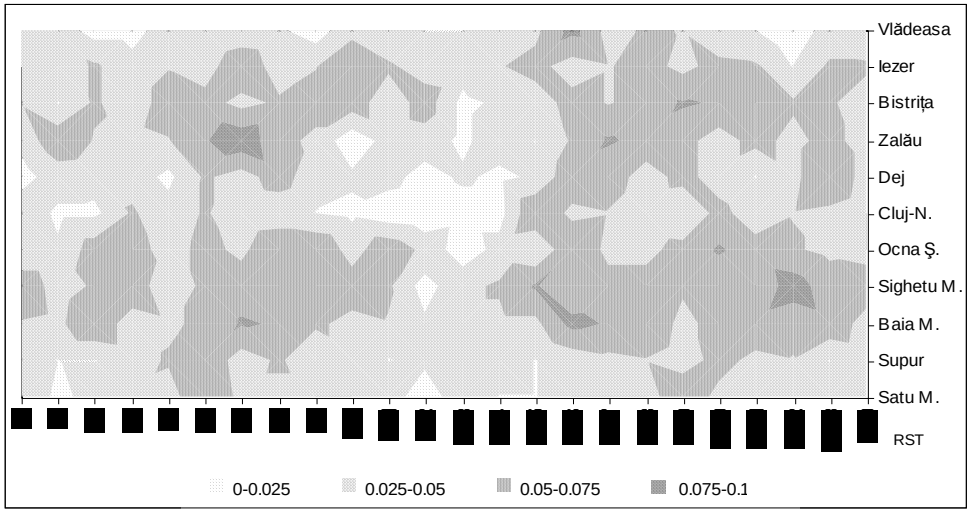


Fig. 6. The diurnal variation of the frequency of significant rains in September (%).

In September (figure 6), as convection diminishes as a result of the decrease of solar radiation intensity, significant rains are registered especially during the afternoon and late evening (between 2 p.m. and 11 p.m. Romanian summer time). In October, they have a random distribution due to the emergence of long-lasting autumn rains (figure 7).

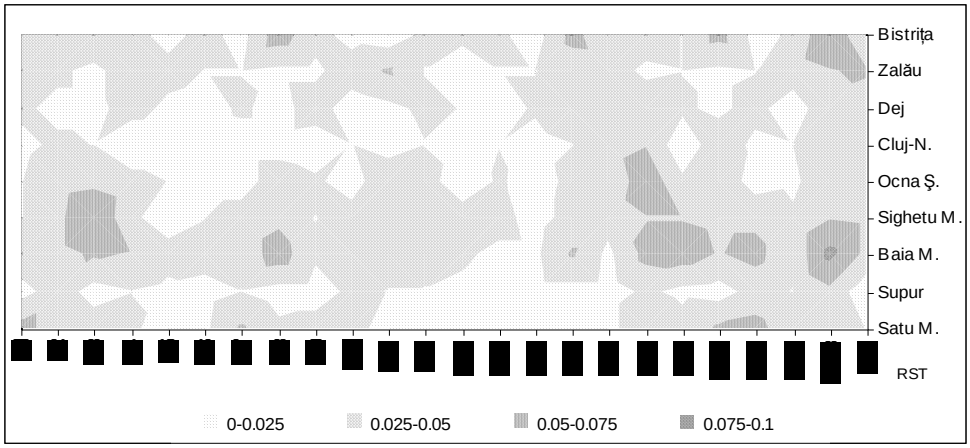


Fig. 7. The diurnal variation of the frequency of significant rains in October (%).

The structure of the annual diurnal variation of significant rains in North-Western Romania underlines a number of features:

- the highest percentage values of all significant rains are recorded in Maramureş (between 10.2% and 10.9%), followed by the hilly area (between 9.8 and 10.1%) and the mountain area. Lower percentage values are registered in the corridor East of Apuseni Mountains (7.8% at Cluj-Napoca and 8.6% at Dej), and frequencies a bit under 8% are recorded in the plain;

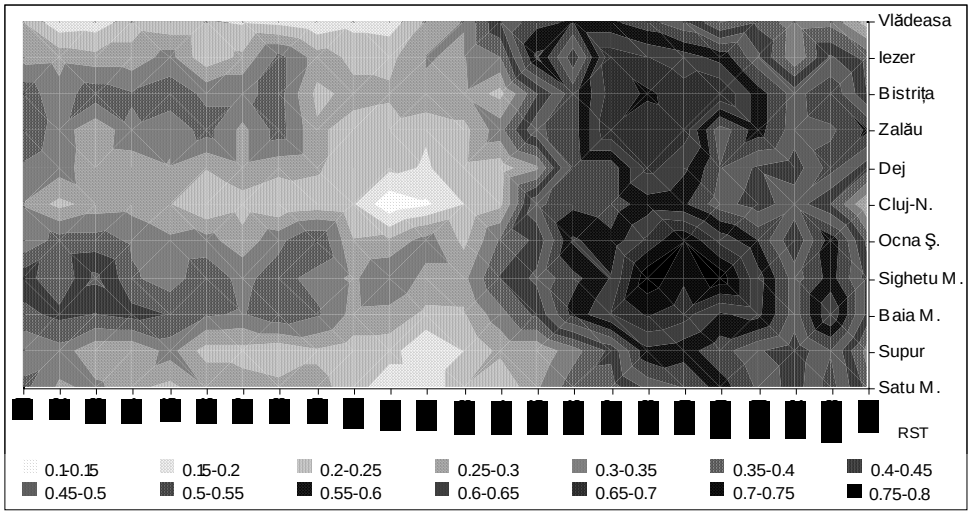


Fig. 8. The annual diurnal variation of the frequency of summer significant rains (April-October) (%).

- the highest annual frequencies for the entire region are registered between 2 p.m. and 9 p.m. Romanian summer time (41.9%), with a maximum between 5 p.m. and 8 p.m. Romanian summer time (19.9% of the total);

- significant rains start 2 to 3 hours earlier in the mountains and 2 to 3 hours later in the plains, compared to the hilly areas. This aspect was also highlighted by Pavai and others (2007) in the case of emergence frequency of significant rains, either torrential or not;

- the presence of a secondary maximum of emergence of these rains, between 10 p.m. and 11 p.m. Romanian summer time in Maramureş and between 10 p.m. and midnight Romanian summer time in the hilly areas. During this period, 9.7% of significant rains start at the level of the entire region;

- there is even a tertiary maximum in the annual frequency of significant rains. It is more obvious in Maramureş and in the hilly areas, between midnight and 9 a.m. Romanian summer time, summing up 16.7% of the total.

Another important element in the analysis of significant rains is their duration. The 20,567 cases of the analysed period were structured in 11 classes, according to duration (figure 9). The highest percentage values belong to significant rains lasting less than one hour (38.1%), followed by those lasting between 3 and 6 hours (18.6%) and between 1 and 2 hours (18.2%). Together, rains lasting up to 3 hours represent more than two thirds of the total (68.4%), and those lasting up to 6 hours, 87%. Because the rains lasting more than 6 hours present a series of common features, they have been analysed together.

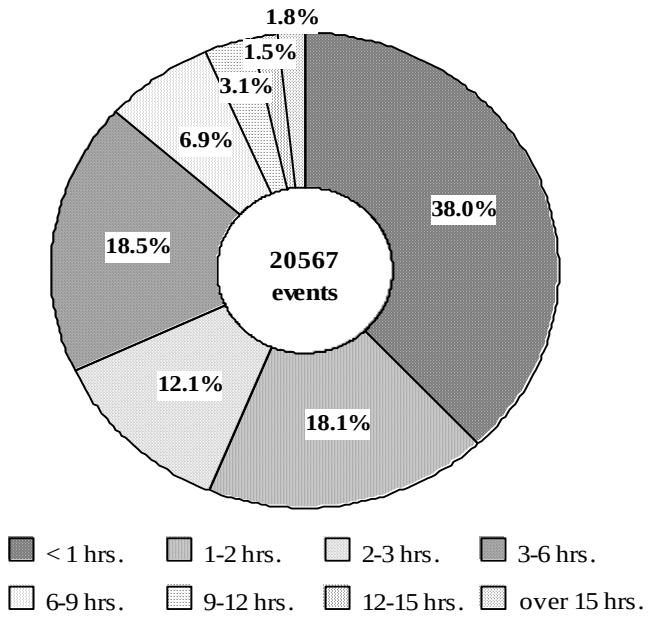


Fig. 9. The frequency of significant rains according to their duration (%).

Significant rains lasting less than one hour emerge in all moments of the day, but they have higher frequencies between 1 p.m. and 10 p.m. Romanian summer time. The maximal values are recorded during the afternoon and the evening, but there are some regional differences. Thus, the highest percentage values belong to the hilly area of the region (Bistriţa, Zalău), with a maximum of emergence between 4 p.m. and 8 p.m. Romanian summer time, and to Maramureş Depression (figure 10). A secondary maximum, less frequent, is recorded in the hilly area between 10 p.m. and 2 a.m., and in Maramureş between midnight and 2 a.m. Romanian summer time.

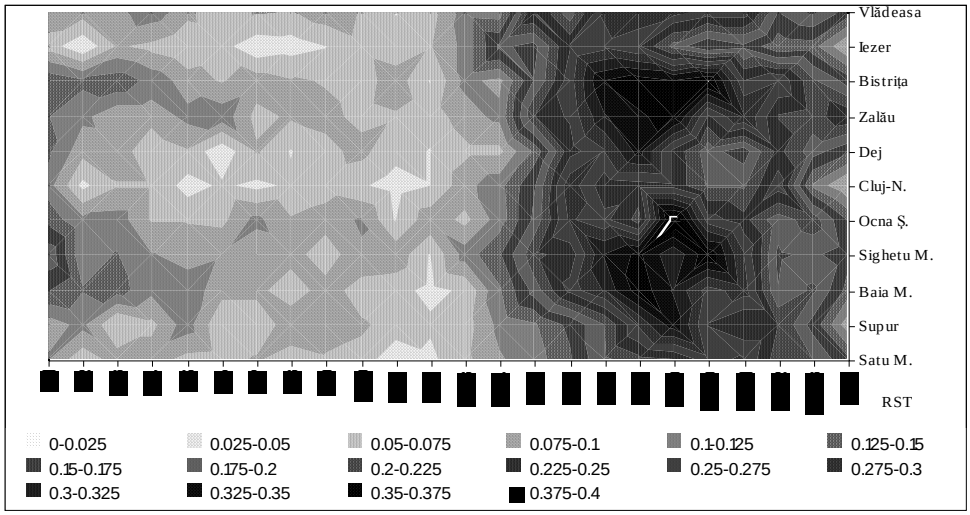


Fig. 10. The annual diurnal variation of the frequency of significant rains lasting less than one hour (%).

One may also notice the relatively low frequency of such rains within the corridor area East of Apuseni Mountains (Cluj-Napoca, Dej), and the 3 to 4 hour delay of the afternoon maximum in the plains. It is also noticeable that the lowest emergence frequency of such rains is from early morning until noon. The monthly structure of significant rains lasting less than one hour reveals the highest frequencies in June and July, totalizing together 45.7% of the total.

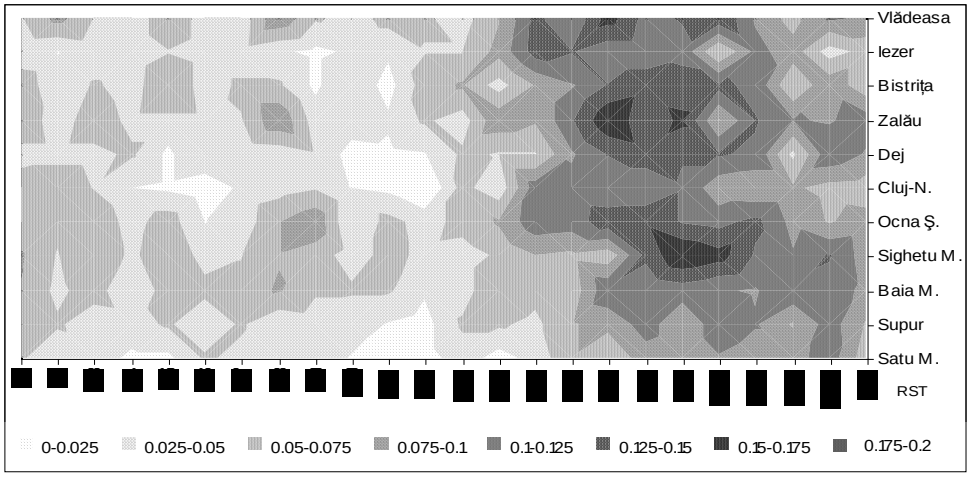


Fig. 11. The annual diurnal variation of the frequency of significant rains lasting between 1 and 2 hours (%).

In the case of significant rains lasting between 1 and 2 hours, the diurnal variation of their moment of start resembles the previous situation. The highest frequencies are recorded during the afternoon. However, the maximal frequencies are differently recorded within the region: between 2 p.m. and 9 p.m. in the mountains; between 3 p.m. and 9 p.m. in the hills and in depressions; until 11 p.m. in the plains. However, there are low frequency values (figure 11) both in the plains and along the valleys, and they do not present an obvious maximum. During the warm season, these rains emerge mostly in June and July (47.6% of the total). During autumn months, the diurnal variation is not significant.

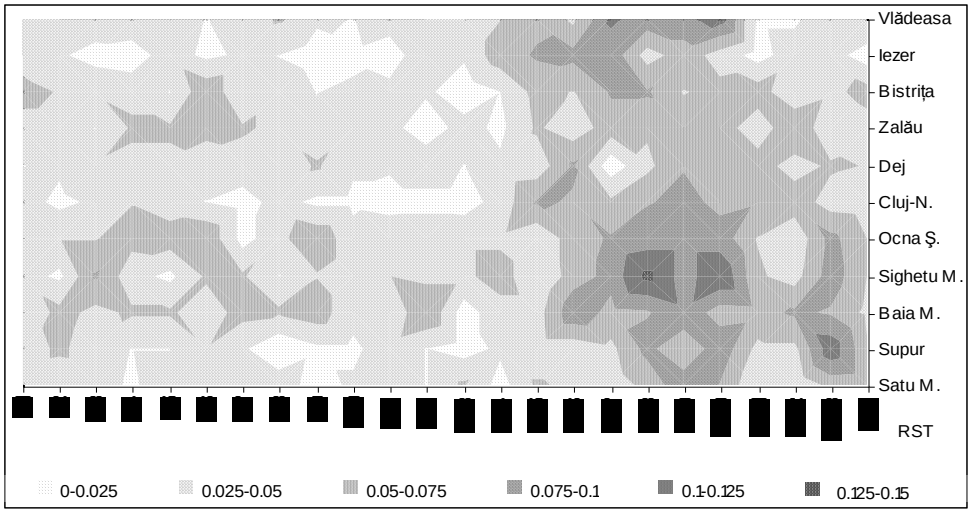


Fig. 12. The annual diurnal variation of the frequency of significant rains lasting between 2 and 3 hours (%).

The diurnal variation of significant rains lasting between 2 and 3 hours, which have a weight of 12.2% of the total number, presents a maximum of emergence frequency during the afternoon (between 2 p.m. and 8 p.m. Romanian summer time). The highest relative values are recorded in Maramureş and in the mountains (figure 12).

On the other hand it can be noticed a secondary maximum in Maramureş and in the plain, during the evening (between 9 p.m. and midnight).

The significant rains lasting between 3 and 6 hours present a different diurnal variation. In Maramureş and in the hills, the highest frequencies are recorded during the afternoon and the evening (between 2 p.m. and midnight Romanian summer time), and during the night (between midnight and 9 a.m.). Along the valleys and in the plain, the highest frequencies are registered during the afternoon and in the second half of the night, while in the mountains these rains are more frequent only during the afternoon (figure 13).

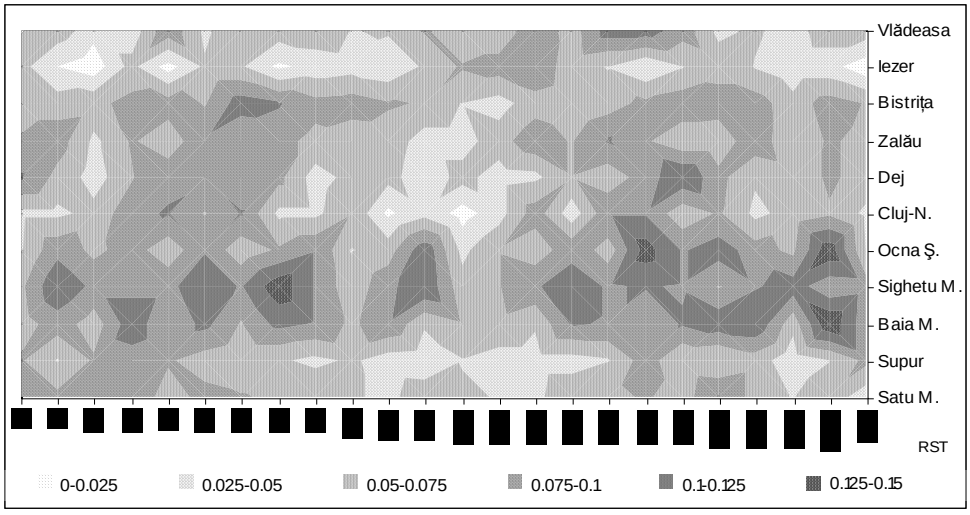


Fig. 13. The annual diurnal variation of the frequency of significant rains lasting between 3 and 6 hours (%).

In the case of significant rains lasting more than 6 hours (making up 13.0%), the diurnal variation of their beginning indicates the highest frequencies during the night and the morning (between 9 p.m. until 8-11 a.m.), especially in Maramureş and in the hills (fig. 14). Their monthly structure highlights their highest frequency at the beginning of summer (June, 15.8%) and the beginning of autumn (September, 17.8%).

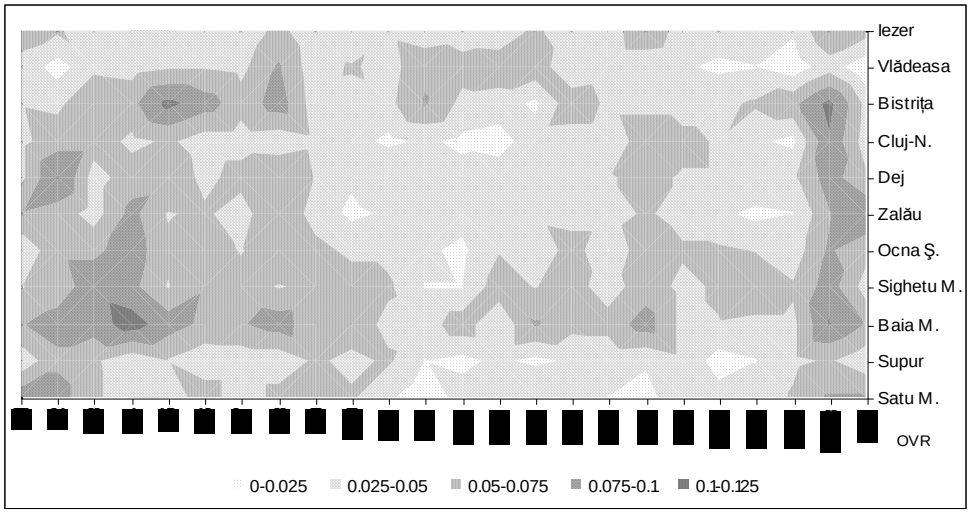


Fig. 14. The annual diurnal variation of the frequency of significant rains lasting more than 6 hours (%).

4. CONCLUSIONS

The analysis of the diurnal variation and duration of significant rains in North-Western Romania reveals a number of essential aspects. During the warm season (April to October), the weight of precipitations exceeds 60% of the total annual amount in the lower part of the region, and 40% in the mountains, where the duration of this season is also shorter (between June and September). Out of the total quantity of warm season precipitations, more than two thirds is represented by significant rains (between 66.9 and 71.4% in the mountains, and between 72.0 and 83.4% in the lower lands). This fact completely justifies their analysis, taking also into account their direct effect on environment and economy, due to their often torrential nature.

The highest monthly relative values of significant rains are recorded during summer, in June and July, summing together 41.7% of the total. One should also underline the monthly increase of the frequency of such rains as summer approaches. The Gauss-type annual variation of significant rains is also noticeable.

The diurnal variation of the moment of start for such rains is characterized by a maximum of frequencies during the afternoon and the evening. 41.9% of them are recorded between 2 p.m. and 9 p.m. Romanian summer time, with a main maximum between 5 p.m. and 8 p.m. Romanian summer time (19.9%). There is also a secondary maximum of emergence of such rains, between 10 p.m. and midnight Romanian summer time, more obvious in Maramureş and in the hills. This secondary maximum sums up 9.7% of the total situations in the entire region. There is even a third maximum of such rains, between midnight and 9 a.m. Romanian summer time, representing 16.7%. It is determined by the long-lasting rains of the end of summer and beginning of autumn.

The distribution according to landforms indicates that the highest frequency (between 10.2 and 10.9%) is recorded in Maramureş Depression, followed by the hilly area (between 9.8 and 10.1%) and the mountain area. Also, the “dam” nature of Apuseni Mountains, generating foehn effects, is well underlined in the case of these rains, as their frequency in the corridor East of these mountains is relatively low (7.8% at Cluj-Napoca and 8.6% at Dej).

Another aspect of the diurnal variation is the moment of start of these rains. The earlier appearance of significant rains (by 2 to 3 hours) characterizes the mountain area of the region. To the contrary, they are delayed by 2 to 3 hours in the plains. This indicates that the beginning of convection, often generating such rains, takes place in the mountains. Then, these rains move towards lower altitudes, an aspect also shown by Pavai and others (2007) in the case of emergence frequency of rains, either torrential or not.

Concerning the duration of these rains, the most numerous ones are those lasting less than one hour (38.09%), followed by those lasting between 3 and 6 hours (18.6%) and those lasting between 1 and 2 hours (18.2%). Together, the rains lasting less than 3 hours totalize more than two thirds of the total (68.4%), and those lasting up to 6 hours totalize 87.0%.

The diurnal variation of rains lasting less than one hour presents the highest frequency between 1 p.m. and 10 p.m. Romanian summer time, with maximum values during the afternoon and the evening (between 4 p.m. and 9 p.m.), especially in the hilly area and in Maramureş Depression. There is also a secondary maximum, less obvious, between 10 p.m. and 2 a.m. Romanian summer time. The rains lasting up to 3 hours have a similar structure. The only difference is that the highest frequency is less visible. In the case

of rains lasting more than 3 hours, one can notice the migration of the highest frequency towards evening and night. So, the rains lasting more than 6 hours are more frequent during the night and early morning (between 9 p.m. and 8-11 a.m. Romanian summer time). However, they emerge mostly at the end of spring and the beginning of autumn.

REFERENCES

1. Howard, H. M. (1942), *Hourly distribution and intensity of precipitation at Kansas City, Mo*., Monthly Weather Review, 70: 153-159.
2. Pavai, C., Maier, N. (2006), *Caracteristici statistice ale câmpului de reflectivitate al radarului WSR-98D de la Oradea*, Sesiunea Anuală de Comunicări Ştiinţifice a Administraţiei Naţionale de Meteorologie, Bucureşti.
3. Pavai, C., Maier, N., Oltean, Bianca (2007), *Variaţii diurne în frecvenţa de apariţie a precipitaţiilor şi descărcărilor electrice*, Sesiunea Anuală de Comunicări Ştiinţifice a Administraţiei Naţionale de Meteorologie, Bucureşti.
4. Wallace, J. M. (1975), *Diurnal Variations of Precipitation and Thunderstorm Frequency over the Conterminous United States*, Monthly Weather Review.
5. *** (1995), *Instrucţiuni pentru staţiile meteorologice. Efectuarea observaţiilor meteorologice şi prelucrarea lor în scopuri climatologice*, I.N.M.H., Bucureşti.
6. *** *Arhiva Centrului Meteorologic Regional Transilvania Nord*, Cluj-Napoca..

STUDIA UNIVERSITATIS BABEŞ-BOLYAI, GEOGRAPHIA, LIV, 2, 2009

THERMIC INVERSIONS IN THE AREA OF ORADEA

O. GACEU[1]

ABSTRACT. – Thermic inversions in the area of Oradea. The present paper analyses *thermic inversions, vertical thermic gradients*, as well as *daily thermic differences* measured at the Oradea meteo station in comparison with the meteo station at Dumbrăviţa de Codru, based on daily data of meteorological observations at the two stations between 1983-1992. *The analysis of the thermic inversions* in Oradea was made by measuring the daily thermic differences of the average, maximum and minimum temperatures between the Oradea meteo station (136 m) and Dumbrăviţa de Codru (590 m), stations which are situated at a difference of altitude of 454 m. It has been noted that in Oradea, thermic inversions are likely to appear every month and season of the year, but they are not too frequent because of the geographic location of the city on the direction of western air masses movement which maintain an accentuated instability of the air. The intensity of the thermic inversion in Oradea has an average temperature range between -4,4°C in the summer, -4,0°C in the winter and -3,0°C in the fall.

Keywords: *thermic inversion, Oradea, radiation, average, gradient* .

1. INTRODUCTION

The issue of the thermic inversions is the main concern for numerous specialists interested in the quality of city air. In order to highlight their importance it is necessary to know the periods leading to the appearance of thermic inversions, as well as their intensity and extension on the vertical.

Thermic inversion, meaning the situations when air temperature rises on the vertical, depend on the synoptic situation and the local geographic conditions, being more frequent in the winter when the anticyclonic time is predominant:

A) from *genetic* point of view, the specialized literature (O. Neacşa, M. Frimescu, 1981; Gh. Pop, 1988; Octavia Bogdan, 1989; Octavia Bogdan, Elena Niculescu, 1999; Gh. Măhăra, 2001; S. Ciulache, 2003 etc.) mentions three genetic types of thermic inversions: *of radiation; of evaporation; dynamic; mixed*.

Inversions of radiation appear on the land and can be: *night radiation* (they appear in every season because of the cooling of the active surface and of the air layer in the near vicinity); *winter radiation* (they are thick and appear as a result of dry land cooling during winter in conditions of anticyclonic time, the process of cooling being amplified by the presence of snow and ice layers); *spring or snow radiation* (they appear in the spring because of the advection of tropical air, wamer, over the colder surface of the snow layer causing its melting). Usually they are accompanied by radiation fog.

[1] *University of Oradea, Faculty of History, Geography and International Relations, Department of Geography, Tourism and Territorial Planning, Center of Research and Territorial Analyses, No. 1 University Street, Oradea, Bihor, România, gaceu@yahoo.com,*

Inversions of radiations can also appear over the water surface, during night-time, to the morning. They are caused by the different way in which water warms up against the air, respectively water, because of the characteristics of the specific heat, warms up and cools down two times slower than the air (Neacşa şi colab., 1974). Thus, water gradually warming up during daytime, becomes warmer than the air in the evening. At night, water releases its warmth in the air which in its turn, towards morning, becomes warmern than water, an aspect that highlights the thermic inversion of radiation which maintains itself several hours after sunrise, because of the water inertness in the process of warming up.

Thermic inversions of evaporation appear in the hot period of the year, during anticyclonic period, towards and after noon, when the warming up is at its peak and favours the development of the convective processes. They may appear on *water surfaces,* on *wet lands, inside the vegetal layer,* on *marshy surfaces.*

Dynamic thermic inversions appear in altitude because of air movement on the vertical and horizontal, which causes adiabatic warming, mixture of air layers or their overpositioning. They play an important part in cloud formation.

They can be: of *compression, sedimentation or anticyclonic; of turbulence or friction* (they appear at the upper limit of the friction layer where the dynamic turbulence caused by wind produces air cooling); of *altitude wind* (the altitude wind having high speed absorbs aerodynamically the air in the close layers with lower speed and causes the formation of descending currents which determine the air warming in the upper layer and ascending currents in the lower one where the air cools down adiabatically. Thus, in the main sector of the air layer with strong wind appears the temperature inversion, respectively a warmer air layer caught between two colder ones); of *advection* (they appear when a warmer air mass moves over a cold land surface); *orographic* (caused by the course of the cold air from the heights to the depressionary landforms where they amplify the radiative cooling especially in the winter and form the so-called *lakes of cold,* with very low minimum temperatures); *frontal* (they appear at the contact point between two air masses of different temperatures which move on the horizontal, the warm one being on top (Gh. Pop, 1988).

Mixed inversions of temperature are caused by a series of factors and can be: *advective-radiative, of radiation and evaporation.*

B) based on the place of formation and positioning they divide into: *thermic inversions on the ground* (at the level of active surface) and *thermic inversions of altitude.*

C) based on the thickness of the inversion layer they divide into:

- *absolute thermic inversions* which are the thickest (1500-2000 m), occupy all the topoclimatic space from the water surface to the level of mountain peaks and are results of general causes, respectively the persistence of the anticyclonic time which favours the sedimentation and compression of the cold air on the ground; generally they correspond to the inversions of sedimentation or compression or anticyclonic;

- *relative thermic inversion* are results of local causes (mountain-valley breeze, plain and lacustrine breeze, processes of evaporation), have smaller thickness and correspond to the lower thermic inversions which appear at the level of active surface.

D) based on *intensity* (difference in temperature between the lower and upper part of the inversion layer) thermic inversions may be of small density ($0,1 – 3,0^0$C), medium intensity ($3,1 – 5,0^0$C), large ($5,1 – 10,0^0$C) and extremely high intensity (over $10,0^0$C).

2. CHARACTERISTICS OF THE THERMIC INVERSIONS WITHIN THE AREA OF ORADEA

It is well-known that atmosphere is generally characterized by a vertical fall of air temperature of 0,5-0,6^{0}C/100 m, according to the vertical thermic gradient that highlights the overall atmosphere condition of thermic instability which, in its turn, favours the thermic convection.

If air temperature does not fall on the vertical anymore at the same time with altitude rising, it rises or stays unchanged, then atmosphere shows a stabile or indiferent thermic stratification which favours the formation of thermic inversions, respectively that of the isotherms.

The present paper analyses *thermic inversions*, *vertical thermic gradients*, as well as *daily thermic differences* measured at the Oradea meteo station in comparison with the meteo station at Dumbrăvița de Codru, based on daily data of meteorological observations at the two stations between 1983-1992.

Determining the thermic inversions in Oradea was made by measuring the daily thermic differences of the average, maximum and minimum temperatures between the Oradea meteo station (136 m) and Dumbrăvița de Codru (590 m), stations which are situated at a difference of altitude of 454 m.

During *a year's period, based on average temperatures*, thermic inversions show a higher frequency in Oradea in October (16,4 %) and December (15,1 %) due to the presence of the anticyclonic period and are less frequent May and June (2,3 respectively 2,2 %) due to the intensification of the thermic convection at the end of spring and the beginning of summer (fig. 1). *Seasonally, based on average temperatures,* thermic inversions are more frequent in autumn (13,7 %) and winter (12,5 %) when the Azorean wedge, respectively the East-European wedge expands, and are less frequent in spring (5,4 %) and summer (6,3 %), as a result of the intensification of thermo-convective processes (fig. 2). *Annually, based on average temperature range,* thermic inversions of 6,1 % are frequently recorded in Oradea (fig. 2).

Based on maximum temperatures, the monthly frequency of thermic inversion in Oradea has the same pattern, respectively is higher in January (12,8 %) and December (12,1 %) and lower in July (0,2 %) and June (0,5 %) (fig 1). *Seasonally*, most days with thermic inversions, *based on maximum temperatures*, are recorded in the winter (11,4 %), and the fewest are recorded in the summer (0,6 %) (fig. 2). *Annually*, based on similar criteria, thermic inversions recorded in Oradea have a frequency of 2,1 % (fig. 2).

Based on maximum temperatures in Oradea, thermic inversions are more frequent *monthly, seasonally and annulally*. Most days with thermic inversions based on this criterion, are recorded in August (22,5 %), and the fewest are recorded in January (12,7 %) (fig. 1). *Seasonally*, based on this criterion, thermic inversions are frequent in all seasons, the most frequent ones being recorded in the fall (18,5 %) and the least frequent in the winter (14,6 %) (fig. 2). Based on minimum temperatures, *annually* appear thermic inversions with a frequency of 9,6 % (fig. 2).

Vertical thermic gradients have been measured based on daily thermic differences, compared to the difference of altitude. *Annual gradients* reach values of 0,13^{0}C/100 m based on daily average temperatures, of –0,11^{0}C/100 m based on daily maximum temperatures and of 0,30^{0}C/100 m based on daily minimum temperatures (table 1).

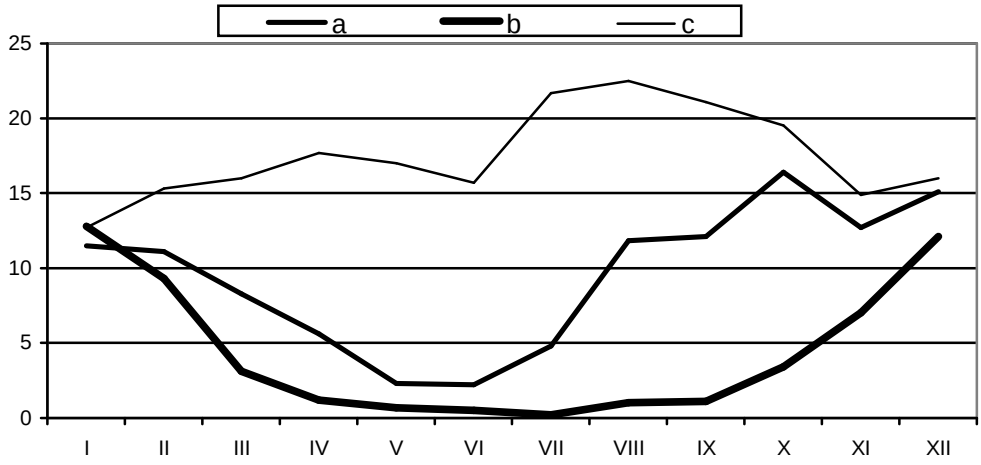


Fig. 1. Monthly average frequency of days with thermic inversions in Oradea: a) based on average temperatures; b) based on maximum temperatures; c) based on minimum temperatures.

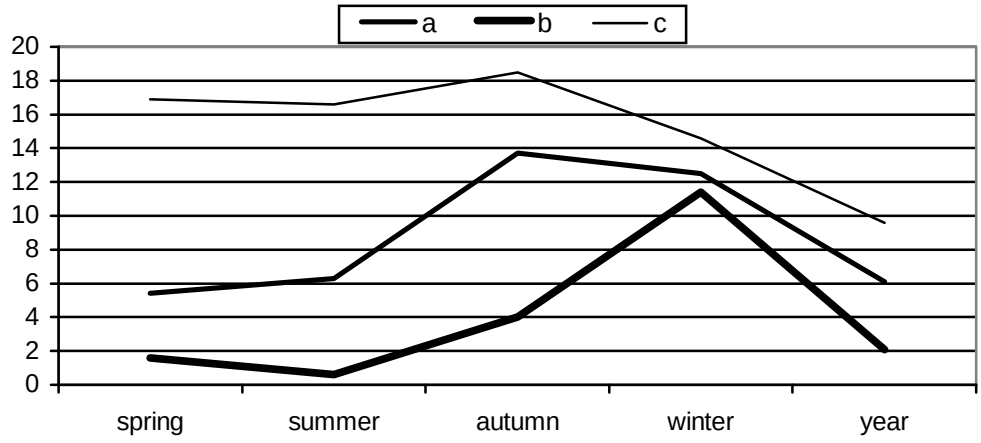


Fig. 2. Seasonally and annually average frequency of days with thermic inversions in Oradea: a) based on average temperatures; b) on maximum temperatures; c) on minimum temperatures.

Vertical thermic gradients (^{0}C/100 m) between the meteo stations in Oradea and Dumbrăvița de Codru (590 m)

Table 1

Month	Average			Maximum			Minimum		
	Aver. temp. (^{0}C)	Max. temp. (^{0}C)	Min. temp. (^{0}C)	Aver. temp. (^{0}C)	Max. temp. (^{0}C)	Min. temp. (^{0}C)	Aver. temp. (^{0}C)	Max. temp. (^{0}C)	Min. temp. (^{0}C)
January	0,04	-0,02	0,17	-0,02	0,26	-0,34	0,17	0,15	-0,58
February	0,04	-0,13	0,11	0,30	0,28	0,02	0,02	0,06	-0,86
March	0,17	-0,11	0,39	-0,47	0,09	-0,63	0,60	0,65	0,63
April	0,26	-0,04	0,67	-0,06	0,52	-1,21	0,50	0,37	1,01
May	0,32	0,11	0,58	0,30	1,12	-0,15	1,34	1,98	0,54
June	0,32	0,26	0,58	0,34	0,63	-1,01	0,67	0,37	-0,09
July	0,26	0,00	0,58	-0,02	0,34	-0,84	0,71	1,08	-0,95
August	0,13	-0,17	0,41	-0,22	0,62	-1,21	0,30	0,84	-0,30
September	0,11	-0,19	0,39	-0,11	0,71	-1,40	0,60	0,28	-0,65
October	0,02	-0,30	0,17	-0,02	0,45	1,51	0,37	0,60	-0,28
November	0,00	-0,28	-0,11	-0,36	0,04	-0,69	-0,45	-0,22	-0,47
December	-0,04	-0,28	-0,02	-0,22	-0,26	-0,43	-0,09	0,15	-0,65
Winter	0,02	-0,75	0,02	0,30	0,28	-0,43	0,17	0,15	-0,86
Spring	0,26	-0,15	0,54	-0,47	1,12	-1,21	1,34	1,98	1,01
Summer	0,24	0,02	0,52	0,34	0,63	-1,21	0,71	1,08	-0,95
Autumn	0,04	-0,26	0,15	-0,37	0,71	1,51	0,50	0,60	-0,65
Annual	0,13	-0,11	0,30	-0,47	1,12	1,51	1,34	1,98	1,01

Daily thermic differences between meteo stations in Oradea (136 m) and Dumbrăvița de Codru (590 m)

Table 2

Month	Average difference			Maximum difference			Minimum difference		
	Aver. temp. (^{0}C)	Max. temp. (^{0}C)	Min. temp. (^{0}C)	Aver. temp. (^{0}C)	Max. temp. (^{0}C)	Min. temp. (^{0}C)	Aver. temp. (^{0}C)	Max. temp. (^{0}C)	Min. temp. (^{0}C)
January	0,2	-0,1	0,8	-0,1	1,2	-1,6	0,8	0,7	-2,7
February	0,2	-0,6	0,5	1,4	1,3	0,1	0,1	0,3	-4,0
March	0,8	-0,5	1,8	-2,2	0,4	-2,9	2,8	3,0	2,9
April	1,2	-0,2	3,1	-0,3	2,4	-5,6	2,3	1,7	4,7
May	1,5	0,5	2,7	1,4	5,2	-0,7	6,2	9,2	2,5
June	1,5	1,2	2,7	1,6	2,9	-4,7	3,1	1,7	-0,4
July	1,2	0,0	2,7	-0,1	1,7	-3,9	3,3	5,0	-4,4
August	0,6	-0,8	1,9	-1,0	2,9	-5,6	1,4	3,9	-1,4
September	0,5	-0,9	1,8	-0,5	3,3	-6,5	2,3	1,3	-3,0
October	0,1	-1,4	0,8	-0,1	2,1	7,0	1,7	2,8	-1,3
November	0,0	-1,3	-0,5	-1,7	0,2	-3,2	-2,1	-1,0	-2,2
December	-0,2	-1,3	-1,0	-1,0	-1,2	-2,0	-0,4	0,7	-3,0
Winter	0,1	-0,7	0,1	1,4	1,3	-2,0	0,8	0,7	-4,0
Spring	1,2	-0,1	2,5	-2,2	5,2	-5,6	6,2	9,2	4,7
Summer	1,1	0,1	2,4	1,6	2,9	-5,6	3,3	5,0	-4,4
Autumn	0,2	-1,2	0,7	-1,7	3,3	7,0	2,3	2,8	-3,0
Annual	0,6	-0,5	1,4	-2,2	5,2	7,0	6,2	9,2	4,7

During the year they vary according to daily average temperatures ranging from $0,0^0$C/100 m in November and $0,32^0$C/100 m in May and June. In the fall and winter they vary between $0,04^0$C/100 m and $0,02^0$C/100 m, and in the spring and summer they reach $0,26^0$C/100 m, respectively $0,24^0$C/100 m. The annual range analysed in accordance with daily average, maximum and minimum temperatures, highlights the highest temperatures in April-June and the lowest in December-January (table 1).

The annual absolute maximum vertical thermic gradients reached $–0,47^0$C/100 m based on average temperatures, $1,12^0$C/100 m based on maximum temperatures and $1,51^0$C/100 m based on minimum temperatures (table 1).

The annual absolute minimum vertical thermic gradients varied between $1,34^0$C/100 m based on average temperatures, $1,98^0$C/100 m based on maximum temperatures and between $1,01^0$C/100 m based on minimum temperatures (table 1).

Negative vertical thermic gradients indicate the presence of thermic inversions of various intensity. Thus, average vertical thermic gradients indicate thermic inversions in all seasons (except for May-June), based on maximum temperatures and rarely in December and sometimes in November, based on average and minimum temperatures.

Maximum vertical thermic gradients indicate the presence of inversions in almost all seasons when the analysis was made based on average and minimum temperatures and only in December, based on maximum temperatures.

The minimum vertical thermic gradients are positive in all seasons (except for November and December), based on average and maximum temperatures , and are negative in all seasons (except for March-May) (table 1).

The daily thermic differences measured according to a*nnual average temperatures* reach $0,6^0$C. In the winter they reach only $0,1^0$C, in the fall $0,2^0$C, and in the spring $1,2^0$C (table 2). During the year, temperatures reach a maximum in May-June ($1,5^0$C), and a minimum in November-December ($0,02^0$C). Measured based on *daily maximum temperatures*, annually the daily thermic variations are lower by $0,5^0$C in Oradea than in Dumbrăvița de Codru, seasonally they are lower by $0,1^0$C (in the spring), up to $1,2^0$C (in the fall) and only in the summer they are slightly higher ($0,1^0$C) than in Dumbrăvița de Codru.

Based on *daily minimum temperatures*, the thermic differences reach $1,4^0$C anually, $2,4–2,5^0$C in the summer and spring, $0,7^0$C in the autumn and $0,1^0$C in the winter. The lowest daily differences of the average minimum temperatures reach $0,5^0$C in February and November, and the highest appear between April-July, $3,1^0$C, respectively $2,7^0$C (table 2).

The *annual absolute maximum differences* recorded based on daily average, maximum and minimum temperatures reached $–2,2^0$C based on average temperatures, $5,2^0$C based on maximum temperatures and $7,0^0$C based on minimum temperatures.

The *annual minimum differences* between the above-mentioned stations, highlights annual temperatures of $6,2^0$C based on average temperatures, of $9,2^0$C based on maximum temperatures and $4,7^0$C based on minimum temperatures (table 2).

According to average temperatures, the *monthly minimum temperatures* are negative only in November-December ($-2,1^0$C, respectively $–0,4^0$C), according to maximum temperatures these are negative only in November ($-1,0^0$C), and based on minimum temperatures, the monthly absolute minimum differences are negative in all seasons (except for spring), the maximum temperature reaching $–4,4^0$C (table 2).

The absolute minimum differences clearly highlights the presence of thermic inversions, especially during winter, with temperatures ranging between $–0,4^0$C and $–4,4^0$C. These monthly negative absolute thermic differences highlighted inversions of average intensity reaching -4^0C in the winter, $-4,4^0$C in the summer, $-3,0^0$C in the fall (table 2).

3. CONCLUSIONS:

- in Oradea thermic inversions may appear every month and season of the year, but have a lower frequency because of the geographic location of the city on the direction of western air masses movement which maintain an accentuated instability of the air. Based on daily average temperatures, in Oradea the monthly average frequency of thermic inversions reaches maximum 16,4 % in October, the seasonally frequency records 13,7 % in the fall, and annually the days with thermic inversions may occur up to 6,1 %;

- the negative vertical thermic gradients which indicate the presence of thermic inversions may appear every month of the year, according to the parameter based on which they were analysed. For example, the vertical average thermic gradients generally indicate the absence of thermic inversions when they were measured based on average and minimum temperatures and their presence when they were determined based on maximum temperatures;

- the intensity of thermic inversions in Oradea, based on absolute minimum differences of temperatures measured in comparison with the meteo station at Dumbrăviţa de Codru has *average temperatures* ranging between $-4,4^0$C in the summer, $-4,0^0$C in the winter and $-3,0^0$C in the fall.

R E F E R N C E S

1. Apăvăloae, M. (1983), *Caracteristicile inversiunilor termice din Depresiunea Dornelor,* Lucr. Sem. Geogr. “D. Cantemir”, Iaşi.
2. Apăvăloae, M., Pârvulescu, I., Apostol, L. (1987), *Contribuţii la cunoaşterea caracteristicilor inversiunilor termice din Depresiunea Rădăuţi,* Lucr. Sem. Geogr. “D. Cantemir”, Iaşi.
3. Apăvăloae, M., Pârvulescu, I., Apostol, L. (1988), *Caracteristici ale inversiunilor termice din Podişul Fălticenilor,* Lucr. Sem. Geogr. “D. Cantemir”, Iaşi.
4. Apăvăloae, M., Apostol, L., Pârvulescu, I. (1996), *Inversiunile termice din culoarul Moldovei (sectorul Câmpulung Moldovenesc - Frasin) şi influenţa lor asupra poluării atmosferei,* A.U. “Ştefan cel Mare”, Suceava.
5. Bogdan, Octavia (1989), *Inversiunile de temperatură cu privire specială asupra celor care se produc pe suprafeţele de apă*, Stud. şi cercet., Bucureşti.
6. Bogdan, Octavia, Niculescu, Elena (1999), *Riscurile climatice din România,* Edit. Sega International, Bucureşti.
7. Ciulache, S. (2002), *Meteorologie şi climatologie*, Edit. Universitară, Bucureşti.
8. Fărcaş, I., Belozerov, V., Tilinca, Z. (1978), *Inversiunile termice pe versantul estic al Munţilor Apuseni*, Studia UBB, Cluj-Napoca.
9. Mititelu, A. (1972), *Studiul inversiunilor termice şi izotermiilor inferioare la Cluj în perioada 1961-1965*, Lucrare de diplomă, Cluj-Napoca.
10. Neacşa, O., Frimescu, M. (1981), Climatologie şi aerologie, Edit. Did. şi Ped., Bucureşti.
11. Neamu, Gh., Mihai, Elena, Teodoreanu, Elena (1968), *Unele cazuri de inversiuni termice în depresiunile intracarpatice Petroşani, Braşov şi Câmpulung Moldovenesc*, H.G.A.M., 5, Bucureşti.
12. Măhăra, Gh., Linc, Ribana (1993), *Anomalii termice în Munţii Codru-Moma,* A.U.O., Geografie, Oradea.

13. Măhăra, Gh. (2001), *Meteorologie*, Edit. Universității din Oradea, Oradea.
14. Pava, R. (1956), *Diferențele de temperatură dintre munte şi atmosfera liberă*, Meteo şi Hidr., 1, Bucureşti.
15. Pop, Gh. (1988), *Introducere în meteorologie şi climatologie*, Edit. Șt. şi Enciclop., Bucureşti.
16. Şorodoc, C. (1957), *Gradienții verticali de temperatură în ciclonii şi anticiclonii care au determinat starea vremii în R.P.R. în perioada 1954-1956*, Meteo şi Hidr., 4, Bucureşti.
17. Țîştea, D., Dobre, I. (1962), *Inversiunile termice în zona termocentralei Paroşeni*, C.S.A., Bucureşti.
18. *** (1983), *Geografia României, I, Geografia Fizică*, Edit. Academiei, Bucureşti.

G.I.S. MODEL FOR ACHIEVING THE SPATIAL CORRELATION BETWEEN AVERAGE MULTI-ANNUAL PRECIPITATIONS AND ALTITUDE

ŞT. BILAŞCO[1]

ABSTRACT. – G.I.S. Model for Achieving the Spatial Correlation between Average Multi-annual Precipitations and Altitude. The model presents a work method for building a data content referring to the average multi-annual precipitations from a drainage basin, surveyed by few measurement stations with a view to achieving a hydric balance model with very good results. The existence of varied landforms imposes the identification of vertical gradients of the climatic element (average multi-annual precipitations) in relation to the altitude. For this reason, the regressions of the type: climatic element=f (altitude) have been studied.

Keywords: *modeling, database, spatial analysis, spatialization, G.I.S.*

1. THEORETICAL CONSIDERATIONS

In modern literature, hydrographic basin is seen as a hydrosystem whose inputs, drainage area (transit area) and outputs can be determined. Some of these components are known (precipitation, basin area), others can be identified as result of mathematical calculations and models (surface runoff, groundwater flow, evaporation).

Atmospheric precipitations represent one of the main supply sources for the hydrographic basin, being also the climatic element with the greatest spatial and temporal variability, as far as duration, intensity, and frequency are concerned. The studied area, the Someşul Mic hydrographic basin, has a very small number of stations to measure the amount of precipitation, that is why, the development of some precipitation-runoff type models is impossible to achieve.

The model presents a work algorithm for creating a database referring to the average multi-annual precipitation from a hydrographic basin, surveyed by few measurement stations, with a view to achieving, with very good results, a hydric balance model.

The existence of a varied relief imposes the identification of the vertical gradients of the climatic element (average multi-annual precipitation) in relation to altitude. For this reason, the regressions of the type:

$$climatic\ element = f\ (altitude)$$

have been studied.

In order to create the model, several stages must be passed through: the achievement of database (precipitation, numerical model of the terrain in DEM format), data validation, validity curve (regression models) selection and equation determination, the spatialization of the climatic element.

[1] *Romanian Academy, Cluj Subsidiary, Geography Section, 400015 Cluj-Napoca, Roumanie, e-mail: sbilasco@geografie.ubbcluj.ro*

2. DATABASE

The database referring to the average multi-annual precipitation was achieved by accessing bibliographic sources and by collecting data from the INMH for the stations: Vlădeasa 1800, Vlădeasa 1400, Stâna de Vale, Băişoara, Huedin, Beliş Lac, Căpuşu Mare, Gilău, Ştei, Câmpeni and Cluj (Tab 1, 2). The digital elevation model was created by using the contour lines with an equidistance of 40m as vectorial database, resulting a grid with a resolution of 20m.

Amount of average multi-annual precipitation (according to Gaceu, O., 2005)

Table 1

Name	Altitude (m)	Precipitation (mm)
Vlădeasa 1800	1836	1151.3
Vlădeasa 1400	1404	1360.5
Stâna de Vale	1108	1570.7
Băişoara	1360	847.4
Huedin	560	596.7
Ştei	256	681.0
Câmpeni	591	738.0

Amount of average multi-annual precipitation (processed after the A.N.M. archive)

Table 2

Name	Altitude (m)	Precipitation (mm)
Beliş Lac	991	555.4
Căpuşu Mare	435	419.2
Gilău	382	425.6
Cluj-Napoca	410	415.3

2. 1. Database validation

At a first visual analysis regarding the representation of the amount of precipitation in relation to the altitude of the station they were measured at (Fig. 1), the existence of two distinct validity zones can be noticed.

The existence of two validity zones I, II, leads to the determination of two different regression functions, valid for the territory found under the influence of the gauging stations the data were collected from.

The passing from the scatteredly measured amounts of precipitation to their spatial estimation and therefore to the identification of the influence zone of each pluviometric station is achieved by using the Thiessen polygon method (Fig. 2).

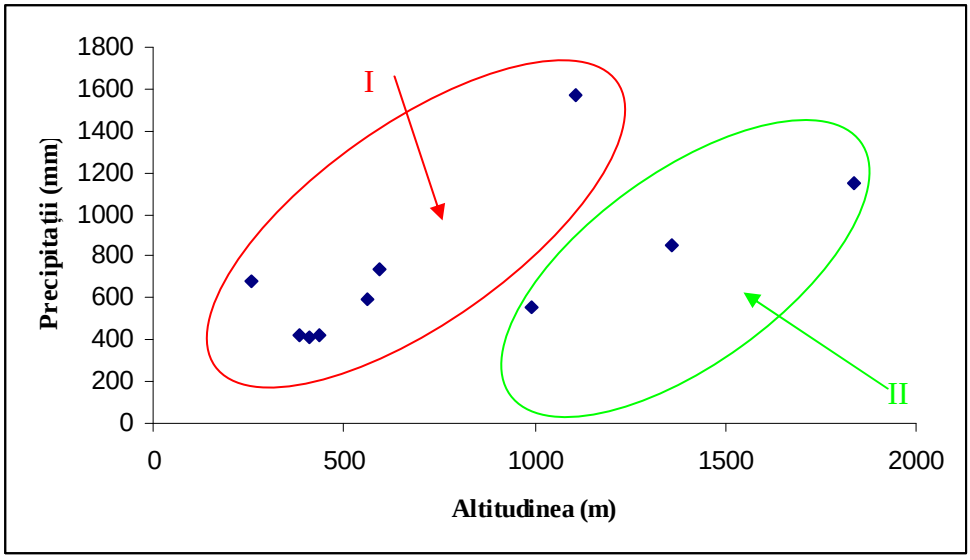


Fig. 1. Validity zones.

This method assigns an influence zone to every pluviometer, whose area, estimated in percents, represents the weighting factor of the local value.

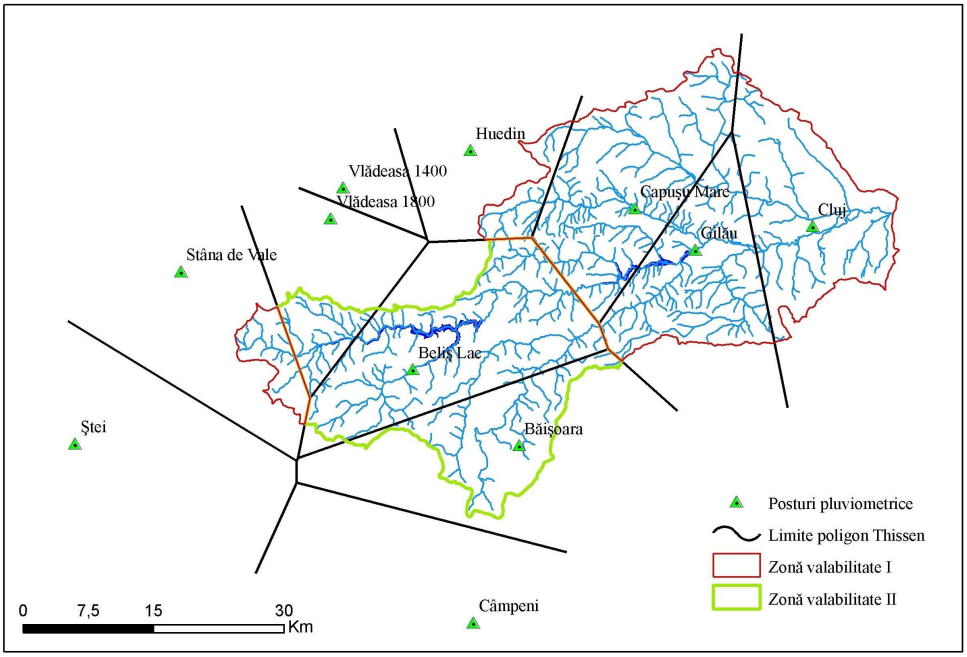


Fig. 2. Thiessen polygons and validity zones.

As a result of Thiessen polygons, the two validity zones (Fig. 2) and the pluviometers taken into consideration for each were delimited, and, at the same time, the three pluviometers that did not influence the studied area were excluded (Tab. 3).

Pluviometers/ validity zone, excluded pluviometers

Table 3

Validity zone	Pluviometer
Zone I	Stâna de Vale
	Huedin
	Căpuşu Mare
	Gilău
	Cluj
Zone II	Vlădeasa 1800
	Băişoara
	Beliş Lac
Excluded pluviometers	Ştei
	Câmpeni
	Vlădeasa 1400

3. SPATIAL ANALYSIS

The alphanumerical database, in grid format, was adapted according to the two validity zones, the grid being cut in conformity with the contour of each zone. Thus, two distinct grids resulted, each having the shape and the dimensions of the validity zone it belongs to (Fig. 3).

3. 1. Regression curve selection

Regression curves, as well as their equations, are created based on the data resulted from the pluviographs specific to each validity zone.

Regression curve defining is achieved by averages of the demo variant of the *CurveFit* programme.

By regression function is averaget a mathematical expression, deduced as result of some experimental data processing, which approximates the dependencies between two or more variables of a system or process. The determination of a regression function is necessary when the dependencies between the respective variables cannot be established in a sufficiently accurate manner by theoretical averages. Once the value of pluviometers is known, a simple mathematical expression of a surface in the space with n+1 dimensions can be found, so that the surface can optimally approximate, after a certain criterion, the multitude of pluviometers. The mathematical expression will not coincide with the theoretical one, but it will approximate it in a sufficiently accurate manner so that it may allow its use in practical applications or even as initial hypothesis in some theoretical studies.

The quality of approximation is deduced based on the standard error of estimation and on the correlation coefficient.

Standard error characterizes the scattering of points around the graphic of the regression function, having a value as much closer to zero, as the respective points get closer to graphic.

Correlation coefficient represents a measure of the rapport between the scattering degree of points around the graphic of the regression function and the scattering degree of the same points in rapport with the arithmetic average of the own ordinates. The value of this coefficient represents a more precise measure of the quality of the regression function obtained in the cases in which the standard deviation of values is relatively high. It is considered that the closer the value of the correlation coefficient is to the unit, the better a regression function approximates the set of experimental points.

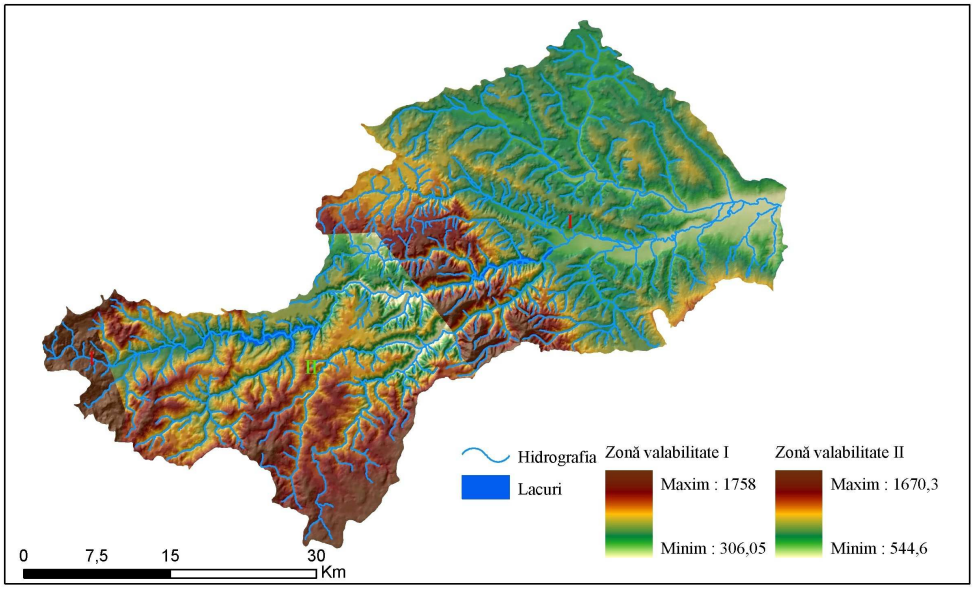


Fig. 3. Grid validity zones.

By using the *CurveFit* programme and by taking into account the values of the correlation coefficient and of the standard error (Tab. 4), the following functions were obtained: for the validity zone I, the *Quadratic Fit* regression function (Fig. 4) and for validity zone II, the *Linear Fit* regression function (Fig. 5).

Function validity indices

Table 4

Function	Standard error	Correlation coefficient	CHI test
Quadratic Fit	32.13	0.998	YES
Linear Fit	39.37	0.997	YES

Quadratic Fit function

$$y = a + bx + cx^2 \qquad (1)$$

a = 6.05, b = 0.75, c = 0.00059, x – DEM, y – precipitation

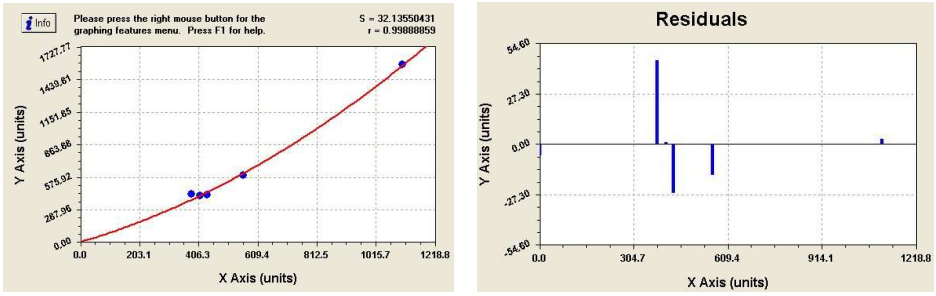


Fig. 4. Quadratic Fit function and afferent residuum.

Linear Fit function

$$y = a + bx \qquad (2)$$

a = -19.02, b = 0.62, x – DEM, y – precipitation

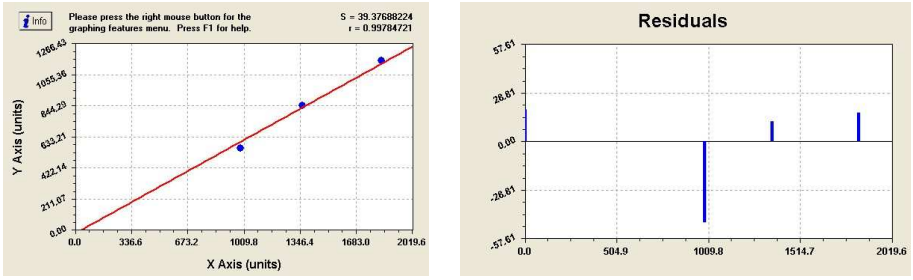


Fig. 5. Linear Fit function and afferent residuum.

3. 2. Spatialization of precipitation

Once the regressions and equations are defined for each validity zone, it can be passed on to the spatialization of precipitation in relation to altitude. Spatialization is done by using the geoinformational programmes, such as ArcGis in our case. By appealing to the *raster calculator* module of the *spatial analyst* extension, the two equations were introduced, using as altitudinal base the digital elevation model, under the following form:

validity zone I

*6.05 + 0.75 * [Validity zone I] + Pow (0.00059 * [Validity zone I], 2)*

validity zone II

*- 19.02 + 0.62 * [Validity zone II],*

resulting a new database composed of two spatial entities in grid format, which have as numerical attributes the value of the average multi-annual precipitation on each separate pixel (Fig 6), (Fig. 7).

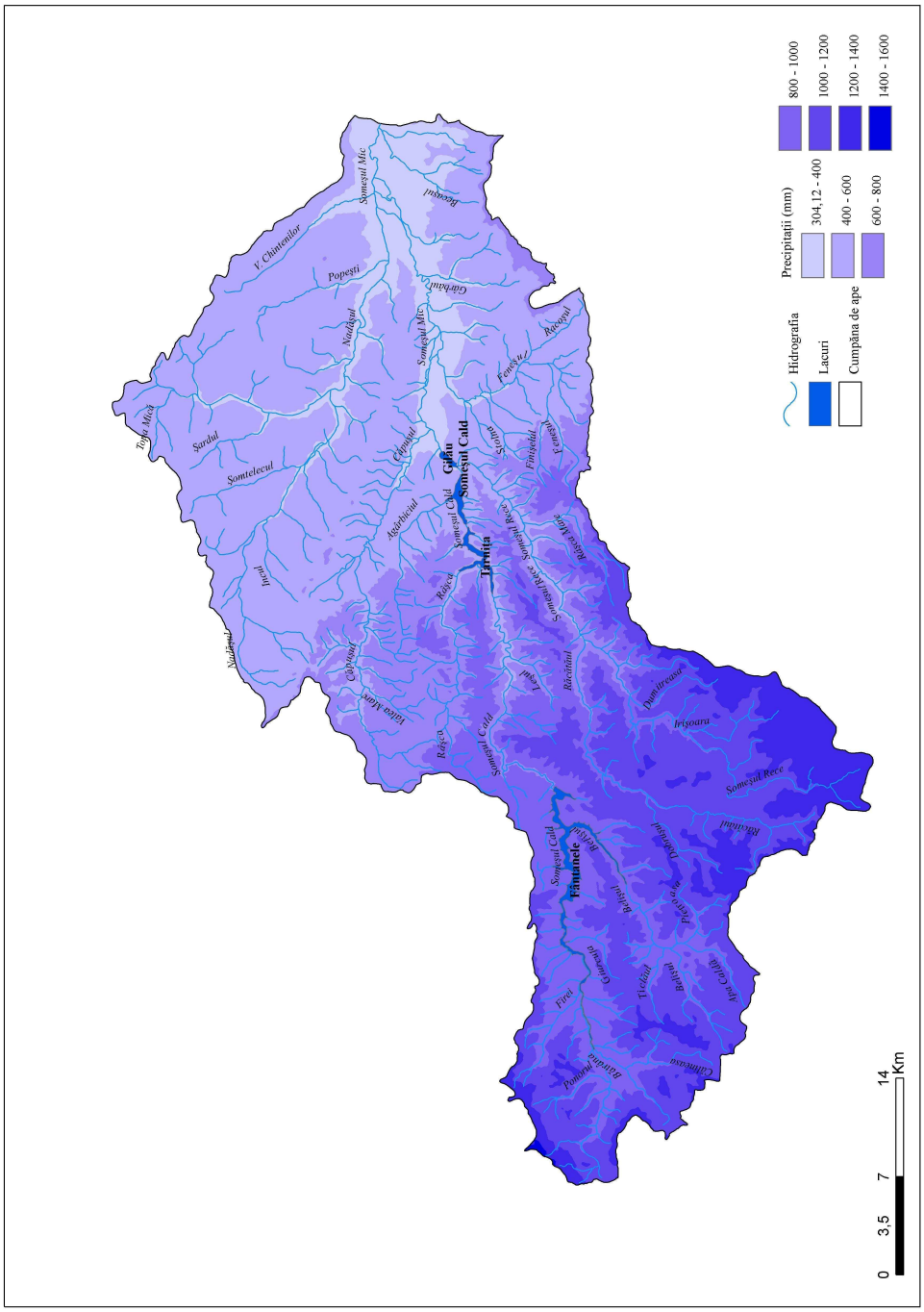


Fig. 8. Variation of average multi-annual precipitation in relation to altitude.

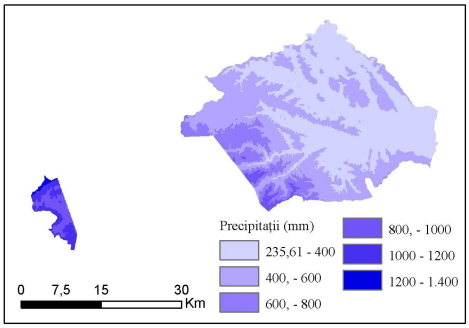


Fig. 6. Precipitation in validity zone I.

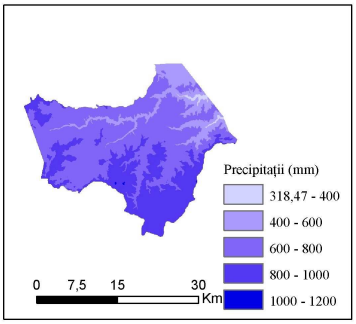


Fig. 7. Precipitation in validity zone II.

With a view to integrate the resulted database into spatial analysis models, it must be unitary (a single spatial entity over the entire analyzed area). *Merge grid* function was used in the process of creating the unitary grid (see Fig.8).

The resulted database has a special importance, being used as input element in creating hydrologic balance models and models of achieving runoff storage on hydrographic basins.

REFERENCES

1. Clark, R. T., (1973), *Mathematical models in hydrology, irrigation and drainage*, Paper No. 19, FAO of the United Nation, Rome.
2. Haidu, I., (1997), *Modele conceptuale şi stochastice de prognoză pe lungă durată a nivelurilor lacurilor. Aplicaţie lacul Vârşolţ.*
3. Haidu, I., Chong-Yu Xu, (1999), *Modelarea bilanţului hidric al bazinului hidrografic la scară lunară*, Studii şi cercetări de geografie.
4. Stănculescu, V. Al., (1985), *Modele matematice în hidrologie*, Institutul de meteorologie şi hidrologie, Bucureşti.

STUDIA UNIVERSITATIS BABEŞ-BOLYAI, GEOGRAPHIA, LIV, 2, 2009

WATER BALANCE IN THE SOUTHERN PART OF SOMEŞAN PLATEAU

V. SOROCOVSCHI[1], CS. HORVATH[1], ŞT. BILAŞCO[1]

ABSTRACT. – Water Balance in the Southern Part of Someşan Plateau. The study proposes to clarify the available scientific information about the water balance components and in this way to emphasize the geographic individuality of this hilly area in the North of the intracarpathian region, known as the Transylvanian Basin. At the same time, we evaluated the water resources of the Southern part of Someşan Plateau for different possible uses. To achieve the objectives, we analyzed and computed runoff values from seven hydrometrical stations, and the annual precipitation values from two meteorological stations and seven pluviometrical stations. The analyzed period was 1976 - 2005. Based on the correlations between altitude and the main components of the water balance (X-precipitations and Y- total runoff), we established validity zones for the relations X= f(H_m) and Y= f(H_m) and created maps with the precipitations and the total runoff distribution. Using GIS techniques for the precipitation and total runoff assessment, it became possible to obtain values over the altitudinal steps in the validity areas and also in the main geographic divisions. The underground runoff values where obtained by separating runoff with the help of the hydrographs of characteristic years. After determining these fundamental components, the other ones (evapotranspiration and the soil humidity) were computed with the help of the M.I.Lvovici formula for the water balance. Finally we computed a global water balance, for the entire analyzed region, and sectorial water balances, for its geographic divisions.

Keywords: *Someşan Plateau, water balance, precipitations, runoff, evapotranspiration.*

1. INTRODUCTION

Integrative part of the Transylvanian Plateau, the studied region overlaps the Southern part of the Someşan Plateau, representing its North – North-Western compartment, and being the most complex and extended unit among the the Transylvanian Plateau's three divisions.

The morphostructural complexity of the region is determined by the geologic evolution, manifested through a diversity of the dominant sedimentary formations (grit, sand, clay, limestone) disposed over crystalline blocks that appear at different depths. This particularity is reflected in the configuration and typology of the relief (predominantly structural and lithologic) and in the rivers network organization, drained by the Someş River to the North-West of the country. Additionally, the particularities of the bio-pedo-geographic cover, mirrored in the predominance of the forestry – preserved mainly on the higher hills- and of the luvisoils at different levels of argil-lluviation. Another particularity of the region is the lack of urban structures, which are grouped in the Someşul Mic Valley, corridor that marks the transition towards the Feleacului Hills and the Transylvanian Plain.

[1.] *Romanian Academy, Cluj-Napoca Branch, Geography Department, Romania, e-mail: svictor@geografie.ubbcluj.ro; hcs1000@yahoo.com; sbilasco@yahoo.com*

1. 1. Geographic Feautures of the Someşan Plateau Southern Divisions

Taking into account the relief morphologic particularities, the climate, the bio-pedo-geographic cover and the land use types, the studied area could be divided into more divisions (fig.1).

Şimişna-Surduc Hills (Gr. Pop, 2001) are bounded in North – Northeast by the Someş Corridor (near Vad and upstream of Jibou), at South by the watershed between the Şimişna-Vad, Şimişna - Olpret, and Luna – Brâglez rivers. To the West it expands to the Brâglez-Almaş watershed, marked to the Almaş-Agrij Depression by the well pronounced cuesta on the right side of the Almaş Valley. The evolution of this subdivision is strongly correlated with the block uplifting of a crystalline horst from the Hercynian fundament and the local subsidence at Jibou. The above mentioned factors, together with the high friability of the formations they are composed of, the high humidity and the high level of the forest cover in the northern part, endow this subdivision with distinctive geographic features, with many similitudes with the region located at the North of the Someş Valley. The significant heights, and especially the relief horizontal (52,7 % of the area has values between 1,3 and 3 km/km^2) and vertical fragmentation, with dominant values lying between 100-150 m (45,7 % from the Şimişna-Surduc Hills total territory) and 150-200 (30,6 %), reflect a very particular way in the geographic space organization.

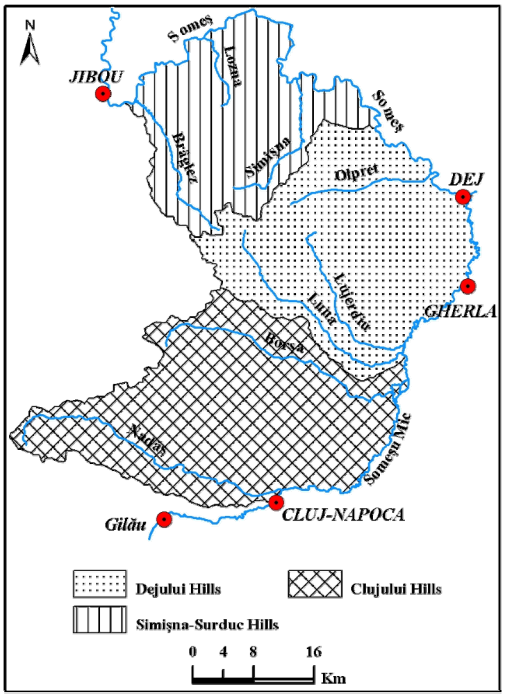


Fig. 1. Someşan Plateau Southern Subdivisions.

The altitudes increase from the Someş Valley (the 200 m contour penetrates till Răstoci) to the Southern and Southwestern watersheds, where they remain at 500-600 m, only in some areas overpassing 600 m (Nadiş, 644 m, Mărului, 622 m, Râpa Şimişnei, 612 m etc.). In this subdivision, the radial divergent orientation of the river network has repercussions on the road network configuration and on the settlements distribution.

The population density is reduced (20-30 loc./km^2), and the settlements are situated along the main river valleys, rarely on the main watersheds. The morphological conditions, the relatively humid climate, with annual average temperatures between 8-9 ^{0}C, and the bio-pedo-geographic cover are favorable for animals breeding, cultivation of grain plants, potato and some forage plants (clover).

The fruit farming (especially plum and apple trees) also benefits from favorable conditions.

Dejului Hills represent the central compartment of the studied area, lying between the watersheds of the Şimişna - Vad rivers, respectively Olpret and Luna to the North and Luna - Borşa to the South. To the East and Northeast it is bordered by the Someşul Mic Valley upstream of Răscruci, continued with the Someş valley between Dej and Vad, while to the East they come into contact with the central compartment of the Almaş – Agrij Depression. Within these boundaries, Dejului Hills occupy more than 34,9 % of the studied area. The maximal altitudes correspond to the structural remains preserved on the Dej tuff layers (the Hills of Bobâlna, 693 m, Făgetul, 602 m, Horgău, 595 m).

The existence of the volcanic tuff is also underlined by the narrowing of some valleys (Lujerdiu, Mărului, Olpretului etc.), upstream of which different sized depressions have developed, facilitating the apparition of many small-sized settlements. From the Northern central part, the peaks decrease in altitude to East and Southeast where they remain frequently between 350 and 400 meters. The 350-450 altitudinal interval occupies almost half of the divisions (45,7 %) area.

The main valleys are orientated towards East and South, and the watersheds are larger than those in the Şimişna-Surduc Hills. The horizontal fragmentation values are reduced, the values grading between 0,5 and 2 km/km^2 (58,8 %). The vertical fragmentation values are also reduced, not exceeding 150 m in more than three quarters (83,4 %) of the divisions area. Within this area, peaks over-passing is difficult, the majority of the passing routes following the main river valleys. In this way, the two limitrophe valleys (Luna şi Olpret) are associated with modern roads that make possible the connection between Cluj-Napoca and Jibou, and also between Dej and Jibou.

Clujului Hills, situated in the Southeast of the Someşan Plateau, develop between the Luna and Nadăş Valleys, and represent 40,3 % of the studied area. The altitudes are generally decreasing from West to East and from South to North. The highest peaks, over 600 m, correspond to the cuesta that dominates the Nadăş Valley (Lomb 682 m, Morunu, 647 m, Gurgueţu Mare, 639 m).

The relatively unitary and uniform peaks have a general orientation from Northwest to Southeast in conformity with the main valleys (Popeştilor, Chintenilor, Feiurdenilor, Borşei). The frequency of cuestas orientated towards South and Southwest are conditioned by the layers inclination from Southwest to Northeast. The horizontal fragmentation of the relief is moderated, with most of the values lying between 0,5 and 2,0 km/km^2 (57,8 % of the area), while the vertical fragmentation (88,9 %) has values between 50 and 150 meters in the most part of the subdivision, an exception in this respect being the small gorge sectors cut in the Dej tuff layers, with values exceeding 200 meters.

Among the actual geomorphologic processes, the depth erosion is the most frequent, developing especially on the cuestas. The massive landslides are rare throughout the studied area, being identified in Clujului Hills, the interfluve between Chinteni and Valea Calda (Râpile Iadului), in the upper basin of Valea Calda, under "Piatra Şoimenilor" and Vârful Grecea in Borşa Valley. The superficial landslides and the small collapses are specific to the entire region, the decreased forest cover influencing the evolution of the slope processes. In the Southeastern part of the Clujului Hills, a specific aspect is the appearance of a silvosteppe vegetation developed on chernozemic soils.

The small and middle-sized rural settlements are situated, in most of the cases, along the major river valleys, on some of their tributaries or in the basinets formed at their origin. Exceptionally, there are some cases when settlements developed on peaks, near the major roads, like Deuşu and Vechea along the road that links Cluj Napoca to Hida, or Topa, along the Cluj-Napoca and Zalău road.

1. 2. Methodology

In the evaluation of the water balance we used the equation elaborated by M.I.Lvovici, which takes into account the genetic elements of the balance in the period of the fallen precipitation separating more components, suggesting the following equation:

$$X = Y + Z$$
$$X = S + W = S + (U + Z)$$

where: X – precipitation; Y – total runoff; S – superficial runoff; U – underground runoff; W – global humidity of the terrain; Z – evapotranspiration.

The average multiannual precipitations (X_0) were evaluated from the pluviometric data provided by two limitrophe meteorological stations (Cluj-Napoca şi Dej) and 12 pluviometrical posts. The correlation between the altitude of the stations and of the pluviometrical post, on one half, and the average multiannual precipitation volume, on the other half, made possible the elaboration of a normal yearly isohyets map. The normal total runoff (Y_0) was calculated from the discharge data of four hydrometrical stations on the autochthon rivers (Nadăş, Borşa, Luna, Olpret) and four of the adjacent region (Căpuş, Almaş, Agrij, Sălătruc). The correlation between the altitude of the hydrometrical stations and the runoff, made possible the realization of an annual normal runoff map. The studied measurement period for precipitation and total runoff was the same: 1970 – 2005.

The normal underground runoff (U_0) was determined by separating the underground alimentation from the runoff hydrograph, and the normal superficial runoff (S_0) was calculated from the difference between the normal total runoff and the underground normal runoff ($S_0 = Y_0 – U_0$). The normal evapotranspiration (Z_0) is determined by differentiating the normal precipitation and the total normal runoff values ($Z_0 = X_0 – Y_0$). Every element was expressed in millimeters.

We also determined an underground runoff coefficient (K_s), which represents a rapport between the underground runoff and the global humidity of the terrain, and an evaporation coefficient (K_e), the rapport between the evaporation and the global humidity of the terrain.

2. SPATIAL REPARTITION OF THE WATER BALANCE COMPONENTS

The water balance components have an unequal repartition in time and space conditioned by the geographic characteristics of the studied region. The territorial distinctions that appear in the spatial repartition of precipitation and runoff are imposed mainly by the particularities of the air masses and of the relief. In this case, it is about the advection of the humid air masses from the West through the “Poarta Meseşului” and the catabatic movements with foehn character, felt on the East side of the Apuseni Mountains, respectively the altitudinal differentiation of the relief and the alternant hills and valleys with different orientation in the three subunits of the studied region. The relatively uniform geological conditions do not justify evident refinements in the possibilities of underground waters accumulation. The analysis of the main components of the water balance spatial repartition was made on altitudinal steps (50 m).

The repartition of the average precipitations is conditioned to a great extent by the spatial variation of the other elements in the water balance. The detailed analysis of the relations between the average multiannual volume of precipitation and altitude made possible the emphasis of some clear refinements in the spatial repartition of the annual precipitation.

These are conditioned by the particularities in the circulation of the air masses determined by the region's position related to the Apuseni Mountains and by the relief (Mac, Sorocovschi,, Maier, 1979, Mac, Sorocovschi, 1982, Sorocovschi, Schreiber, 1986, Sorocovschi, 2001). The relations between the multiannual average precipitation and the altitude reveal some distinctive associations, mirrored in the developing of some territorial units that are differentiated according to the values of the pluviometric gradient (fig. 2 a şi b.).

According to the relief exposure to the advection of the humid air masses, the increase of precipitation amount regarding the altitude is different in the five mentioned areas. So, to the Northern part of the studied area, correspondent to the Northern part of Şimişna – Surduc Hills, the favorable exposure to the advections that enter through the "Poarta Meseşului" determines the highest pluviometrical gradients values. In the Southern part of Şimişna – Surduc Hills and in the most part of Dejului Hills, the pluviometrical gradient values keep relatively high (II. and III. validity zone). However in the areas situated at the shelter of the Apuseni Mountains, the Southern part of Dejului and Clujului Hills, the pluviometrical gradients values are very low because of the air masses descendant character.

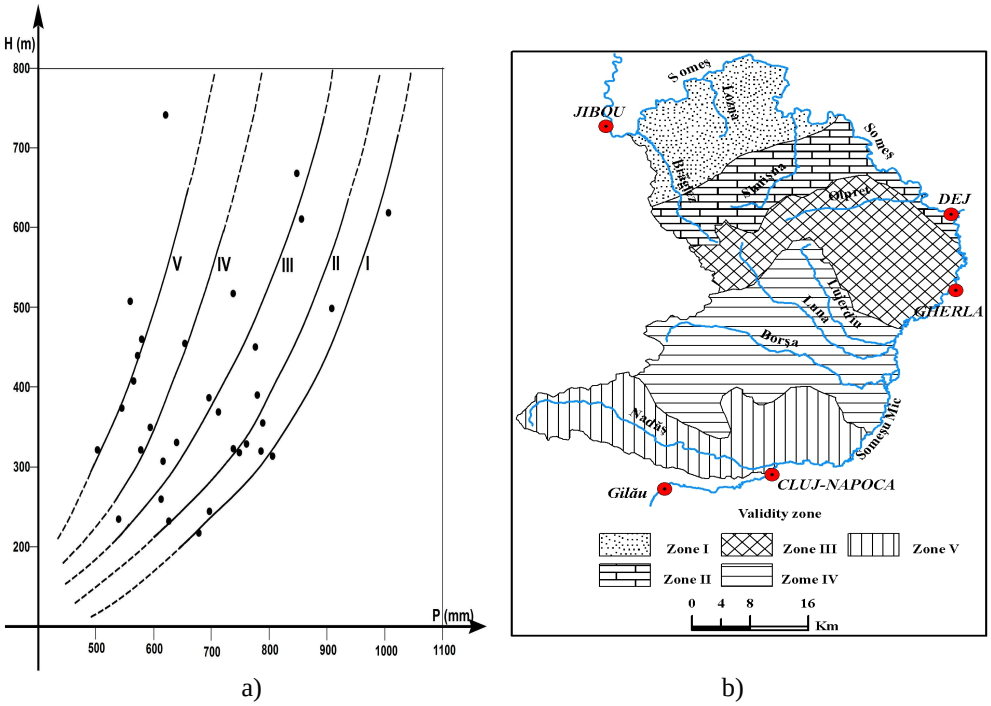


Fig. 2. The relation of X = f(Hm) (a) and the afferent validity zones (b).

The analysis of the average multiannual precipitation volume repartition according to the altitudinal intervals from the validity zones of the function X = f(Hm) reveals in an evident way the spatial differences enforced by the altitudinal zonation law (table 1.).

The repartition of the average multiannual precipitations according to the altitudinal intervals and the X = f(Hm) function validity zones.

Table 1

Altit. Int. (m)	Validity zones X=f(Hm)				
	I	II	III	IV	V
150-200	587,5	500,0	442,5	410,0	392,0
201-250	680,0	595,0	522,5	467,5	432,0
251-300	747,5	677,5	590,0	522,5	475,0
301-350	800,0	742,5	645,0	570,0	512,0
351-401	847,5	787,5	690,0	607,5	542,0
401-450	887,5	822,5	730,0	637,5	567,0
451-500	917,5	855,0	767,5	660,0	592,0
501-550	942,5	882,5	800,0	682,5	615,0
551-600	967,5	907,5	827,5	702,5	635,0
601-650	990,0	930,0	850,0	720,0	652,0
651-700	1012,5	952,5	872,5	740,0	667,0
701-750	1027,5	967,5	887,5	757,5	682,0

The differences between the precipitation amounts from the adjacent areas in relation to the altitudinal intervals are insignificant (25 - 80 mm). However, in case of distant areas, it can reach 200 mm, which reveals evident contrasts in the distribution of precipitation volumes enforced by the specific pluvial genetic conditions of the studied area

The multiannual average precipitation map, realized according to the X=f(Hm) function, emphasizes the mentioned altitudinal zonation. In the Clujului and Dejului Hills we remarked a general increase in precipitation from East (500 – 600 mm) to West and South (600-650 mm). In Șimișna – Surduc Hills the average multiannual precipitations are decreasing in general from South and West (750-800 mm) to the North (650-700 mm).

Determining the surfaces corresponding to each altitudinal interval, we could evaluate for each validity area the average precipitation quantity and the equivalent water volume (table 2.).

Average water volumes (million m^3) from precipitation according to the altitudinal intervals and the X = f(Hm) function validity zones.

Table 2

Altitudinal intervals (m)	Validity zones X=f(Hm)					Total	% from total
	I	II	III	IV	V		
150-200	9.491	0.007	-	-	-	9.498	0.7
200-250	27.665	6.591	12.599	0.039	-	46.894	3.4
250-300	36.756	14.585	31.498	14.204	8.443	105.487	7.7
301-350	46.832	33.705	55.324	31.639	17.176	184.676	13.5
351-400	46.600	50.924	70.736	65.796	28.604	262.659	19.2
401-450	32.566	48.617	72.254	99.648	36.846	289.931	21.2
451-500	18.386	32.581	50.837	91.176	54.355	247.335	18.1
501-550	8.753	9.832	21.122	42.580	50.307	132.595	9.7
551-600	2.406	1.739	5.381	12.634	38.217	60.378	4.4
601-650	0.110	0.082	0.343	4.368	18.354	23.258	1.7
651-700	-	-	0.050	0.653	2.363	3.066	0.2
701-750	-	-	-	-	0.091	0.091	0.0
Total	**229.566**	**198.664**	**320.1**	**362.7**	**254.756**	**1365.868**	**100.0**

According to the surface and to the corresponding precipitation amount, each interval participates with a certain percent to the entire water volume in the area (table 2.). The highest amounts appears in the 400 and 500 m altitudinal interval (39,3 %) followed by the interval between 300 and 400 m (32,7 %). In the lower intervals (250 – 300 m) and in those higher than 550 m, only 8 % from the total amount is achieved from precipitations.

If referring to the entire studied region, the multiannual water volume from the atmospheric precipitations was evaluated to 1365,8 million m^3, value which is corresponding with a 684,1 mm precipitation amount. However, there are significant deviations on validity zones from this average value, because of the differentiations in the surface weight and in the pluvio genetic conditions (table 2).

Analyzing the spatial distribution of the precipitations in the main geographic divisions, we observed some evident differences, the smallest amount of precipitations where registered in the Clujului Hills, followed by Dejului Hills and by the Şimişna - Surduc Hills (table 3).

Repartition of the average multiannual precipitations (mm) according to the geographic divisions and to the altitudinal intervals.

Table 3

Altitudinal intervals (m)	Clujului Hills	Dejului Hills	Şimişna-Surduc Hills	Average
150-200	-	-	587,0	587,0
201-250	-	528,2	670,3	649,3
251-300	497,5	569,1	734,2	617,0
301-350	553,6	625,9	780,7	661,4
351-401	720,0	668,3	819,7	725,3
401-450	696,3	702,8	850,2	730,8
451-500	592,2	735,3	878,1	679,6
501-550	570,5	764,7	911,3	652,6
551-600	610,5	786,7	895,2	647,8
601-650	591,7	780,2	733,2	597,5
651-700	552,7	840,7	-	557,6
701-750	682,0	-	-	682,0
Average	**623,6**	**676, 6**	**795,8**	**684,1**

The spatial distribution of the water volume resulting from precipitations differs to some extent, because of the importance of the surface weight. The highest quantity of water from precipitation comes from the Clujului Hills (543 million m^3), followed by the Dejului Hills (509,4 million m^3) and the Şimişna - Surduc Hills (432 million m^3).

The repartition of the global average runoff(Y_o) is determined by the oro-aero-dynamic conditions of the precipitations and by the influence of some physical-geographic factors. Among these, the relief has the most important influence in the distribution of the average runoff, determining the altitudinal zonation, that in the four analyzed areas area described by different runoff gradients.

The highest runoff gradients are in Şimişna – Surduc Hills (fig.3 b) and the lowest ones in the South of the Clujului Hills, the area situated in the shadow of the Apuseni Mountains. The average runoff sheet increases with the relief altitude. At small altitudes, 250-350 meters, it keeps between 40 and 70 mm in Clujului and Dejului Hills, respectively at 90-120 mm in Şimişna – Surduc Hills. At higher altitudes, 500 and 600 meters, the average runoff sheet is between 110 -130 mm in Clujului Hills, 125-145 mm in Dejului Hills and 190-220 mm in Şimişna – Surduc Hills.

The repartition of the average runoff according to the altitudinal intervals in the geographic divisions of the studied area expresses properly the relief's altitude induced zonation (table 4).

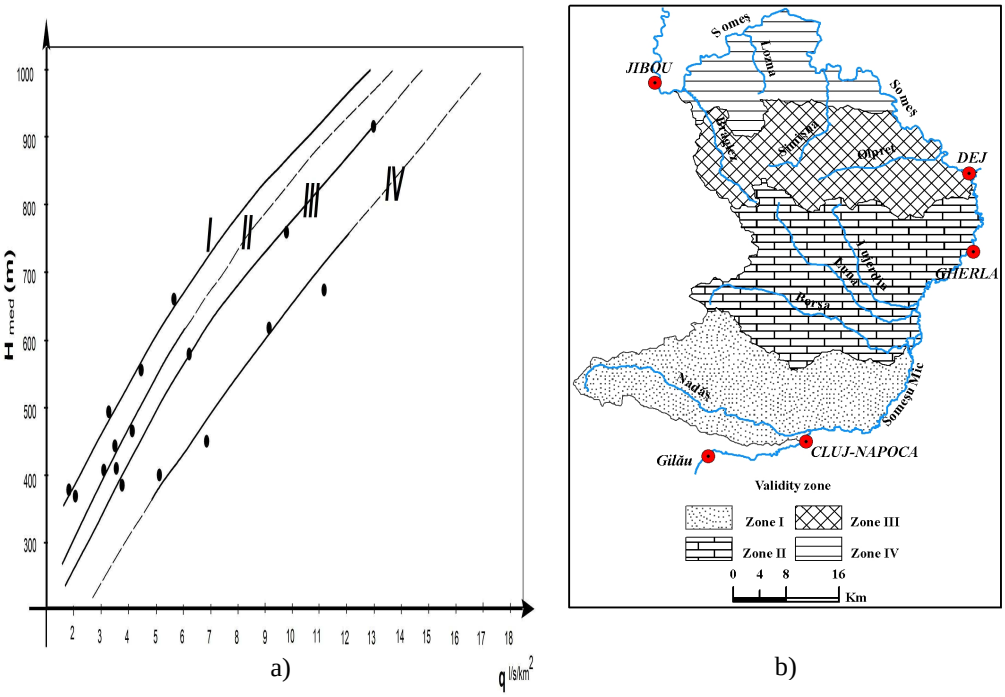


Fig. 3. The Y = f(Hm) relation (a) and the afferent validity areas (b).

Analyzing the repartition of the average runoff sheet by the geographic divisions, we could not find significant differences, the values being 98 mm in Clujului Hills, 95,2 mm in Dejului Hills and 128 mm in Şimişna – Surduc Hills.

Regarding the entire studied region, the average multiannual water volume from runoff was evaluated at 208,787 million m ^{3}, value which is corresponding to 103.9 mm. As in the case of the precipitations, the spatial repartition of the water volumes from the average global runoff differs from one region to another, depending on the surface weight of the different geographic units. In this respect, the contribution of the territorial subunits to the total water volume from runoff is different: Clujului Hills participate with 37 %, Dejului Hills with 31,7 % and Şimişna – Surduc Hills with 30,5 %.

The repartition of the superficial runoff (S_0) obeys the same repartition laws that were already mentioned in the case of the average runoff. The values are higher in Şimişna – Surduc Hills (70-100 mm), in Dejului and Clujului Hills reaching only 60-80 mm.

The underground runoff (U_o), like every element of the water balance, is described by a zonation conditioned by the growing of humidity and of the drainage intensity from the ax of the main valleys to the peaks of the watershed. In the Dejului and Clujului Hills the average underground runoff values are low, between 20 and 40 mm, however in the Şimişna – Surduc Hills they keep between 40 and 60 mm. These higher values could be explained by the relatively abundant and constant discharge from the accumulated underground waters in the sedimentary permeable formations characterizing this subdivision.

The repartition of the multiannual average runoff (Y mm) and the runoff water volume (V mil. m^3) according to the altitudinal intervals and to the geographic divisions.

Table 4

Altitudinal intervals (m)	Clujului Hills		Dejului Hills		Şimişna-Surduc Hills		Total		% from total
	V	Y	V	Y	V	Y	V	Y	
150-200	-	-	-	-	1,160	72,5	1,110	72,5	0,53
201-250	-	-	0,793	29,0	5,383	93,4	6,020	74,6	2,88
251-300	0,804	24,8	3,816	53,4	6,190	103,9	12,045	71,3	5,77
301-350	3,339	55,0	9,388	72,6	10,680	116,0	23,284	83,5	11,15
351-400	8,626	77,1	15,415	90,7	14,516	129,5	37,155	96,6	17,80
401-450	16,517	92,1	17,511	107,2	13,664	144,9	45,075	107,9	21,59
451-500	21,187	105,4	13,534	125,3	9,560	162,3	41,615	118,9	19,93
501-550	15,573	116,5	6,582	144,6	4,150	189,9	24,302	129,7	11,64
551-600	9,918	129,9	2,039	165,3	1,237	218,4	12,151	139,4	5,82
601-650	5,379	142,7	0,254	187,8	0,079	228,5	5,266	154,1	2,52
651-700	1,145	174,2	0,031	219,8	-	-	0,733	175,1	0,35
701-750	0,099	195,5	-	-	-	-	0,024	195,5	0,01
Total	**82,587**	**98,3**	**69,362**	**95,2**	**66,619**	**128,5**	**208,781**	**103,9**	**100**

The evapotranspiration (Z_o), determined as the diference between the average precipitations (X_o) and the global average runoff sheet (Y_o), depends on the evaporation potential and on the ammount of the soil humidity evaporation. Calculated in this way, the evapotranspiration value is only orientative, because of the lack of direct observations data that are influenced by the local conditions specific to each subdivision (forestry grade, soil and culture types, exposition, slope inclination). The evapotranspiration values oscillate to a reduced extent between 525 and 650 mm. In case of the geographic divisions, the average evapotranspiration values are lower in Clujului Hills (525 mm) than in Dejului (581 mm) and Şimişna-Surduc Hills (577).

The global humidity of the soil (W_o) is computed from summarising the underground runoff and the evapotranspiration value, representing the part of the precipitations which cannot participate to the runoff. The values of the global humidity of the soil primarily depend on the air humidity that presents minor oscillations in horizontal and vertical directions. Regarding the geographic divisions, the values of the global humidity of the soil are lower in Clujului Hills (547 mm) than in Dejului (614 mm) and Şimişna-Surduc Hills (624 mm).

3. THE GLOBAL WATER BALANCE

We computed the water balance for the entire studied region, starting from the average multiannual values of the main components. Accordingly, we considered the average precipitations at 683 mm/year average precipitations, from which 108 mm are consumed by the total average runoff and 575 mm by the evapotranspiration (table 5).

The geographic units water balance structure from the south part of the Someşean Plateau

Tabel 5

Subdivision name	Water balance elements (mm)					
	X_o	Y_o	S_o	Z_o	U_o	W_o
Clujului Hills	623	98	75	525	23	547
Dejului Hills	671	95	63	586	32	614
Şimişna-Surduc Hills	796	128	81	577	47	624
Region average	**683**	**108**	**76**	**575**	**32**	**607**

From the total runoff, 76 mm represent the surface runoff and 32 mm the underground runoff. This shows the reduced contribution of the underground resources to the global humidity of the soil, which represent 89 % of the fallen precipitations, respectively 607 mm.

Analyzing the structure of the hydrologic balance on the geographic divisions we remarked that the water cycle is more intense in the Şimişna-Surduc Hills than in Clujului Hills.

Knowing the repartition of the water balance components on different altitudinal intervals is a necessary condition in the evaluation of the water resources and of the possibilities to use them integrally and rationally.

R E F E R E N C E S

1. Pop, Gr.(2001), *Depresiunea Transilvaniei*, Edit. Presa Universitară Clujeană, Cluj - Napoca.
2. Sorocovschi, V., Schreiber, W.(1986), *Relaţii morfohidroclimatice în nordul Transilvaniei*, SUBB, Geol. – Geogr, XXXI, 1, Cluj-Napoca.
3. Sorocovschi, V.(1993), *Potenţialul scurgerii medii a râurilor din nord – vestul Podişului Transilvaniei*, Analele Univ. din Oradea, Geogr., Oradea.
4. Sorocovschi, V., Şerban, Gh.(1995), *Diferenţieri regionale ale potenţialului scurgerii râurilor din Podişul Someşan*, SUBB, Geogr., 1 – 2, Cluj-Napoca.
5. Sorocovschi, V. (2001), *Particularităţile scurgerii lichide în vestul Podişului Someşan*, Analele Univ. "Dimitrie Cantemir", Târgu Mureş.
6. Sorocovschi, V. (2005), *Câmpia Transilvaniei. Studiu hidrogeografic*, Casa Cărţii de Ştiinţă, Cluj-Napoca.
7. Sorocovschi, V., Horvath, Cs. (2007), *Potenţialul scurgerii medii lichide din Podişul Someşan*, Studia Univ. Babeş-Bolyai, Geographia, LII, 2, University Press, Cluj.

STUDIA UNIVERSITATIS BABEŞ-BOLYAI, GEOGRAPHIA, LIV, 2, 2009

IMPORTANCE OF SALT MINING IN THE FORMATION OF SALT LAKE BASINS IN THE TRANSYLVANIAN DEPRESSION

M. ALEXE[1]

ABSTRACT. – Importance of Salt Mining in the Formation of Salt Lake Basins in the Transylvanian Basin. The salt lakes from the Transylvanian Basin are grouped in 8 sectors; their age differs a lot, one is from the Roman period (over 2000 years), others are in the stage of evolution. Many of these lakes are anthroposaline, from where one may establish the importance of salt mining, which has an impact on the shape of the lakes, the number of them in every extraction point and, of course, on the future modifications of the basins.

Keywords: *salt mining, "bell" mines, salt lakes, Transylvanian Depression, Romania.*

1. INTRODUCTION

Even if these lakes are natural or anthropogenic ones, the lakes that are related to the salt mounts are the most representative for the Transylvanian Basin.

The 41 lakes situated in the Transylvanian Basin, on salt mounts, cover an area of 305000 m^2, and the water volume is 1755351.7 m^3. We can underline that the majority of the studied lakes are anthroposaline lakes, formed as a result of the natural accumulation of waters in the abandoned salt mines (especially the "bell" mines) or in the cuts that remained after the collapse of galleries.

Salt represents one of the most important resources of Romania. We can assume that its existence was one of the reasons why the Romans wanted to conquer Dacia. Thus, they could supply other parts of the Empire with salt, which led to growth of salt exploitations.

The technique of salt exploitation, which began with the roman period and continued in some parts even in the present period, had different aspects for different historic moments. It is important to mention these techniques, and also their amplitude, because they had an influence on the size and shape of lakes, and of course on their number.

2. SALT EXPLOITATIONS

The beginning of salt exploitations and their amplitude differ a lot from one place to another, insisting on those aspects that are related to the formation and evolution of the lacustrine basins.

In correlation with the improvement of the techniques, the type of salt extraction has changed, from the surface excavations (preordain and roman period) to "bell" mines, trapezoidal, rectangular mines characterizing especially the Middle Age and modern epoch or to brine extraction in the present.

[1] *"Babeş-Bolyai" University, Faculty of Geography, 400006 Cluj-Napoca, Roumanie, e-mail: malexe@geografie.ubbcluj.ro*

In the southern part of the Transylvanian Basin salt was extracted at ***Ocna Sibiului***. The proof of early exploitations relies on the roman mining instruments discovered in the area.

It is hard to mention the beginning of industrial exploitation of salt because of the absence of historic documents. The oldest evidence which reminds us about the salt mines goes back in 1770. It is about a sketch, which is now kept in the archive of the ex mines, where there are drawn some profiles and other elements regarding the known exploitations (total depth, the depth of extracting wells, base perimeter etc.). Also, there are mentioned, besides the active mines, other "13 flooded mines for many years" (Maxim, 1931). It is absolutely sure that the exploitations were done in "bell" mines, aspects which are confirmed by Fichtel in his study about the mines from Ardeal (1780).

Any salt exploitation was made through extraction well. Usually there were two vertical wells, with square sections, one for extracting salt, and the other for the workers. The walls were strengthened with birch, elm or oak logs. When the well reached the salt, it was deepened more with 4-5 m and afterwards widened with 4-6 m, resulting a threshold called "uzna", which bear the reinforcing of the well. The empty space behind the reinforcing was filled up with clay mixed with husk and sheep wool, and they made sure to be very well troddened. After that, they continued digging to the depth of 8-10 m (sometimes more) were they made the junction with the other well, which led to the extending of the mine walls to a bell shape (fig. 1). They reached various depths, from some tens of metres to over 160 m.

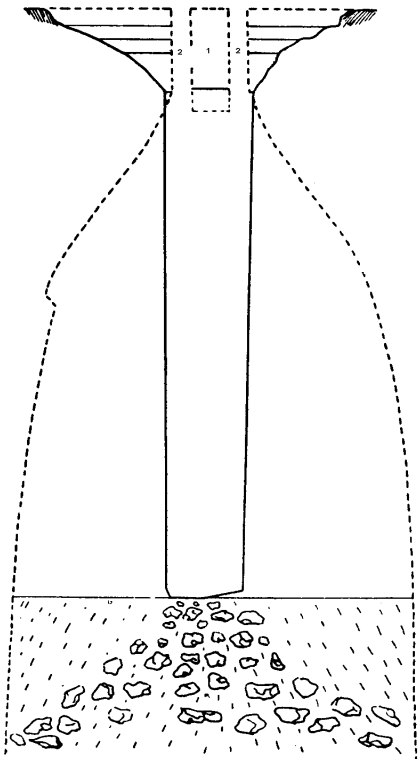


Fig. 1. Profile of a "bell" mine - Ocna Mare Mine from Ocna Sibiului (after Maxim, 1942).

The modernization of exploitations began in the 19th century with the extension of earlier mines, when they passed from the "bell" system to the digging of trapezoidal mines. It is about Sf. Ioan mine, whose shape had been suggested to be changed in 1870, without the certainty of the realization of this project and Sf. Ignatiu mine, on whose place began the formation of Lake Gura Minei in 1967. The surface of the lake will grow large as the collapse of the ceiling of the ex mine takes place, and which shelters an underground mine of 12000 m^2 (Bobeică, 1969). It is estimated that after the collapse, there will be a lake of approximately 20000 m^2.

In 1935 the exploitation of salt at Ocna Sibiului stopped because of some factors such as: salt impurity, the infiltration of phreatic waters, the economic crisis between the years 1932-1933 and the concurrence of some profitable salt mines situated in more accessible places for railway transportation.

It is hard to establish the beginning of exploitation of the two salt mounts

situated on the north-eastern part of municipium ***Turda*** (Roman Massif – Turda-Băi area and Ocnei-Valea Sărată Massif) because of the missing of written documents. Due to the fact that salt appears at the surface, we can assume that there were surface excavations even from the preroman period.

But, from documentary point of view, the exploitation is known from the roman occupation, from an inscription discovered in the Roman camp from Turda in 1796. From this inscription we can observe that there existed an association of salt tenants called *Collegium Salinariorum*. In the area of Ocnei Massif there was discovered an old roman mine as a result of digging some binding galleries between Ghizela and Anton mines. Also there were discovered mining tools used by workers from the roman period.

The first mention of salt exploitation at Ocnei Massif is found in a document of King Sigismund from 1450. In 1780, J.v.Fichtel published a paper in which he enumerated from south to north all the ”bell” mines exploited on the western side of Sărata Valley: **Die Obere Grube** (called then **Carolina**), **St. Ioseph, Maria Terezia, St. Anton and Koloscher Grube (Ocna Cojocna);** from these, only Carolina mine crumbled. The linear distribution of the 5 lakes on the western side of Sărat Valley, points to an earlier exploitation of this salt mount, the mines – of whose collapse led to the formation of lakes – being positioned along a line, probably having some connections between them.

Thus, the existence of exploitations on two alignments, points out two periods of time in the exploitation of the massif: an older one, represented by the mines from the eastern side (on those we do not have any written documents) and a recent one, represented by the western mines, many of them being preserved even nowadays.

In 1850 began the modernization of salt exploitation from Turda, when they replaced the old system of bringing salt to the surface by using horses with an elevator (**Iosif, Terezia and Anton mines**). In 1858, to facilitate the transportation of salt, they started digging a gallery from east to west (Franz Iozef gallery), which began with Iosif mine and ended at the bottom of Alaşmal Hill, in Turda.

Also they gave up to the system of “bell” mines. In 1860 the new mines: **Rudolf** (between Iosif and Tereza), and **Ghizela** (between Tereza and Anton) were cut into a system of parallelepiped chambers. The Anton mine was excluded from the modernization programme, the exploitations being interrupted (1862) because the salt was very impure. In mine Rudolf, the last exploited at Turda, the extraction of salt continued until the end of the First World War (1932), and mine Terezia being used as sterile deposit. During the World War II the mine was used as an anti-aircraft shelter and Franz Iozef gallery served as a warehouse for dairy products from 1948 to 1992. During time, because of air currents, the walls were reshaped, edges being rounded, and at the contact between the roof and walls appeared some pans. There is a consistent layer of recrystalized salt at the bottom of the walls, due to the discharge of the solution as a result of condensation. The black colour of the walls is given by the usage of candles during salt extraction. Although it is not in use anymore, Turda Salt Mine entered the touristic circuit in 1992.

The extraction of solid salt began at ***Ocna Mureş*** in the iron epoch and continued until 1978. At the beginning, they exploited salt at the surface, after that they passed to underground exploitation, in bell chambers, trapezoidal and later to smaller rectangular chambers.

The first documents about the exploitations go back in the 1200 B.C., and later, a branch of the Scythians, known as hard working miners, settle on the valleys of Mureş and Arieş between 550-450 B.C.

They continued extracting salt even in the Dacian period, due to the fact that there was a dava. After the Roman conquest, mining has known a great development. In this period, the exploitations were made at the depth of 5-15 m, in quarry. Thus, the Romans stripped the northern and north-western part of the massif, salt being transported on special plute.

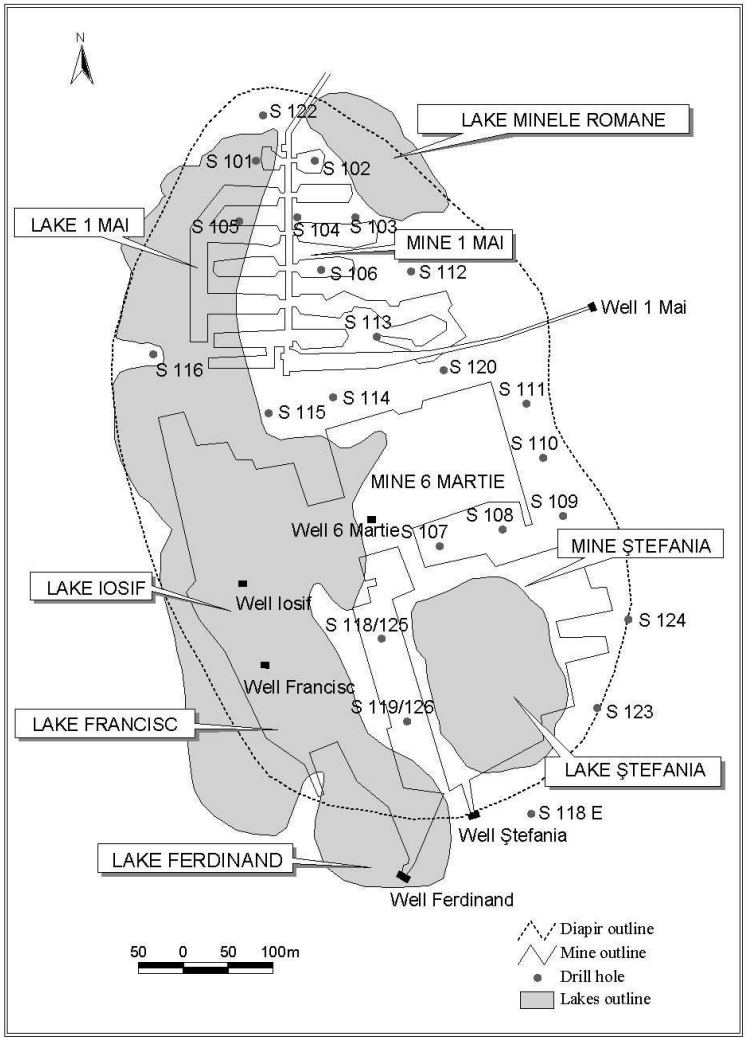


Fig. 2. Schetch of salt exploitations of Ocna Mureş.

The first underground exploitations began in 1791 (at first with bell chambers and wells, after that trapezoidal and rectangular) and with this Iosif Mine began to deepen (fig. 2) in the western part of the massif, giving birth to three exploitation chambers.

Because of water infiltration, Iosif Mine suffered damages and the walls began to dissolve. As a result, this mine is abandoned and Mine Francisc begins to be deepening, serving the chambers of Iosif Mine, and with this two more exploitation chambers are opened. Because of the fire, that affected Francisc Mine, and the damages at Mine Iosif, Mine Carolina is deepened and two other chambers are opened to assure a fluency in the extractions. But in a short period of time this well is flooded by the infiltration of waters and abandoned. The authorities from that period decided the opening of a new well to exploit the opened chambers. Thus, Mine Ferdinand is deepened, in salt, but after two years this mine has collapsed.

Only after the inundation of Mine Iosif, Carolina and Ferdinand (being in use just Mine Francisc) a new well is deepened outside the massif and called Mine Rudolf (Ferdinand 2). They considered this method to be better and safer than in the wells deepened in salt.

In 1870 **Ştefania Mine** was opened – also in barren gangue – and was deepened in two phases, at first to - 90 m, after that reaching - 120 m.

In 1867, to eliminate the problems of the infiltrations from the Mureş River, they decided to move the riverbed by digging an artificial riverbed and consolidating the river banks against flooding. This process reduced the infiltration of waters from the Mureş River protecting the northern part of the massif against surface erosion.

Also it is decided to build in barren gangue a deep drain of 14 m and 1054 m long around the northern, north-western and eastern side of the massif. The big mistake of the projectors was that they did not prolong the drain to the southern side of the salt massif. Thus, while the drain stopped the infiltrations from the Mureş River, the southern part of the massif remained without drainage, and the phreatic waters of the Banța valley affected Mine Rudolf and Mine Ştefania.

An unforgettable event in the formation of the lakes occurred in 1913 when the waters of Mureş swelled, braking the protecting dam and taking back the old course; as a consequence through Mine Iosif all the exploitation chambers and galleries of the mines in the south-western part of the massif are flooded, causing the dissolvation of salt.

This event had a great influence on Mine Rudolf. To avoid the collapse of the dividing wall between Mine Rudolf and Ştefania and the perturbation of the exploitations, they decided to evacuate the waters from Mine Rudolf, pumping out 450000 m^3 of brine in the Mureş River in three years. But this caused another problem - the infiltration of fresh water and the increasing of the degradation process. Only Mine Ştefania remained untouched by this process being isolated from the old exploitations.

Between 1918-1919 it is opened a new exploitation field near the old one, called Mine 6 Martie (Nicolae), with a main chamber and two secondary. In 1920, the great demand of brine (500 m^3/day) led to the introduction of waters through Mine Iosif, water being collected as brine at the horizon of - 170 m.

This method proved to be unappropriate, because the waters dissolved randomly causing the undermining of safety cogs and floor collapses. This process was abandoned, water being pumped in through pipes in some exploitation chambers to sprinkle the walls in the spots indicated before.

It is decided the opening of a new mine because Mine Ştefania was being on the edge of collapse. Thus, Mine 1 Mai is deepened to 136 m, in barren gangue, in the eastern part of the massif between 1930-1932.

After 1940, the exploitation of solid salt continued in Mine Ştefania and 6 Martie, and of brine in Mine 6 Martie. If Mine 6 Martie could be exploited in normal conditions, Mine Ştefania was threatened by the shorter than usual of safety cogs and by the proximity of the old mines. Their collapse began in 1896 that is why Mine Ştefania was abandoned at the date of 15 March 1947.

Because of the fact that on these mines was built the old centre of the town, they evacuated and demolished all the buildings to avoid the crumbling inside the mines.

The basins inside Mine 6 Martie merged and intersected with the exploitation chambers. But in 1945 this mine was abandoned too.

After 1954, the only mine that remained in exploitation was Mine 1 Mai, which had the main galleries of 1300 m long. Perpendicular on the main gallery there were the exploitation chambers of 60-130 m long, 20 m wide and 12 m high.

On 22/23 September 1978, the waters from the old mines dissolved the floor (40 m thick from the horizon of - 90m) in Mine 1 Mai, and flooded the three horizons of the mine. This was the end of the exploitation of refined salt in the Ocna Mureş massif.

After that, the exploitation of salt was made only through kinetic dissolvation at 1700 m deep. From the beginning of exploitations and until now from the deposits of Ocna Mureş there were extracted over 33 mil. tones of salt from a total volume estimated at 155 mil. tones.

Between 1950-1952 there were made 6 wells in Mine 1 Mai at the horizon of - 150 m (underground field no. I), with a volume of 2753 mil. m^3. This field ran until 1972 when the salt reserves were exhausted.

Between 1953-1986 there were built 9 wells (field II) projected to work at 40 m in diameter and 110 m deep, being surface wells. The volume of the gaps in this field is around 4883 mil. m^3.

Beginning with 1972, field no. III includes 7 wells (116-122) projected to work at a diameter of 80 m and 1700 m deep. The volume of gaps is estimated at 3.88 mil. m^3.

We can add the empty holes from the roman mines and the older ones, with a total volume of 5 mil. m^3, as well as the holes created by natural floods and dissolvation processes. These holes are estimated at 1.5 mil. m^3. Thus the total volume of holes in the Ocna Mureş massif is estimated at 18 mil. m^3 (table 1).

The total volume of holes in the Ocna Mureş massif

Table 1

Exploitation unit	Volume (m^3)
Field I	2 753 230
Field II	4 883 708
Field III	3 880 075
Old exploitations	5 000 000
Other gaps	1 500 000
TOTAL	**18 017 013**

For the first time salt was exploited at ***Ocna Dej*** from the roman period, as a proof being the archeological discoveries of roman copper coins and the altar (ara votica). These exploitations have been placed at the northern limit of the salt deposit, on Cabdic Hill. Because of the presence of salt near the surface, the romans used surface excavations, 3-6 m wide and 10-20 m deep. Later the system was changed into "bell mines" exploitations.

There are seven exploitation points in this area, traces of the ex Roman mines and a section of 50 m of the road used by the Romans to transport the salt.

The continuation of exploitations in the 6^{th}-9^{th} centuries is proved by the linguistic elements: it was the epoch of Slavic influences, as a proof being the term ocna derived from "akna", as well as the name of the Szolnok County from Transylvania derived from the Slavic word "solnic".

The exploitation of salt continued in the area of Cabdic-Valea Codrului until the beginning of the 18th century.

Between 1200-1300 began the exploitation of salt in the Pârâul Ocnei region, situated in the eastern part of the settlement, as a result of the reduced thickness of salt layer on the Cabdic Hill.

The first written evidences regarding the extraction of salt at Ocna Dej goe back in 1245. It is about a donation paper of King Bela IV who donated the salt mines to his obedient Laszlo.

In 1478 Ocna Dej became a town, being free from all fees and military obligations, which prove the importance of salt exploitations one more time.

Mining continued in the 15th – 16th centuries too. They used the "bell" method, at the upper level being a well that made the connection with the surface. In a paper published by mineralogist J. Fridwalsky in 1767, he described the exploitation techniques used in that period (bell method). Also he wrote about some mines, but without mentioning their names: "*the town of Dej from the Szolnok county has two very rich salt mines – the former is 22 fathom deep and has a base diameter of 16 fathom; the latter has a diameter of 60 fathom and is 56 fathom deep*".

Between 1700-1800, there were opened a series of mines, one of them known only by tradition (Mine Puturoasă, Mine Miron, Salt Mine), others known after position, depth and exploitation period:

- **Ciciri Mine** (1734-1754) -133 m deep;
- **Mică Mine** (1746-1772) - 57 m deep and 34.2 m thick;
- **Mandschein Mine** (1768-1785);
- **Mare Mine -** the deepest (151 m) was abandoned in 1773;
- **Ştefan Mine** (1773-1834) – 84 m deep.

The mines were abandoned when an obstacle occurred (water infiltration for example), but when they worked at one mine, also they prepared the exploitation of a new mine.

The first salt mine exploited in a "chamber system" at Ocna Dej was **Iosif Mine** (1795-1887), which had three parallelepiped chambers. Then followed **Ferdinand Mine,** opened in 1836, with huge trapezoidal chambers of 42000 m^2 (five transversal chambers and seven longitudinal ones, a flank gallery and three wells).

After 1944, the name of the mine was changed into Mine 23 August, but closed in 1962 because of the exhaustion of salt, the cracks in the cogs and other collapses. Immediately after that Mine 1 Mai is opened, having three longitudinal chambers, ten transversal and an access gallery of 830 m length. But this mine is closed after 20 years of activity.

Because of the exhaustion of salt in 1 Mai Mine, there appeared the necessity of opening a new mine. Thus, the Institute of Research and Mining Design (Minesa) from Cluj-Napoca has projected **Transylvania Mine.** Works began in 1975 and ended in 1978. The mine began the production in 1979 and it is use nowadays too. It is designed to work for 70 years.

The method in use is with small chambers and square cogs; this method was applied in England, Canada and U.S.A., but in Romania was used for the first time in 1970 at Slănic Prahova and Târgu Ocna.

The quality of salt from ***Cojocna*** led to the exploitation of it even from the dacic period, after that following the roman period. The extraction of salt continued in the bell system until 1850 and 1852 when the mines closed after a commercial speculation at Budapest.

It is not known the exact number of salt mines, but on the place of seven ex mines, seven lakes took birth, one of them being filled up or in an advanced phase of evolution nowadays.

Even the name of this place talks about the existence of exploitations - Kolozs Akna (Cojocna).

As well as in other places with salt resources, there were discovered mining instruments at Sic too. There are no certain proofs that the Romans extracted salt from this massif, but it is certain that there existed roman settlements before.

There have been two exploitation fields on the territory of this parish: one at the bases of the western part of the Sărata valley and the other on the eastern slope of Cipan Hill.

Concrete proofs of salt exploitations at Sic are known from the first part of the Middle Ages. In 1315, in the name of the locality appeared the term "ocna" and in 1593 Sigismund Bathory wrote that there existed a mine in exploitation.

In 1780 Fichtel, paraphrased by I.Al.Maxim, showed that at Sic there was in exploitation a mine with two wells deep enough: total depth of 57 m, 118 m base perimetre, 23 m well depth. Although it was not said about what mine they were referring to, one can presume that it was about the mine on the Cipan Hill. Salt extraction ended at this mine in 1812 and the wells were filled up in 1822. Also they were marked with grit stone obelisks which are preserved nowadays too.

Regarding the salt exploitation from ***Jabenița***, the only proof that in this area was a mine is Lacul din Băi (Ștrandul). After the shape and sizes of the whole, we can say that the salt mine could exist from the late medieval period, when the mines were digged in bell or cone shape (Pânzaru, 1986).

Another aspect that could sustain that period of exploitation is the great depth of the lake (70 m), information collected from the people who arranged this swimming place between 1935-1936.

At the same stage of presumption remains salt exploitation from ***Sovata***. On the actual place of Lake Ursu could have existed a roman surface mine with lesser depths (5–6 m).

3. CONCLUSIONS

The type of exploitations and the period when they occurred can be observed in the morphobathymetric characteristics of some lakes that appeared consequently. So, surface workings made possible the appearance of lakes that are not so deep and have irregular form (Lake Minele Romane – Ocna Mureș). The "bell" exploitations led to the formation of circular and deeper lakes (Lake Mâțelor, Fără Fund, Brâncoveanu – Ocna Sibiului, Lake Rotund, Ocnei, Tarzan – Turda, Lake Băilor from Sic etc.).

In the case when lakes appeared in the place of two or more close mines, they have an elongated shape (Lake Horia and Cloșca from Ocna Sibiului, Lake Durgău – Cojocna etc.).

The size of the deposits and the easy exploitations led to the formation of lacustrine complexes, some of them with many lakes in a limited area (Ocna Sibiului – 12 anthroposaline lakes), or on the contrary some isolated lakes appeared (Jabenița).

R E F E R E N C E S

1. Alexe, M., Şerban, Gh., Fülöp-Nagy, J. (2006), *Lacurile sărate de la Sovata*, Edit. Casa Cărţii de Ştiinţă, Cluj-Napoca.
2. Doboşi, A. (1951), *Exploatarea ocnelor de sare din Transilvania*, Studii şi cercetări de istorie medie, Bucureşti.
3. Drăgănescu, L. (1997), *Originea sării şi geneza masivelor de sare*, Ploieşti.
4. Gâştescu, P. (1961), *Tipuri de lacuri din R.P.R. după originea cuvetei lacustre*, Probleme de geografie, vol. VIII, Bucureşti.
5. Irimuş, I. A. (2006), *Hazarde şi riscuri asociate proceselor geomorfologice în aria cutelor diapire din Depresiunea Transilvaniei*, Edit. Casa Cărţii de Ştiinţă, Cluj-Napoca.
6. Maroşi, P. (1959), *Contribuţii la problema genezei lacurilor sărate de la Ocna Mureş*, Studia Universitatis Babeş-Bolyai, series II, fasc. 1, Cluj-Napoca.
7. Maxim, I. Al. (1937), *Contribuţiuni la explicarea fenomenului de încălzire al apelor sărate din Transilvania. Lacurile sărate de la Turda*, Revista Muzeului Geologic-Mineralogic al Univ. din Cluj, vol. VI, Cluj-Napoca.
8. Maxim, I. Al. (1942), *Contribuţiuni la explicarea fenomenului de încălzire al apelor sărate din Transilvania. Lacurile sărate de la Sic (Someş)*, Revista Muzeului Geologic-Mineralogic al Univ. din Cluj, vol. VII, Cluj-Napoca.
9. Maxim, I. Al. (1942), *Evoluţia procesului de formare al lacurilor născute din vechi ocne. Profilul lor de echilibru*, Revista Muzeul Mineralogic-Geologic al Univ. din Cluj, vol. III, nr.1, Cluj-Napoca.
10. Maxim, I. Al. (1961), *Câteva observaţii asupra aspectelor morfologice ale locurilor de apariţie a masivelor de sare din Transilvania. Dezvelirea sării. Datarea unor procese de migrare*, Studia Universitatis Babeş-Bolyai, seria Geol-Geogr., fasc. 1, Cluj-Napoca.
11. Pânzaru, T. (1970), *Lacurile de la Ocna Dejului (aspecte morfologice şi morfometrice)*, Colocviul naţional de limnologie fizică, Bucureşti.
12. Pânzaru, T. (1971), *Complexul lacustru de la Cojocna (aspecte morfologice şi morfometrice)*, Studia Universitatis Babeş-Bolyai, Series Geografia-Geologia, fasc. 1, Cluj-Napoca.
13. Pânzaru, T. (1974), *Complexul lacustru „Valea Sărată" (Turda). Aspecte morfohidrografice*, Lucrări Ştiinţifice, seria A, Geografie, Institutul Pedagogic, Oradea.
14. Pânzaru, T. (1975), *Lacurile de pe masivul de sare de la Sic (jud. Cluj)*, Lucrări Ştiinţifice, seria A, Geografie, Institutul Pedagogic, Oradea.
15. Pânzaru, T. (1977), *Complexul lacustru de pe masivul de sare de la Ocna-Sibiului (I). Sectoarele lacustre „Incinta Băilor" şi „Parcul Public"*, Lucrări Ştiinţifice, seria A, Geografie, Institutul Pedagogic, Oradea.
16. Pânzaru, T. (1982), *Complexul lacustru de pe masivul de sare de la Ocna Sibiului (II), sectoarele lacustre „Ocniţa-Avram Iancu" şi „Ignaţiu"*, Studia Universitatis Babeş-Bolyai, Geologia-Geographia, 27, nr.1, Cluj-Napoca.
17. Pânzaru, T. (1986), *Complexul lacustru Turda-Băi*, Probleme de geografie aplicată, Cluj-Napoca.

18. Pânzaru, T. (1986), *Lacurile de pe masivul de sare de la Jabeniţa*, Probleme de geografie aplicată, Cluj-Napoca.
19. Stoica, C., Gherasie, I. (1981), *Sarea şi sărurile de potasiu şi magneziu din România*, Edit. Tehnică, Bucureşti.
20. *** (1985), *Monografia comunei Cojocna*, Arhiva Consiliului Local Cojocna.
21. *** Proiect nr. 2880/1994, *Plan urbanistic zonal de zonă naturală protejată – Băile Sărate Cojocna*, S.C. Institut Proiect S.A. Cluj-Napoca.
22. *** Contract C. 01/2002, *Plan urbanistic general „Staţiunea Băi Sărate Cojocna”*, beneficiar Consiliul local Cojocna, proiectant S.C. „Arcor” S.R.L.-Arhitectură şi design, Cluj-Napoca.
23. *** (2005), Memoriu tehnic – *Creşterea atractivităţii turistice a zonei cu potenţial balnear – lacurile sărate – zona Durgău – Valea Sărată şi salina Turda*, Universitatea „Babeş-Bolyai”, Cluj-Napoca, Laboratorul de Evaluare a Impactului factorilor de Risc asupra Mediului (EIRM).

SPATIAL DISTRIBUTION OF HEAVY METALS IN THE SOILS OF ERATH COUNTY, TEXAS

M. DIA[1], D. WEINDORF[2], C. THOMPSON[1], H. CUMMINGS[1]
H. CACOVEAN[3], T. RUSU[4]

ABSTRACT. – Spatial Distribution of Heavy Metals in the Soils of Erath County, Texas. The presence of heavy metals in soils is a potential threat to plants, animals, humans and the environment. The soils of Erath County, Texas were examined to determine the spatial variability of heavy metals (Pb, Mn, Zn, and As) near the major highways (US-281, 377, 67, and State Highway 8 and 108) as well as unpaved county roads. It is hypothesized that heavy metals generated from combustion of motor fuel have accumulated near roadsides. However, their persistence in the soil varies with the distance from the road edge, direction of prevailing wind, traffic density, and type of road. Soil samples were collected along both sides of the road at variable distances: 25, 50 and 100 m from the road edge.The high concentration of Pb, Mn, and Zn in roadside soil was found to be associated with traffic related activities. The distribution of Pb, Mn, and Zn in roadside soil is related to traffic density, and distance from the road edge. The prevailing wind also had a significant effect on the accumulation pattern of Pb and Mn in roadside soil. Although As in roadside soil was higher than typical background levels, As distribution was not influenced by traffic density, distance from the road edge, or direction of prevailing wind. Rather, observed differences were attributed to the nature of the soil parent material.

Keywords: *Automobile; Gasoline; Heavy metals; Roadside soil; Erath County, TX*.

1. INTRODUCTION

According to the United Nations, the world's population is expected to grow from 6.5 billion in 2005 to 9.2 billion in 2050. As the world's population continuous to grow, it becomes increasingly important to understand the dynamic interaction between human activities, their immediate environment, and its quality for human health. Environmental contamination has become particularly important since it is gradually expanding from a local level to a regional level and will eventually become a global concern (Medvedev, 1999; Lopez et al., 2000). The rapid urbanization, growing transport intensity, and numerous human activities including municipal, industrial, commercial, and agricultural operations have created a problem of heavy metal contamination globally (Nirangu and Pacyna, 1988). The term "heavy metal" is a group of metallic chemical elements with a high density (>5.00 g cm^{-3}) (Epstein, 2003). The most toxic heavy metals are arsenic (As), cadmium (Cd), chromium (Cr), nickel (Ni), lead (Pb) and Zinc (Zn) (Mazvila, 2001; Navas and Lindhofter, 2005).

[1] Tarleton State University, Stephenville-76401, Texas, USA, e-mail: *mahendra.dia@gmail.com*;
[2] LSU AgCenter, Louisiana State University, Baton Rouge-70803, Louisiana. USA, e-mail: *dweindorf@agcenter.lsu.edu*;
[1] Tarleton State University, Stephenville-76401, Texas USA, e-mail: *cthompson@tarleton.edu*;
[1] Tarleton State University, Stephenville-76401, Texas, USA, e-mail:*hcummings@tarleton.edu*;
[3] O.S.P.A. Cluj, Str. Fagului nr. 1, Cluj-Napoca, 400483, Romania, e-mail: *turda75@yahoo.com*;
[4] Universitatea de Ştiinţe Agricole şi Medicină Veterinară Cluj-Napoca, Romania, e-mail: *rusuteodore23@yahoo.com*

According to the Korte index, which indicates hazards to environmental quality, heavy metals are among the worst pollutants (Stravinskiene, 2005). Heavy metals are non-biodegradable and long-term contaminants with the ability to accumulate in soils and plants (White and LeTard, 2002). Elevated emissions and their temporal deposition cause metal contamination, particularly in soils, that can significantly amplify the exposure of human, plant, and animal populations. The excessive exposure of humans to heavy metals via inhalation, ingestion, and dermal contact causes toxic effects (Mielke et al., 1999). It is generally accepted that children represent the most sensitive group (Shen et al., 1996). The exposure of children to heavy metals has toxicological effects on their physiology, development of vital organs, behavior, and nervous system (Hrudey et al., 1996).

In terrestrial ecosystems, heavy metals come from different natural and/or anthropogenic sources. Natural processes include geological weathering of parent material, volcanic activities, and/or sedimentation. Anthropogenic activities include traffic related activities (fossil fuel combustion, wear of vehicular parts, and leakage of metal-containing motor oils), industry specific activities, the disposal of municipal waste (incineration and landfill), and the corrosion of construction/building material (Councell et al., 2004; Nadal et al., 2004). Heavy metals can accumulate in topsoil from atmospheric deposition by sedimentation, impaction, and interception. Therefore, soil serves as the most important sink for heavy metal contamination in the terrestrial ecosystem (Xiangdong et al., 2001). However, the distribution and persistence of heavy metals in soil is largely governed by factors including metal solubility, physicochemical soil properties, and other environmental factors (Hernandez et al., 2003).

Several environmental studies have shown that heavy metal accumulation in soils and plants near the roadside is due to atmospheric deposition and traffic related activities (Uminska, 1988). Such contamination is generally attributed to the combustion of leaded gasoline and the consequent release of lead particles through automobile exhaust (Smith, 1976). Leaded gasoline was banned in the United States in the 1980's. Today, methylcyclopentadienyl manganese tricarbonyl (MMT), an organometal, is used as an anti-knock agent in lieu of tetraethyl lead in once used in leaded gasoline. However, crude oil contains trace amounts of over 30 elements, including As, Cd, Co, Cu, Hg, Mn, Mo, Ni, Pb, V and Zn (Davydova, 2005). The content of these heavy metals in gasoline is quite stable and is capable of forming chelates and π-complexes with petero-organics (Caroli, 2000). In addition to fuels, Cd and Zn are found in automobile tires which wear down while driving on roads. Therefore, the levels of these heavy metals are anticipated to rise in roadside environments, due to fossil fuel combustion and motor vehicle tire wear.

According to the Texas Department of Transportation, the number of vehicles registered in the state of Texas has increased from 4,087279 in 1957 to 20,284,709 in 2007 (L. Buddie, Personal communication, 2008). In Erath County, TX, the number of vehicles has increased 396% in last five decades. Thus, the consumption of gasoline has also significantly increased. Through motor fuel combustion, tire wear, and leakage of auto lubricants, heavy metals accumulate in roadside soils and because of their non-biodegradable nature, likely persist in soils for long periods of time. However, the influence of prevailing winds, distribution pattern of metals, influence of traffic density on metal accumulation, and length of heavy metal persistence in roadside soils remain largely unknown. The objective of this study was to assess the spatial variability of heavy metals in the soils of Erath County, TX by determining the variation of Pb, Mn, Zn and As in roadside soils with respect to traffic density, distance from the roadside, and direction of prevailing winds.

2. MATERIALS AND METHODS

2. 1. Area description and sampling

The study sites were randomly selected roadside soils located in the Erath County, TX. A total of 144 samples across 20 locations in Erath County were collected (Figure 1). Eleven sampling locations were adjacent to major highways (US Highway 281, US Highway 377, US highway 67, State Highway 6, State Highway 108) and another nine locations were adjacent to unpaved farm and county roads. Sampling points were located in areas where the soil was not disturbed by human activities (farming, etc.) or exposed to various chemicals used in commercial agriculture (fertilizer, pesticides, plant hormones, etc.). At each location, samples were collected at either 3 or 4 variable distances from both the sides of the road, depending on the location of the site. Sampling distances of *variable*, 25, 50 and 100 m from the edge of the road were collected. The *variable* distance at every point was always adjacent to the property fence line. Soil samples were collected using a Montana Sharpshooter to a depth of 10 cm, stored in plastic bags for transport and storage, then oven dried at 35º C for 3 days. The dried samples were sieved in a 2-mm sieve to remove gravel-sized material and large plant roots. Then soil samples were ground, homogenized, and packed into labeled bags for analysis.

2. 2. Analytical Methods

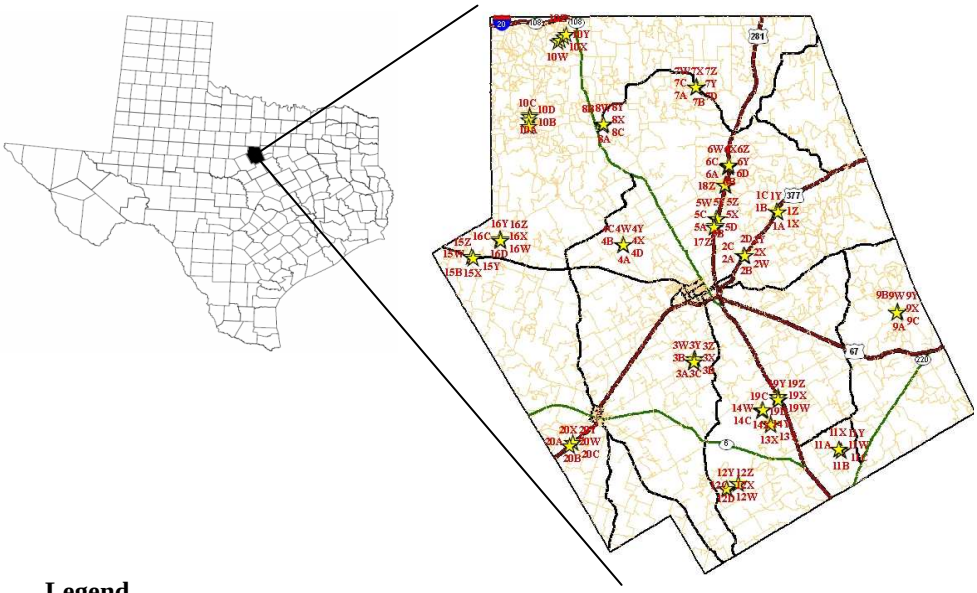
Soil samples were analyzed for particle size distribution, soil reaction (pH), electrical conductivity (EC), Pb, Mn, Zn, and As content. Soil pH and EC readings were made according to Rhoades (1996) using a 1:2.5 soil to water mixture. Soil pH was measured with an Accumet Research AR20 pH/EC meter (Fisher Scientific International, Hampton, NH, USA). The instrument was calibrated between each replication, using certified buffer solutions at pH 4.00, 7.00, and 10.00, each with an accuracy of ± 0.01. Soil EC was measured from the mixture used for pH determination using a Traceable® Expanded-Range Conductivity Meter (Control Company Friendswood, TX). The sensitivity of the instrument is 0.01 to 200.00 dS m^{-1} with a resolution up to two decimals and an accuracy of ± 4%. A solution of 0.01 N KCl was used to standardize the EC meter.

A modified hydrometer method was used to determine the relative percentage of sand, silt, and clay in all the soil samples (Gee and Or, 1996). Particle dispersion was accomplished via the use of soidium hexametaphosphate and mechanical agitation. Clay and sand percentages were derived from 24 h and 40 s hydrometer readings, respectively.

The concentrations of Pb, Mn, Zn, and As were determined by acid digestion of soil samples followed by quantification using inductively coupled plasma atomic emission spectrometery (ICP-AES). For the digestion of soil samples, methods developed by Sparks (1996) and US EPA (2007) were employed. One gram of 2 mm sieved soil was mixed with 20 ml of 1:1 HNO_3 + $HClO_4$, and heated to 200º C for 1 h. Then the sample was cooled and a mixture of 5 ml $HClO_4$ and 10 ml HF was added. The sample was reheated until a final volume of 2-3 ml was reached. The digested material was cooled and transferred to a 50 ml volumetric flask. Deionized water was added to make 50 ml of final volume and then filtered using Whatman No. 42 filter paper (US EPA, 2007).

Heavy metal concentrations were determined using a Spectro-Ciros ICP–AES (Spectro Inc, Marlborough, MA, USA). The instrument was calibrated and standardized by using a 0.002, 0.02, 0.04, 0.1, 0.4, 1, 3, 4, 5, 10, 15, 20, 40, and 80 mg kg^{-1} multi-element standard. Reagent blanks, standard solution, and duplicate samples were used to assess contamination, precision and bias. The precision and bias in the analysis were generally <5%.

All experiments were performed in duplicate. The data obtained was statistically analyzed using MS Excel and SAS 9.1 (SAS Institute Inc., 2006). Statistical significance difference of mean values of heavy metal concentrations was tested by a 'student-T' test at a 5% level of probability.



Legend

★	Sample point		Secondary state highway
	Primary U.S. highway		Secondary state and country highway
	Country road		

Fig. 1. Map of Erath County, TX showing the location of roadside sampling locations along highways and unpaved county roads.

3. RESULTS AND DISCUSSION

3. 1. Soil Physicochemical Properties

The surface soil pH, EC, sand, silt and clay of study points ranged from 5.20 - 7.48, 0.16 - 0.80 dS m^{-1}, 14.16 - 76.95%, 7.24 – 56.57%, and 2.60 – 50.16%, with an average of 6.86, 0.48 dS m^{-1}, 53.32%, 28.37%, and 18.46%, respectively. Surface soil textures of sampled points were found to be clay, clay loam, loam, sandy clay, sandy clay loam, sandy loam, and silty clay loam. Sampling locations were in Altoga *(Udic Haplustept)*, Bunyan *(Typic Ustifluvent)*, Duffau *(Udic Paleustalf)*, Gowen *(Cumulic Haplustoll)*, Lewisville *(Udic Calciustoll)*, Lindy *(Udic Haplustalf)*, Maloterre *(Lithic Ustorthent)*, May *(Udic Haplustalf)*, Purves *(Lithic Calciustoll)*, and Windthorst *(Udic Paleustalf)* soils series (Soil Survey Staff, 2009).

3. 2. Heavy Metal Concentration in Roadside Soils

Heavy metal concentrations of roadside surface soil up to 100 m from the road edge were different. Elemental concentrations of surface soils were as follows: Pb: 12.97 to 98.23 mg kg^{-1}, Mn: 71.98 to 2,048.40 mg kg^{-1}, Zn: 21.53 to 547.59 mg kg^{-1}, and As: 1.89 to 34.12 mg kg^{-1}. The range of Pb, Mn, Zn, and As concentration in roadside soil was similar to those reported in studies by Ahmed and Ishoga (2006) and Stasys et al. (2007).

The upper range limit of Mn, Zn, and As concentrations in roadside surface soil was higher than the typical background concentrations of those metals established by the U.S. Environmental Protection Agency in U.S. soils (Figure 2). A series of studies conducted in different parts of the U.S. on roadside soils have found elevated concentrations of Mn, Zn, and As, which were above the background levels. For example, Mielke et al. (2002) found high levels of Mn in soil samples collected around New Orleans, LA; Huang et al. (1994) and Falahi-Ardakani (1984) found considerably higher amounts of Zn in roadside soils of Cambridge, MA, and College Park, MD, respectively; and Sharma and Shupe (1977) found As in the range of 7.5 – 654.6 mg kg^{-1} in soils of Logan, UT.

However, the highest concentration of Pb recorded was within the range of typical background concentrations of Pb found in soils of the U.S. (U.S. EPA, 2008a) (Figure 2). The low concentration of Pb in roadside soil is due to the ban on leaded gasoline effective January 1, 1986. Models developed by Black et al. (1985) predicted that Pb concentrations in roadside soils would dramatically decline in the U.S. from 1988 to 2000. Results of our study have validated their prediction.

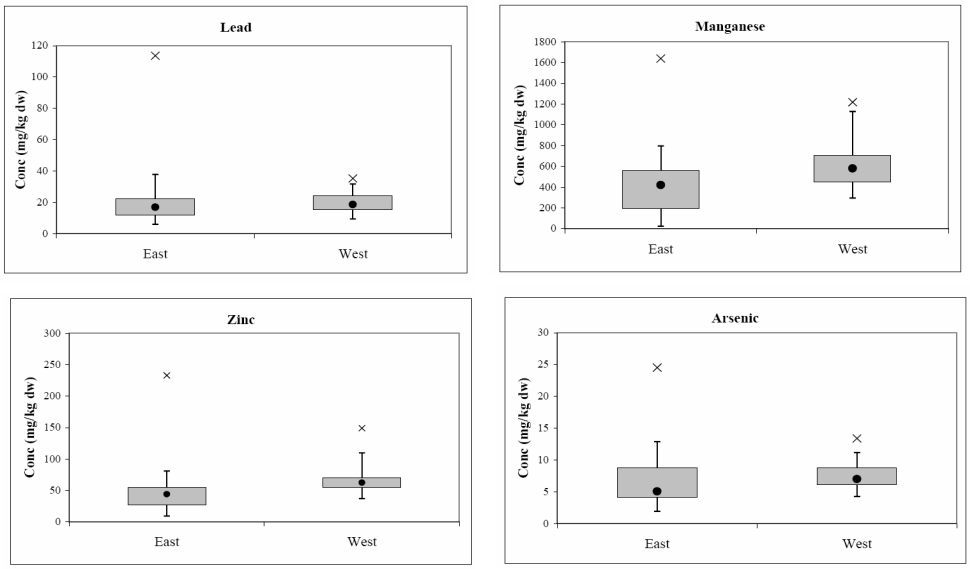


Fig. 2. Typical background concentrations of Pb, Mn, Zn, and As in eastern and western U.S. soils (US EPA, 2008a). The United States Environmental Protection Agency describes the typical background concentration of heavy metals by using its background soil concentration database. This database contains data of background concentrations of heavy metals found in soils across the USA. This data was retrieved from United States Geological Survey (USGS) reports; reports from states, universities and other agencies, published literature, and CERCLIS-3 records associated with Superfund sites (US EPA, 2008a).

3. 3. Effect of Traffic Volume on Heavy Metal Concentration in Roadside Surface Soil

Concentrations of Pb, Mn, Zn, and As in roadside surface soil at the fence line as a function of the traffic volume are presented in Table 1. Figure 3 gives the correlation plot between the Pb, Mn, Zn, and As concentration in roadside surface soil and the traffic volume. The correlation between the Pb (r^2 = 0.89), Mn (r^2 = 0.65), and Zn (r^2 = 0.89) concentrations in roadside surface soil and the traffic volume was found to be significant and positive. Only As was not significant (r^2 = 0.00). The positive correlations between the Pb, Mn, and Zn concentrations in roadside surface soil and traffic volume indicate that motor vehicles are likely the major source of metal contamination in those soils.

The Pb concentration in roadside surface soils increased with increased vehicular traffic. However, it is noteworthy that such patterns remain even today, some 20 years after the cessation of lead in fuel. The quantity of Pb additives in 1970 was 0.53 g L^{-1}, and about 75% of the total Pb was emitted from the tailpipe (US EPA, 1977). Of this 75%, 54% settled near the highways and 46% remained airborne (Huntzicker et al., 1975). Mielke and Reagan (1998) reported that from mid-1920 to mid-1980, between 4 and 5 million metric tons of Pb were emitted and deposited as a residue in the environment. This deposited Pb is inert in soil and remains detectable for several years (Wheeler and Rolfe, 1979; Ward et al., 1977; Yassoglou et al., 1987; Piron-Frenet et al., 1994).

Mean concentrations of Pb, Mn, Zn, and As in roadside surface soils at the *variable distance in relation to the average daily traffic volume (vehicles day^{-1}) in Erath County, TX.**

Table 1

Road	Average daily traffic volume	Heavy metal concentration			
		Pb	Mn	Zn	As
		mg kg^{-1}			
Farm Road 847	990	44.77	1376.12	167.82	12.13
Farm Road 1715	283	28.65	854.14	143.82	10.56
Country Road 104	50	30.40	882.47	76.15	18.64
Country Road 109	110	30.24	819.62	91.65	8.42
Country Road 123	30	48.59	631.74	93.70	9.53
Country Road 236	270	43.88	650.09	130.47	17.77
Country Road 247	150	31.40	605.27	90.01	11.56
Country Road 265	70	26.60	689.30	67.80	16.35
Country Road 396	40	36.30	687.00	55.46	14.22
Country Road 417	160	35.99	733.58	138.95	12.13
U.S. Highway 8	2595	62.54	1096.15	274.05	9.32
U.S. Highway 67	5200	85.24	1932.15	373.96	16.84
U.S. Highway 281	5010	79.60	1453.72	363.94	11.45
U.S. Highway 377	5435	95.76	1690.13	415.96	13.72

***** Variable distance was the very first sample location of each sample point and it was always next to the property fence line.

While the phasing-out of leaded gasoline has reduced the concentrations of Pb in roadside environments, automobile emission characteristics have also changed due to factors such as modern catalytic converters and changes in motor oil additives. Methylcyclopentadienyl

manganese tricarbonyl (MMT), an organometal, is used in unleaded gasoline as anti-knock agent to substitute for tetraethyl lead once used in leaded gasoline (Huang et al., 1994). According to emission studies, 13% of the Mn in fuel is emitted from the tailpipe of a motor vehicle; with the remaining 87% trapped in the oil and engine components (Lynam et al., 1999).

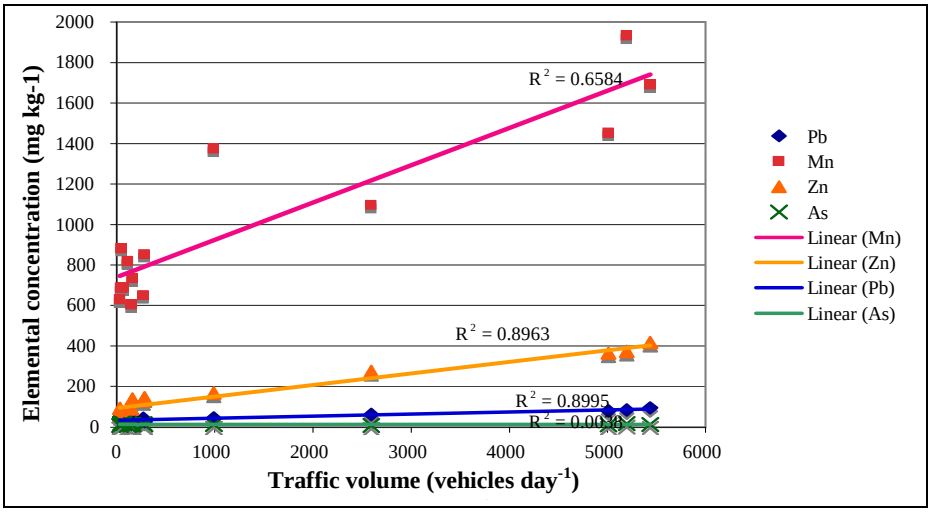


Fig. 3. Relationships between Pb, Mn, Zn, and As concentrations in roadside surface oils and traffic volume in Erath County, TX.

However, compared to amounts of Pb additive (about 0.53 g L^{-1} in 1970), relatively small amounts of Mn (0.0083 g L^{-1}) are allowed in U.S. gasoline and diesel fuels. But increasing demands of transport fuel may lead to elevated accumulations of Mn in roadside soil environments in the near future (Lynman et al., 1999; Crump, 2000). Mielke et al. (2002) reported that in 1999, U.S. vehicles (passenger cars, buses, light trucks, and other trucks) used about 607 billion L of fuel $year^{-1}$. Thus at 1999 rates of fuel consumption, if all U.S. fuel for on-road vehicles contained 0.0083 g Mn L^{-1}, the annual quantity of Mn aerosol emitted into the atmosphere would be about 650 metric tons $year^{-1}$ with 4,350 metric tons remaining trapped in engine components or in crankcase oil. The high concentrations of Mn in roadside surface soils with the increased traffic density in this study are likely attributed to the contemporary use of MMT in motor fuel. This conclusion strengthens similar observations by Ho and Tai (1988), Lytle et al. (1995) and Wong et al. (2005).

The positive correlation between the Zn concentration in roadside surface soil and traffic volume indicates that Zn levels in soil increased with increases in traffic volume. Elevated Zn concentrations in roadside soils are likely tied to Zn-dithiophosphate, an antioxidant, and Zn-diethyl or dimethyl carbamate used in lubricating motor oil and tire vulcanization, respectively. Thus, high Zn in roadside surface soils may come from the burning of motor oil and the wearing of tires. Increased Zn concentrations in roadside soils with increases in traffic volume support earlier findings of Ward et al. (1977), Ho and Tai (1988), and Olajire and Ayodele (1997).

The negative correlation between the As concentration in roadside surface soil and traffic volume indicate that elevated concentrations of As in roadside soil are not associated with vehicular traffic. The high level of As in roadside surface soils of this study are a function of the texture, mineral component, and soil parent materials.

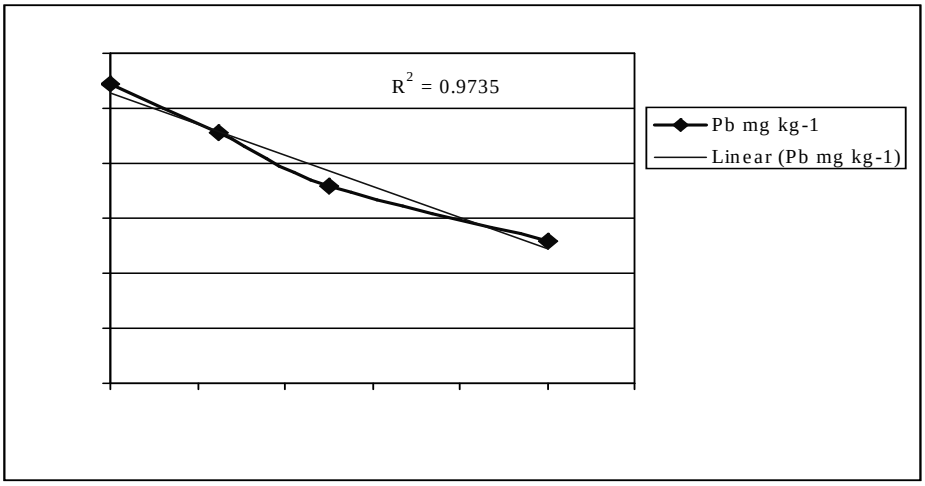
3. 4. Effect of Distance on Heavy Metal Concentration in Roadside Surface Soil

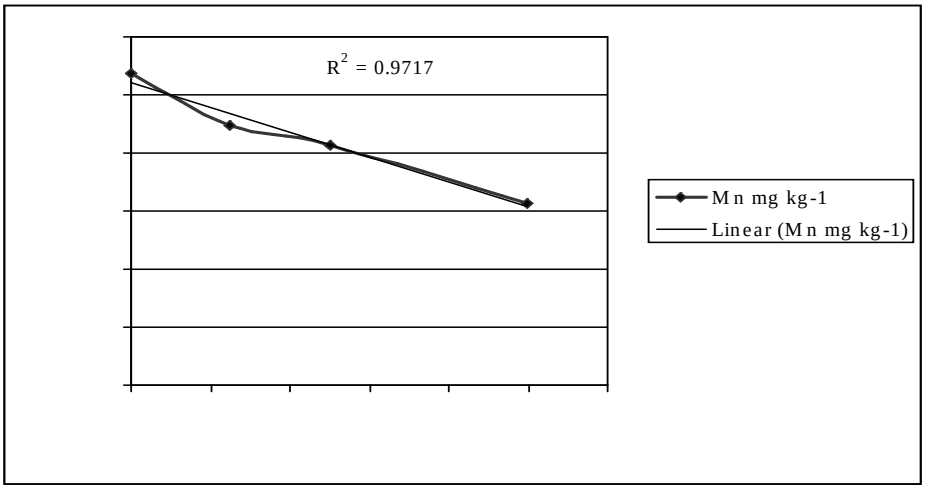
The concentrations of Pb and Mn in roadside surface soil decreased with distance away from the road (Figure 4), with the lowest concentrations observed at 100 m. The shortest distance where samples were taken (variable-fence line), showed the highest level of Pb and Mn. A decline in the relationship between Pb concentration in surface soil and the distance is shown in Figure 4 supports the findings of Norrstrom and Jacks (1998) and Nabulo et al. (2006). A reduction of Mn with increasing distance from the road is also reported in earlier findings of Motto et al. (1970). Similarly, Lytle et al. (1995) found a distinctive decay of soil Mn away from a major road in Utah.

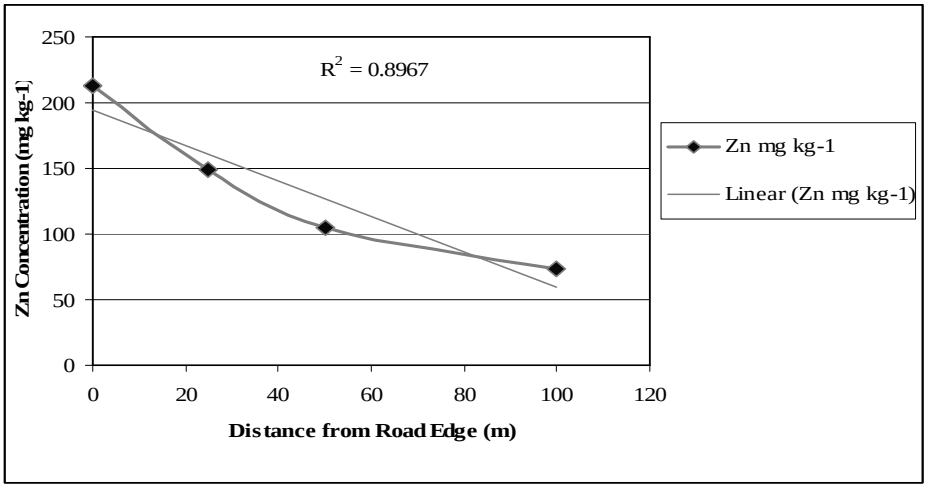
The steep gradient between Pb ($r^2 = 0.973$) and Mn ($r^2 = 0.971$) concentrations and the distance away from the road suggest that majority of Pb and Mn emitted from motor vehicles accumulate close to the roadways. This may be due to Pb and Mn being primarily emitted as airborne particulate from automobiles tailpipes, which use motor fuel enriched with Pb and MMT. The distribution of airborne Pb and Mn is selective and follows a double exponential function. The first exponent is associated with larger particles that settle rapidly near the roadways, while the second (with smaller particles) settle more slowly, within about 100 m of the source. This observation confirms the results of Wheeler and Rolfe (1979), who studied the distribution Pb concentration in roadside soil and vegetation in relation to traffic density in Urbana, IL. Similarly, Baltrenas and Kliaugiene et al. (2003) and Davydova (2005) reported that heavy metals emitted from the tailpipe of automobiles are exposed to various aerodynamic and gravitational forces resulting in their separation and, depending on their physical and chemical properties, they settle selectively on the soil surface at different distances from the road surface.

The correlation of Zn concentration to the distance away from the roadway ($r^2 = 0.90$), showed a similar trend to Pb and Mn (Figure 4). The highest and lowest concentrations of Zn were recorded at the distance of variable (nearest distance from the road edge) and 100 m, respectively. The high concentration of Zn near the roadways is attributed to the wearing of tires. Zinc is present in the range of 20-90 mg kg^{-1} as Zn-diethyl or dimethyl carbamate in tires. These observations support with earlier findings of Doss et al. (1995) and Yassoglou et al. (1987). However, the horizontal distribution of Zn in roadside surface soil is not similar to those of Pb and Mn. The former is primarily distributed via runoff of water and Pb and Mn are distributed from wind. Therefore, the horizontal distribution of Zn in roadside surface soils depends on topography, slope and precipitation. The US EPA (2008b) reported that Zn demonstrates low mobility in most soils, and is strongly adsorbed to soils at pH 5 or greater.

The As concentrations in roadside surface soil did not show a detectable reduction gradient ($r^2 = 0.53$) with the distance (Figure 4). The highest concentration of As in roadside surface soil was noted at 50 m, which was comparable with the As found at the nearest distance (variable) from the road edge. The lowest concentration of As in roadside surface soil was recorded at the distance of 100 m. The uneven distribution of As in roadside surface soil in relation to the distance from the road edge indicates that the concentration of As in roadside is not related to vehicular traffic. This nonsymmetrical distribution attributes its origin from the nature of the soil parent material.


R2 = 0.9735
Pb mg kg-1
Linear (Pb mg kg-1)


R2 = 0.9717
Mn mg kg-1
Linear (Mn mg kg-1)


R2 = 0.8967
Zn mg kg-1
Linear (Zn mg kg-1)
Zn Concentration (mg kg-1)
250
200
150
100
50
0
0
20
40
60
80
100
120
Distance from Road Edge (m)

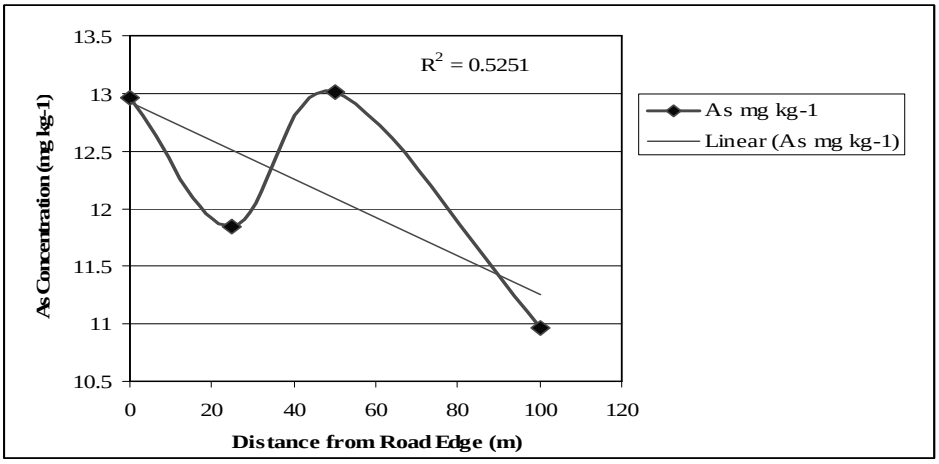


Fig. 4. Relationship between Pb, Mn, Zn, and As concentrations in surface soils with respect to distance from the road edge in Erath County, TX.

3. 5. Effect of Prevailing Wind Direction on Heavy Metal Concentration in Roadside Surface Soil

The distribution of Pb, Mn, Zn, and As on roadside surface soil in relation to the orientation and distance away from the road is presented in Table 2. The predominant wind direction in Erath County, TX, is from south to north and southwest to northeast (J. Brady, personal communication, 2008), and had a significant effect on the distribution of Pb and Mn in roadside surface soil. Table 3 gives the statistical analysis of Pb and Mn concentration in relation to the different orientations. The Pb concentration was significantly different at S-N ($P = 0.015$) and SW-NE ($P = 0.034$) orientation combinations. High concentrations of Pb in surface soils were noted in leeward directions i.e. north and northeast orientation in relation to the direction of the road (Figure 5). Similarly, the Mn concentrations in the roadside surface soils were higher toward the downwind side of prevailing wind directions. Unlike Pb, Mn accumulation near the roadside surface soil did not show significant difference ($P = 0.204$) between south and north directions (Figure 5). This may be because only 2 sample points, out of 20, were located on south to north orientation and out of that 2, one point was located on an unpaved county road where traffic density was low. This difference in concentration of Pb and Mn in leeward and windward sides suggests an aerial route for the dispersion of Pb and Mn throughout the ecosystems near the roads. A similar observation was made by Black et al. (1985), where particulate concentrations in the atmosphere were 6 and 13 mg kg^{-1} in windward and leeward directions, respectively, on I-45 in Houston, TX.

The concentrations of Zn and As in roadside surface soil did not show any significant difference on upwind and downwind directions (Table 2 and Figure 5). This was attributed to the origin and dispersion of these metals. Zinc is primarily emitted from the wearing of tires of automobiles and its route of dispersion in roadside surface soil is via run-off water (Roderguez-Flores and Roderguez-Castelleon, 1982). Whereas As in this study was not found to be related to any traffic related activities.

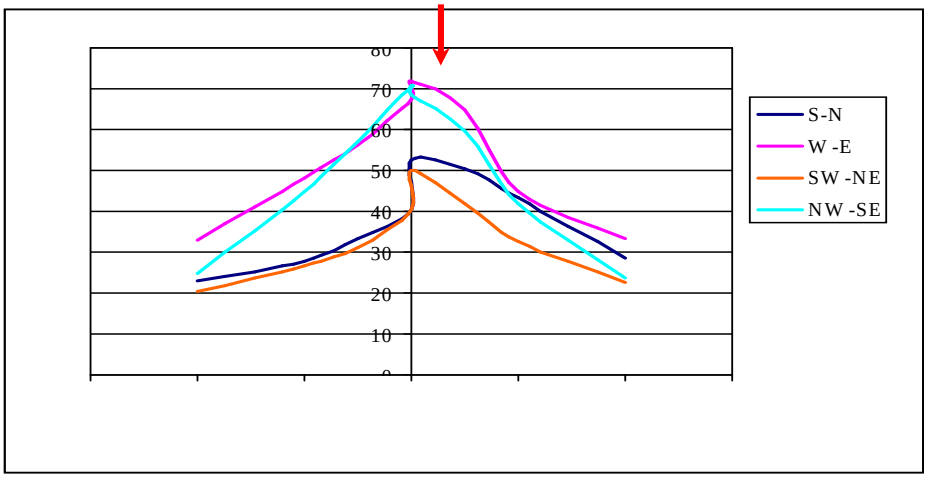
Concentrations of Pb, Mn, Zn, and As in roadside surface soil as a function of orientation and distance (m) from the road edge in Erath County, TX.

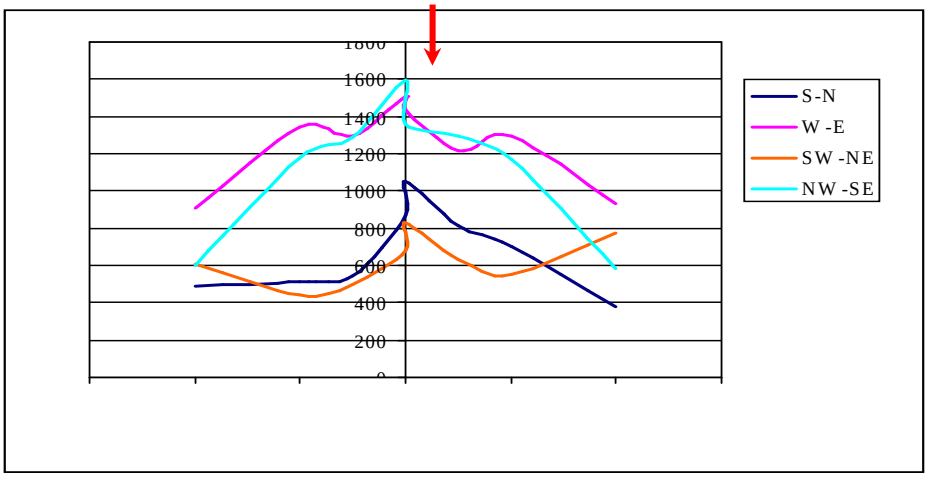
Table 2

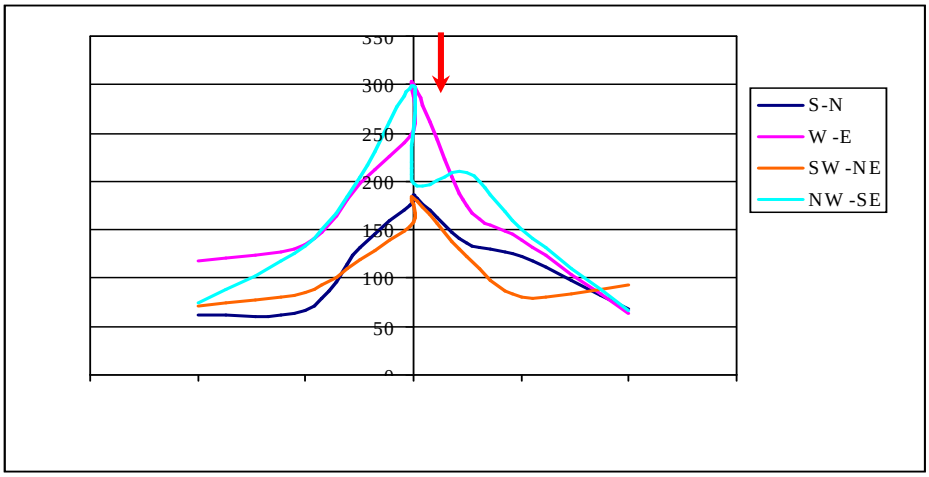
Heavy metal	Distance (m)	Orientation[1]							
		S	N	W	E	SW	NE	NW	SE
		mg kg^{-1}							
Pb	Variable[2]	40.2	52.6	67.2	71.76	40.4	50.0	70.9	68.3
	25	33.4	50.3	56.3	64.80	31.2	42.0	57.1	59.5
	50	27.9	43.3	48.0	44.80	26.6	32.4	44.8	41.7
	100	22.9	28.6	32.9	33.31	20.3	22.6	24.6	23.8
Mn	variable	865.3	1051	1507	1438	682.7	830.2	1593	1358
	25	543.0	812.8	1292	1218	497.7	632.2	1284	1292
	50	517.0	705.0	1345	1299	438.9	550.9	1180	1166
	100	489.6	382.4	905.1	935	608.7	773.7	596.2	588.1
Zn	variable	180.2	185.6	252.7	300	157.5	183.2	299.1	197.6
	25	131.6	136.8	197.8	175	119.1	122.1	204.6	208.7
	50	67.0	122.9	135.5	139	84.7	80.9	133.0	150.7
	100	62.5	67.6	118.0	63.3	71.7	92.9	74.4	66.4
As	variable	9.3	8.5	9.6	12.7	14.0	13.2	13.1	16.0
	25	11.0	9.6	12.2	14.0	12.8	12.5	10.9	9.2
	50	11.7	8.2	12.4	9.3	12.4	15.5	7.8	19.2
	100	16.6	10.3	12.4	9.1	10.8	14.0	9.3	8.4

[1] N, north; S, south; E, east; W, west; NE, northeast; NW, northwest; SE, southeast; SW, southwest.
[2] Variable distance was the very first sample location of each sample point and it was always next to the property fence line.

To date, there has been little investigation in the US on the effect of prevailing winds on heavy metal distribution from gasoline combustion in roadside surface soils. Considering trends of increasing vehicle ownership, progressive urbanization, and the increasing proximity of urban areas toward rural areas, further work is needed to assess the spatial distribution of metals in roadside soils especially in areas with strong prevailing winds. Smaller scaled, intensive sampling studies to measure any change or increase of heavy metals in roadside surface soil are needed. The use of field portable x-ray fluorescence spectrometry would be a tool well suited for such investigations by providing rapid, in-situ results of metal spatial variability near roads.


70
60
50
40
30
20
10
S-N
W -E
SW -NE
NW -SE


1600
1400
1200
1000
800
600
400
200
S-N
W -E
SW -NE
NW -SE


300
250
200
150
100
50
S-N
W -E
SW -NE
NW -SE

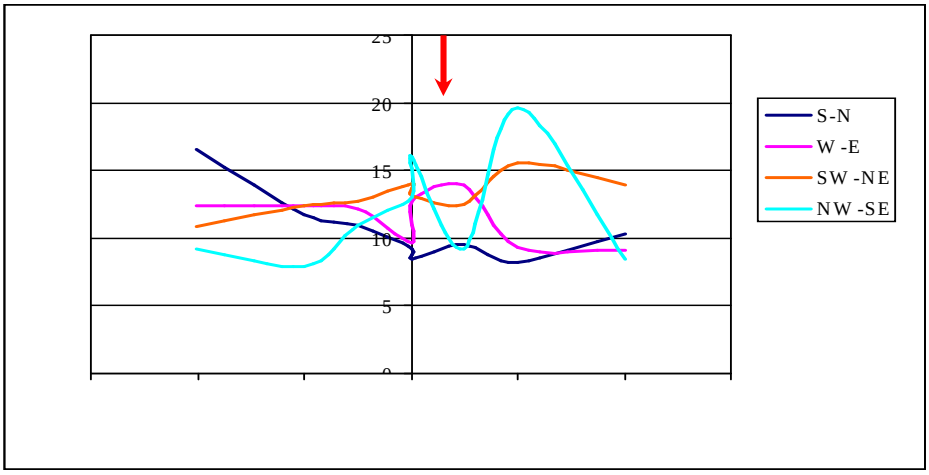


Fig. 5. Effect of wind direction on Pb, Mn, Zn, and As concentrations in roadside surface soils and on different orientations in relation to the road. (→ direction of the road; S-N, south to north; W-E, west to east; SW-NE, southwest to northeast; NW-SE, northwest to southeast) in Erath County, TX.

4. CONCLUSIONS

In conclusion, increasing urbanization, ownership of vehicles, and motorization will increase traffic density. With such increases, the consumption of gasoline enriched with MMT will also increase. However, compared to leaded gasoline (0.53 g Pb L^{-1}), relatively small amounts of Mn (0.0083 g L^{-1}) are allowed in U.S. gasoline and diesel. Yet increasing rates of fuel consumption suggest that Mn levels will continue to rise in future roadside environments. Results of this study clearly indicate that higher levels of Pb and Zn are tied to roads with higher traffic density (highways, major paved roads). Results were less conclusive with Mn and non apparent with As. Results of this study also point to differing modes of transportation for various metals. Both Pb and Mn are deposited via wind and can extend for up to 100 m from the road surface. Zinc is primarily moved into adjacent soils via water runoff and shows a weaker correlation with distance from the road than Pb and Mn. Arsenic does not follow any discernable pattern with increased distance from the road. Future work in heavy metal spatial variability could evaluate differential distribution patterns in urban/suburban vs. rural settings or industrial vs. agronomic settings. Furthermore, models could be developed to show the linkage between vehicle fuel economy, emissions, and the predicted metal impact (deposition) on various environments.

5. ACKNOWLEDGEMENTS

Special thanks go to the Department of AAHRM of Tarleton State University for providing funds for this research study.

REFERENCES

1. Ahmed, F., Ishiga, H. (2006), *Trace metal concentration in street dusts of Dhaka city, Bangladesh*, Atmos. Environ. 40.
2. Baltrenas, P., Kliaugiene, E. (2003), *Soil pollution by heavy metals from transport system in Lithuania [Online]*, Available at http://home.lanet.lv/~asi/Abstracts.html. (accessed 18 March 2008; verified 12 April 2008). International conference "Integrative approaches towards sustainability".
3. Black, F., Braddock, J., Bradow, R. (1985), *Highway motor vehicles as sources of atmospheric particles: projected trends 1977 to 2000*, Environ. Int.
4. Caroli, S. (2000), Proc. 2nd Intl. Conf. on Trace Elements. Elements in food analysis and classification. Warsaw.
5. Councell, B., Duckenfield, K., Landa, E., Callender, E. (2004.), *Tire-wear particles as a source of Zn to the environment*, Environ. Sci. and Technol.. 38.
6. Crump, K.S. (2000), *Manganese exposure in Toronto during use of gasoline additive methylcyclopentadienyl manganese tricarbonyl*. J. Expos. Anal. Environ. Epidemiol. 10.
7. Davydova, S. (2005). *Heavy metals as toxicant in big cities*, Microchem. J.
8. Doss, J., Elfving, D., Lisk, D., (1995), *Zinc in foliage downwind from a fire-burning plan*, Chemosphere 31 (3).
9. Epstein, E. (2003), *Land Application of Sewage Sludge and Biosolids*, CRC Press, Boca Raton, Florida.
10. Falahi-Ardakani, A. (1984), *Contamination of environment with heavy metals emitted from automotive*s, Ecotoxicol. Environ. Safety. 8.
11. Gee, W., Or, D (1996), *Particle-size analysis*, *In* J.H. Dane et al. (ed.) Methods of soil analysis, Part 4 – physical methods. SSSA, Madison, WI.
12. Hernandez, L., Probst, A., Probst, L., Ulrich, E. (2003), *Heavy metal distribution in some French forest soils: evidence for atmospheric contamination*. The Sci. of the Total Environ. 312.
13. Ho, B., Tai, M., (1988), *Elevated levels of lead and other metals in roadside soil and grass and their use to monitor aerial metal deposition in Hong Kong*, Environ. Pollut. 49.
14. Hrudey, S.E., Chen, W., Rousseaux, C. (1996), *Bioavailability in Environmental Risk Assessment*, CRC Press, Boca Raton, Florida. 264pp.
15. Huang, X., Olmez., I., Aras, N., Gordon, G., (1994*), Emission of trace elements from motor vehicles: potential marker elements and source composition profile*, Atmos. Environ. 28. .
16. Lopez-Alonso M., Benedito, J., Miranda, M., Castillo, C., Hernandez, J., Shore, R. (2000), *Arsenic, cadmium, lead, copper and zinc in cattle from Galicia, NW Spain.*, Sci. Total Environ. 246.
17. Lynam, D., Ross, J., Pfeifer, G., Fort, B., Pullin, T. (1999), *Environmental effects and exposures to manganese from use of methylcyclopentadienyl manganese tricarbonyl (MMT) in gasoline*, NeuroToxicology. 20.
18. Lytle, M., Smith, B., McKinnon, C. (1995), *Manganese accumulation along Utah roadways: a possible indication of motor vehicle exhaust pollution*, Sci. Total Environ. 162.
19. Martin, H., Coughtrey, P. (1982), *Biological monitoring of heavy metal pollution*, London, Applied Science Publisher.
20. Mazvila, J. (2001), *Sunkieji metalai Lietuvos dirvozemiuose ir augaluose*, (In Russian, with English abstract). Monografija. Kaunas: LZI.

21. Medvedev, N. (1999), *Levels of heavy metals in Karelian wildlife, 1989-91*, Environ. Monitoring and Assessment. 56(2).

22. Mielke, W., Gonzales, C., Powell, E., Shah, A., Mielke, P. (2002), *Natural and anthropogenic process that concentrate Mn in rural and urban environment of the lower Mississippi river delta*, Environ. Res. A90.

23. Mielke, W., Gonzales, C., Smith, M., Mielke, P. (1999), *The urban environment and children's health: soils as an integrator of lead, zinc, and cadmium in New Orleans, Louisiana, U.S.A*, Environ. Res. 81.

24. Mielke, W., Reagan, P. (1998), *Soil as an important pathway of human lead exposure*., Environ. Health Perspect. 106(1).

25. Motto, L., Daines, R., Chilko, D., Motto. C. (1970), *Lead in soils and plants: its relationship to traffic volume and proximity to highways*, Environ. Sci. Technol. 4.

26. Nabulo, G., Oryem-Origa, H., Diamond, M. (2006), *Assessment of lead, cadmium, and zinc contamination of roadside soils, surface films, and vegetables in Kampala City*, Uganda. Environ. Res. 101.

27. Nadal, N., Schuhmacher, M., Domingo, J. (2004), *Metal pollution of soils and vegetation in an area with petrochemical industry*, Sci. Total Environ. 321.

28. Navas, A., Lindhofter, H. (2005), *Chemical partitioning of Fe, Mn, Zn and Cr in mountain soils of the Iberia and Pyrenean Ranges (NE Spain)*, Soil and Sediment Contamination. 14(3).

29. Niriagu, J.O., and J.M. Pacyna.1988. Quantitative assessment of worldwide contamination of air, water and soils by trace metals. Nature. 333: 134-139.

30. Norrstrom, C., Jacks, G. (1998), *Concentration and fractionation of heavy metals in roadside soils receiving de-icing salts*, Sci. Total Environ. 218.

31. Olajire, A., Ayodele, E. (1997), *Contamination of roadside soil and grass with heavy metals*, Environ. Int. 23(1).

32. Piron-Frenet, M., Bureau, F., Pineau, A. (1994), *Lead accumulation in surface roadside soil: its relationship to traffic density and meteorological parameter*, Sci. Total Environ. 144.

33. Ramsey, H., Thompson, M. (1987), *High-accuracy analysis by inductively coupled plasma atomic emission spectrometry using the parameter-related internal standard method*, J. Anal. Atmos. Spectros. 2:497-502.

34. Rhoades, D. (1996), *Salinity: electrical conductivity and total dissolved solids*. *In* D. L. Sparks et al. (ed.) Methods of soil analysis, Part 3– Chemical methods.SSSA, Madison.

35. Rodriguez-Flores, M., Rodriguez-Castellon, E. (1982.), *Lead and cadmium levels in soil and plants near highway and their correlation with traffic density*, Environ. Pollut. 4.

36. Sharma, P., Shupe, J. (1977), Lead, *cadmium, and Arsenic residues in animal tissues in relation to those in surrounding habitat*, Sci. Total Environ. 7.

37. Shen, M., Rosen, J., Guo, D., Wu, S. (1996), *Childhood lead poisoning in China*, Sci. Total Environ. 181.

38. Smith, H. (1976), Lead contamination of the road side ecosystem. J. Air Pollut. 26:753-766.

39. Sparks, L. (1996), *Methods of soil analysis*, Part 3, Chemical methods. Soil Science Society of America, Inc., America Society of Agronomy, Inc. Madison, Wisconsin, USA.

40. Stasys J., Jodkoniene, D., Sabiene, N. (2007), *Contamination of soil and grass by heavy metals along the main road in Lithuania*, Ekologija. 53(3). s

41. Stravinskiene, V. (2005), *Bioindikaciniai aplinkos vertinimo metoda.Kaunas*, (In Lithuanian, with English abstract) Vytauta Didziojo universiteto leidykla.

42. Uminska, R. (1988), *Assessment of hazardous levels of trace elements to health in contaminated soils of Poland*, Medical Institute of Warsaw, Poland (in Polish).
43. Ward, I., Reeves, R., Brooks, R. (1975), *Lead in soil and vegetation along a New Zealand state highway with low traffic volume*, Environ. Pollut. 9.
44. Wheeler, L., Rolfe, G. (1979), *The relationship between daily traffic volume and the distribution of lead in roadside soil and vegetation*, Environ. Pollut. 18.
45. White R., LeTard, L. (2002), *Investigating environmental pollution through dendrochemical analysis*, OSCAR Journal. 9.
46. Wong, C., Li, X., Thronton, I., (2005), *Urban environmental geochemistry of trace metals*, Environ. Pollut. 142(1).
47. Xiangdong, L., Poon, C., Liu, P. (2001), *Heavy metal contamination of urban soils and street dusts in Honk Kong*, Appl. Geochem. 16.
48. Yassoglou, N., Kosmas, C., Asimakopoulus, J., Kallianou, C. (1987), *Heavy metal contamination of roadside soils in the Greater Athens area*, Environ. Pollut. 47.
49. SAS Institute Inc. (2006), *SAS Version 9.1*. SAS Inst., Cary, NC.
50. Soil Survey Staff. (2009), *Official soil series descriptions [Online]*. USDA-NRCS. Available at http://ortho.ftw.nrcs.usda.gov/cgi-bin/osd/osdname.cgi (verified 6 Jan. 2009).
51. US EPA. (1977), *Air quality criteria for lead. Office of research and development*, Washington, D.C. EPA-600/8-77-017.
52. US EPA. (2007), *Method 3050B, acid digestion of sediments, sludges, and soils* [Online]. Available at www.epa.gov/sw-846/pdfs/3050b.pdf (accessed 21 July 2007; verified 29 Oct. 2007).
53. US EPA. (2008a), *Guidance for developing ecological soil screening levels (Eco-SSLS)*, Review of background concentrations of metals. [Online]. Available at http://www.epa.gov/ecotox/ecossl/pdf/ecossl_attachment_1-4.pdf (accessed 11 November 2007; verified on 15 April 2008).
54. US EPA (2008b), *Ecological soil screening levels for zinc* [Online]. Available at http://www.epa.gov/ecotox/ecossl/pdf/eco-ssl_zinc.pdf (accessed 11 November 2007; verified on 15 April 2008). U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C.

STUDIA UNIVERSITATIS BABEŞ-BOLYAI, GEOGRAPHIA, LIV, 2, 2009

ECONOMICS FOR SUSTAINABLE DEVELOPMENT. A PLEA FOR PLURALISM

P. SÖDERBAUM[1]

ABSTRACT. – Economics for Sustainable Development. A Plea for Pluralism. In attempting to get closer to a sustainable development it is not enough to focus on concrete issues and possible measures to deal with these problems. Also more fundamental issues of theory of science, paradigms in economics and ideological orientations have to be approached. A comparative approach will hopefully make us understand how our mental maps or worldviews are influenced by science and ideology.In this paper the limits of neoclassical theory in relation to environmental issues has been emphasized and an alternative 'sustainability economics' outlined. Pluralism is suggested as a strategy to constructively approach problems of an admittedly complex kind. Monopoly for one theory of science, one paradigm in economics and one ideology is similarly a dangerous strategy. In any democracy we have to live with competing ideological orientations and articulation and development of such ideologies is important in attempts to get closer to a sustainable society.

Keywords: *Environmental economics, sustainability economics, political economic person, ideological orientation, political economic organization, mission statement, pluralism.*

1. INTRODUCTION

A number of unsustainable trends can be observed at local, regional, national and global levels. Environmental degradation of various kinds and exploitation of natural resources belong to the more obvious cases. Climate change is discussed a lot these days but there are many other signs of deterioration that deserve attention. Biodiversity loss, pollution of water from agricultural activities and exploitation of agricultural land for housing and other urbanization purposes are additional examples. In Sweden we hear of the Baltic that in large parts show signs being in an unhealthy position. Unsustainable trends of a serious kind may also be related to poverty and human health. Environmental conditions and human health are often connected as in the case of quality of drinking water.

Changes in environmental and other indicators are caused by multiple factors but it is clear that human beings have contributed in many ways. Following the Brundtland report (World Commission on Environment and Development 1987), the Rio conference and other recommendations at United Nations, European Union and national levels, it is assumed that sustainable development is accepted as an idea of progress. The task in front of us then becomes one of changing a considerable part of unsustainable trends and move systematically in more sustainable directions.

[1] School of Sustainable Development of Society and Technology Mälardalen University, Västerås, Sweden: e-mail: *peter.soderbaum@mdhf.se*

It is often possible to connect problems with specific activities locally, regionally and globally. Specific measures can then be proposed. In what follows, I will emphasize that problems can be understood and articulated also at a more fundamental level in terms of the perspectives referred to by individuals as actors. The types of perspectives that will be discussed as part of the mental maps or world-views of actors are theories of science, paradigms in economics and ideologies. Dominant perspectives in these three areas tend to make specific institutions or institutional arrangements legitimate and thereby influence the behavior of actors in society and the economy (Table 1). It is argued that positivism as the dominant theory of science, neoclassical theory as the dominant paradigm in economics and neo-liberalism as the dominant ideology among influential actors make specific institutional arrangements legitimate, the WTO and the profit-maximizing firm being two examples (cf. left-hand side of table 1).

Existing and potential future institutions understood in relation to theory of science, economics paradigm and ideology

Table 1

Perspectives as elements of an actor's world view	Dominant perspectives	Complementary or alternative perspectives
Theory of science	Positivism	Hermeneutics and other approaches to the study of an actor's subjectivity
Paradigm in economics	Neoclassical	Institutional version of ecological economics
Ideology	Neo-liberalism	Specific interpretation of Sustainable Development
Institutions and institutional arrangements	For example the present World Trade Organization (WTO)	A system of rules for trade compatible with sustainable development

Positivism as a theory of science essentially stands for objectivity and value-neutrality. The scholar is an outside observer watching what goes on in society. Claims for value-neutrality suggest that science is seen as being separate from politics and that the scientist looks for the truth and presents his or her results to be used by other actors. Exclusive reliance on positivism can be described as a 'limited responsibility' view in the sense that the scholar is not responsible for how the knowledge produced is used.

While there is an important role for positivism as a theory of science, more recent developments in the humanistic and social sciences are also of interest. Social constructivism (Berger and Luckman 1966) is one example, i.e. the idea that our concepts, models, perspectives and thereby world-views or cognitive maps are socially constructed and can be modified or changed as a result of dialogue and research. Hermeneutics similarly stands for a focus on the subjectivity of specific actors and how their stories or narratives can be interpreted (Ricoeur 1981, Porter 2002). One idea behind all this is that the individual as actor in different roles is responsible for his or her arguments and behavior. Subjectivity matters and the same can be said about individual cases making 'contextualism' (Toulmin 1990) a relevant approach. The scholar among actors is no longer a neutral observer but part of society and rather than being hidden in analysis, values, ethics and ideology are explicitly considered.

Mainstream neoclassical economics suggests a specific perspective in relation to the economy and its different actors. There is an emphasis on prices and the monetary dimension. Efficiency is understood in specific ways as will be discussed later on in this essay. Alternatives to neoclassical economics include different versions of institutional economics, social economics, feministic economics and ecological economics.

Neo-classical economics is (not identical with but) closely related to neo-liberalism as ideology in present society with respect to ideas about efficiency and in other ways. Again there are alternative more or less established ideologies or ideological orientations, for example some version of social democracy or specific interpretations of sustainable development or a Green ideology. Such ideologies are influential today but tend to be secondary to ideological orientations emphasizing markets and business corporations with economic growth in GDP-terms and monetary profits in business as the main considerations.

Some actors in influential positions are happy with the present situation. Their mental maps are coined in terms of neoclassical economics and they may share the ideology of neo-liberalism as conducive to their own interests and even progress in society. Actors focusing more on various aspects of social and environmental degradation are worried and may look for opportunities to strengthen other ideas about economics, other ideological orientations and a different set of institutions (right-hand side of Table 1). While neoclassical economics as a mental map has been useful for some purposes, its dominance among influential actors in the EU, Sweden and other member countries appears to be a problem in relation to sustainable development. Complementary or alternative mental maps are needed. An argument often attributed to Albert Einstein is that one cannot solve complex problems with the same perspective and theories that once created the problems. In what follows, I will argue in favor of a multi-perspective or pluralistic approach as opposed to reliance on neoclassical economics as a single mental map.

It should be emphasized that perspectives in relation to present agricultural, forestry, energy or health related policy issues are never exclusively scientific. While being specific in scientific terms such perspectives necessarily reflect specific values and ideas about ethical and ideological orientation. “Values are always with us” in social science research as argued by Gunnar Myrdal (1978) and economics is always ‘political economics’.

2. INTERPRETATIONS OF SUSTAINABLE DEVELOPMENT

As already mentioned ‘sustainable development’ became part of the international policy dialogue through the Brundtland report. The term suggests that unsustainable development trends should be avoided but is otherwise not completely clear. ‘Sustainable development’ can then be described as a ‘contested concept’ (Connolly 1993) much like other concepts used in political science or the development dialogue, such as ‘power’, ‘institution’ and ‘democracy’.

This suggests that one should open the analysis to different interpretations of sustainable development. And, again, each interpretation has a specific ideological (political) content:

A. *Business-as-usual (BAU)* interpretation. Some actors do not perceive or accept that there is a need for change at all. They understand ‘sustainable development’ as ‘sustained economic growth’ at the macro level and ‘sustained monetary profits’ in business. Such ideas are normally connected with extreme technological optimism and equally optimistic beliefs in market mechanisms. Any problem related to markets will be solved more or less automatically;

B. *Social and ecological modernization.* Another group of actors realize that the BAU-alternative above will not work. Present mental maps and institutional arrangements need to be changed but modification or 'modernization' is believed to be enough. Add-on institutions, such as Environmental Management systems (EMS) in business (where there is an interest in environmental performance in addition to monetary performance), environmental labeling and Environmental Impact Assessment (EIA) at the public or societal level are needed. It can be added that EIA focuses on environmental impacts and does not cover all impacts. This often means that traditional methods such as neoclassical CBA are used for other (non-environmental) impacts. Connected with the modernization idea is generally a belief in 'win-win' solutions. Conflicts can be eliminated and 'we can have both' improved monetary and non-monetary performance;

C. A third actor group welcome minor adjustments according to B but believe that much more is needed and feel that *radical changes in mental maps, ideological orientations and institutional arrangements* are required. They look for something other than neoclassical economics and Neo-liberalism. To open the door for such new perspectives, pluralism becomes a relevant strategy. Monopoly in economics and neo-liberal fundamentalism has to be counteracted.

The different interpretations of sustainable development outlined are ideal types. A specific actor may move back and forth between ideal types or have his/her own particular ideas of relevant interpretations. My own judgment is that the Brundtland report and the following Rio de Janeiro documents represent something new and that the BAU interpretation can be excluded from the very beginning. A radical change in mental maps and ideological orientations can be articulated as follows:

- A movement away from one-dimensional, monetary ideas of efficiency and progress in society and business to *multidimensional profile thinking* where also non-monetary variables of different kinds are articulated and evaluated;
- A movement away from assumptions about self-interest as the only guiding motive to also include *broader ethical and ideological concerns*;
- A movement away from extreme technological optimism and beliefs in market mechanism to *acceptance of complexity and a precautionary principle*;
- A movement away from extreme reliance on experts ('technocracy') to an increased role for *democracy and participation* in problem solving processes.

Concerning the first point above, economists often refer to a need for a common yardstick. Money is said to be the natural choice; people know about money. With money follows a trade-off philosophy in the sense that one impact via its price can be traded against another. This is the main idea behind neoclassical cost-benefit analysis (CBA). The position taken here is that monetary impacts and considerations are often important but that non-monetary impacts cannot be reduced to an alleged monetary equivalent. We have to move away from one-dimensional analysis to multidimensional analysis. One reason is that the non-monetary logic differs from the monetary one. Phenomena such as inertia, path-dependence and irreversibility are common on the non-monetary side. In sustainability assessment of projects and policies, one has to live with this multidimensional complexity rather than assume it away. Monetary reductionism can also be questioned for the kind of ethical-ideological reductionism it involves. Economic theory cannot dictate correct prices for purposes of resource allocation. Reference to current market prices is just one among options.

This brings us to the second point in the list above. Economic analysis that is based on the assumption of self-interest will strengthen egoism by making it more legitimate and is therefore not very helpful in the attempts to get closer to a sustainable path. While self-interest is always there, it should be related to and balanced against the interests of others.

Actors who extend horizons socially and geographically to other regions and in time to future generations should be encouraged. Also non-human forms of life should be considered as possible elements of an actor's ideological orientation. The title of the Brundtland report *Our Common Future* is relevant to remind us that perspectives should be broadened rather than reduced. This title also points in the direction of cooperation and implies that exclusive reliance on competition in markets will not be enough.

The third point above refers to the need to observe a precautionary principle. When it is understood that technology or money (or both) cannot solve all possible future problems because of inertia or irreversibility on the non-monetary side, for instance, then it becomes wise to think before acting. In a study for the European Environment Agency, Poul Harremoës and colleagues (2002) have pointed to a number of cases where the precautionary principle could have saved us from a number of problems, had it been applied. Fisheries, radiation, benzene, asbestos, PCBs, halocarbons and hormones are among the cases described.

The Brundtland report and the Rio documents, such as Agenda 21, argue that experts certainly have a role in dealing with unsustainable trends but that these issues concern all individuals or actors in different roles. In principle all individuals need to understand sustainability issues and can actively contribute by changing behavior and participating in a dialogue and democratic decision-process.

3. LIMITS OF NEOCLASSICAL ECONOMICS

The above list of desirable changes in thinking patterns and ideology point in the direction of a sustainability economics (Söderbaum 2000, 2008a, 2008b) and indicates at the same time some of the weaknesses of neoclassical economics:

a) Neoclassical economics focuses on prices and the monetary dimension while non-monetary dimensions of various kinds are neglected or treated as less important. This can be described as a kind of reductionism, more precisely 'monetary reductionism'. Complex issues are transformed to simple monetary analysis, CBA being one example. According to this philosophy, all kinds of impacts can be traded against each other. Non-monetary impacts are transformed to monetary impacts forgetting about inertia and irreversibility in non-monetary dimensions;

b) Neoclassical theory is reductionist also in ethical (and at the same time, ideological) terms. Each market actor is assumed to focus on self-interest rather than bother about other market actors or society as a whole. Community aspects or interests do not exist as part of this world-view. In relation to societal issues, such as the construction of dams, airports or roads, neoclassical economists dictate correct ethics in the form of correct prices for various impacts. These are equal to current market prices or hypothetical ideas of what such prices might be. This ethical reductionism, first to the monetary dimension then through specific prices to monetary values, is clearly far from the radical idea of sustainable development previously described. Why should ethics be dealt with in monetary terms and how can economists dictate correct ethics for analysis thereby excluding all other ethical or ideological standpoints. This is clearly an extreme case of 'technocracy';

c) In neoclassical theory and analysis monetary and ethical reductionism tends to be accompanied by extreme beliefs in technological solutions and market mechanisms. There is not much room for a precautionary principle. As part of this philosophy, it is assumed that economic growth will make financial resources available to deal with all kinds of problems;

d) Human beings are reduced to consumers and wage earners as part of neoclassical theory and 'economic man' assumptions. Other roles such as the one of being a citizen are not considered. It is clear however that transforming society from its present unsustainable path to a sustainable one is not a small thing. Human beings as parents, professionals and citizens have to be involved.

Neoclassical economics has been assessed elsewhere (Söderbaum 2008b) and compared with alternative theoretic perspectives, the conclusion being that economics exclusively of the neoclassical kind will not be enough to deal with present unsustainable trends. Other theoretic perspectives have to be articulated and encouraged as part of a pluralistic strategy and policy.

4. ENVIRONMENTAL ECONOMICS, ECOLOGICAL ECONOMICS AND SUSTAINABILITY ECONOMICS

Neoclassical economics has been extended to cover environmental issues. Reference can be made to neoclassical environmental economics. Environmental problems are connected with 'market failures' and so called 'externalities' implying that third parties (actors not being part of a market transaction) are affected. This can be corrected, it is argued, in monetary terms through environmental charges or taxes. While neoclassical economists admit in principle that such corrections should be made, their faithfulness to the neoclassical paradigm with its marvelous market mechanism tends to downplay possible recommendations to correct markets.

In neoclassical environmental economics, individuals are essentially treated as consumers and business corporations are assumed to maximize monetary profits. Recent debate about Corporate Social Responsibility (CSR) is not understood and tends to be rejected as irrelevant by the neoclassical economist. Economic growth in GDP terms remains the main idea of progress in society and environmental impacts are valued in monetary terms to become elements in neoclassical cost-benefit analysis (CBA) of the monetary and ethically reductionist kind. At best cost-effectiveness analysis is proposed in the sense of minimizing the monetary cost of reducing specific quantities of negative environmental impacts. This is still an optimizing technique and far from the multidimensional and ethically open analysis advocated in this essay.

While neoclassical environmental economics goes back to the 1960s and 1970s, attempts to articulate an ecological economics started in the 1980s (Röpke 2004, 2005). These efforts were initiated as a criticism of environmental economists by ecologists. It is not enough to discuss environmental impacts in relation to single market transactions, it was argued. Ecosystems must be recognized as being fundamental to the functioning of an economy. Natural resources and ecosystems provide inputs in economic processes and are affected in different ways by production and consumption activities. Protection of ecosystems and natural resources is often needed to avoid their degradation.

The International Society for Ecological Economics (ISEE) was formed in 1989 and the first issue of the journal *Ecological Economics* was published in 1990. Regional organizations followed, such as the European Society for Ecological Economics (ESEE), the Russian Society (RSEE), the Canadian Society (CANSEE) etc. One of the leading actors when ISEE was formed Richard Norgaard (1989)pointed to a need for pluralism. It is probably not wise to exclusively focus on attempts to integrate or merge dominant ecology and environmental science with dominant (neoclassical) economics. This 'interface' idea of

the relationship between ecology and economics is just one possibility. While traditional approaches limited to positivism as a theory of science should not be excluded, also other ideas based on developments in social sciences have to be encouraged.

Pluralism is still celebrated as a principle by many of us ecological economists but in our journal *Ecological Economics*, there tends to be dominance for positivist and quantitative environmental science and equally positivist neoclassical economics. The editors receive a large amount of traditional manuscripts many of which appear more appropriate for traditional environmental economics journals. As I see it, *Ecological Economics* should rather be dominated by articles that depart from the neoclassical mainstream[1].

Ecological economics can be defined as economics for sustainable development. In this essay and elsewhere (2008b), I will refer to 'sustainability economics' as a current within ecological economics that clearly differs from environmental economics and the positivistic mainstream (table 2):

-the economy is no longer reducible to consumers and firms with their market transactions. Individuals are understood as Political Economic Persons, i.e. actors;

- guided by their ideological orientation. All kinds of roles are potentially relevant for sustainability issues, the role as citizen in a democratic society being one example. Similarly firms represent a subcategory among Political Economic Organizations (PEOs) as actors guided by their mission statements. The objectives;

- of business corporations is regarded as an open issue (rather than limited to monetary profits) making Corporate Social Responsibility (CSR) potentially a relevant issue. Political parties, environmental and human right organizations, churches are other PEOs relevant for the development dialogue;

- Market and non-market relationships and transactions are embedded in the ecosphere and in various ways influence the functioning of ecosystems;

- In neoclassical environmental economics actors are assumed to base their behavior upon self-interest making greediness legitimate. As part of sustainability economics ethics is an open issue and a matter of an actor's ideological orientation;

- Neoclassical economics relies on monetary efficiency indicators while sustainability economics rather emphasizes non-monetary efficiency indicators related to health, social impacts, environmental impacts etc;

- Similarly the ideas of progress in society are open issues but sustainability economics should include social, environmental and cultural aspects;

- Governance is no longer a matter exclusively of state regulation. All kinds of actors and interested parties at all levels are potentially involved;

- The expert is no longer a person pointing to optimal resource allocation or solutions to problems but rather a facilitator who contributes by illuminating different policy issues or decision situations and decisions are seen as a matter of 'matching' each decision-makers ideological orientation with expected impact profiles of specific alternatives considered. Conclusions as part of analysis are then conditional in relation to each ideological orientations considered.

[1] It may be noted that members of the European society, ESEE, actively contribute to a number of other journals with a profile closer to their interests. *European Environment* for instance will be renamed and connected with ESEE.

Sustainability economics compared with neoclassical environmental economics

Table 2

View of:	Environmental economics	Sustainability economics
Individual	Economic Man	Political Economic Person as actor guided by an ideological orientation
Organization	Firms maximizing monetary profits	Political Economic Organization as actor guided by its mission statement
Ethics	Self-interest	Open issue, a matter of ideological orientation
Efficiency	Primarily monetary efficiency indicators	Open issue, a matter of ideological orientation
Progress in society	Primarily 'economic growth'	Open issue, a matter of ideological orientation (also using social, health-related, environmental performance indicators)
Market	Supply and demand	Making market actors visible; fairness, exploitation etc.
Role of experts	'Technocracy'	Democracy
Governance	State regulation	Multiple administrative, geographical levels, Multiple parties/actors
Decision-making	Optimization	'Matching' ideological orientation and expected impact profiles of each alternative

5. NEO-LIBERALISM AS A DOMINANT IDEOLOGY AND ITS ALTERNATIVES

Neo-liberalism as ideology has been described by a number of civil society intellectuals as follows (International Forum on Globalization 2002, p. 19):

Promotion of hypergrowth and unrestricted exploitation of environmental resources to fuel that growth;

- Privatization and commodification of public services and of remaining aspects of the global and community commons;

- Global cultural and economic homogenization and the intense promotion of consumerism;

- Integration and conversion of national economies, including some that were largely self-reliant, to environmentally and socially harmful export-oriented production;

- Corporate deregulation and unrestricted movement of capital across borders;

- Dramatically increased corporate concentration;

- Dismantling of public health, social and environmental programmes already in place;

- Replacement of traditional powers of democratic nation states and local communities by global corporate bureaucracies.

This is not a kind description of neo-liberalism but it is certainly correct for the authors of the book cited. I will limit my comments to three aspects:

a) It is clear that neo-liberalism as described above is closely related to neoclassical economics. Profit maximization in business is made legitimate by this theory; progress in society is a matter of consumerism and economic growth; free trade and free capital movements is thought to increase efficiency; there is no or only a limited role for citizens and democracy;

b) Privatization is an essential element of neo-liberalism. There is a naïve belief in monetary profits as efficiency indicator for all kinds of organizations. The fact that profits can be increased considerably through exploitation of other actors or interested parties or that other kinds of unfair behavior exist is not discussed. Neither is there any ambition to extend efficiency indicators to non-monetary dimensions as previously discussed;

c) Neo-liberals only consider self-interest and thereby neglect that public or common interests are involved in any public decision or market transaction. Neo-liberalism is extremely simple and reductionist also in this case. Dealing with complexity by assuming that it does not exist is hardly a wise philosophy.

The strength of neo-liberalism in contemporary societies such as the EU or Sweden is difficult to understand. One partial explanation is the monopoly of neoclassical theory at university departments of economics in almost all parts of the world. This theory is not identical with neo-liberalism but very close to it.

To liberate Sweden or Romania or the EU from neo-liberalism, the existence of alternative theories of science, paradigms in economics and ideological orientations has to be made clear. One way of dealing with this is to make systematic comparisons between different perspectives. Relying only on one theory or ideology easily becomes inseparable from fundamentalism. Business corporations may have their ideological preferences but why should their preferences be relevant also for society as a whole. Why should we then rely on a kind of organization which for historical reasons is defined exclusively in monetary terms?

Sustainability represents a move away from one-dimensional monetary thinking.

6. THOUGHTS ABOUT ROMANIA AND OTHER NEW MEMBERS OF THE EUROPEAN UNION

My knowledge about or experience concerning Romania is limited and any advice will be formulated at an abstract level. I believe that the issues of theory of science and role of science raised in this paper are relevant also for Romania. In any attempt to deal with present unsustainable trends also competing theoretical perspectives in economics and competing ideological orientations have to be considered.

It appears that not all kinds of liberalism should be encouraged. While ‘social liberalism’, i.e. human rights, freedom of speech and other rights connected with democracy should rightly be celebrated, freedoms in the market place have to be carefully scrutinized and discussed. ‘Social’ in ‘social liberalism’ or ‘social democracy’ also stands for recognition of the existence of numerous common interests – sometimes referred to as solidarity – relevant for the individual as actor.

The market mechanism and market actors are sometimes seen as contributing to progress in society and in other cases to social and environmental degradation, depending partly on the observer’s ideological position. Market actors who use their power to exploit other market actors or exploit natural resources in a way that is connected with pollution of the environment can certainly be questioned. In short, the functioning of markets and the behavior of market actors has to be evaluated on a case-by-case basis. To worship the market, so called market fundamentalism, is not an ideology for the present century.

In relation to agriculture, it becomes important to consider the historical development path of each country. Thinking in terms of large scale production is not always a good idea. If organic farming is practiced in some parts of Romania this becomes

an important starting point and it is nowadays understood that for a prospering countryside, the farming activities of a family can be combined with other professional and income-generating activities.

Accepting a degree of complexity and questioning some of the worst forms of reductionism is thus the main conclusion and recommendation of this paper.

REFERENCES

1. Berger, Peter L. and Tomas Luckman (1966), *The construction of social reality*, Anchor Books, London.
2. Conolly, William E. (1993), *The terms of political discourse (Third edition)*, Blackwell, Oxford.
3. International Forum on Globalization (2002), *Alternatives to Globalization. A Better World is Possible*. Report drafting committee: J. Cavanagh, co-chair, J. Mander, co-chair, S. Anderson, D. Barker, M. Barlow, W. Bello, R. Broad, T. Clarke, E. Goldsmith, R. Hayes, C. Hines, A Kimbrell, D. Korten, H. Norberg-Hodge, S. Larrain, S. Retallack, V. Shiva, V. Tauli-Corpuz and L. Wallach. Berret-Koehler, San Francisco.
4. Myrdal, Gunnar (1978), *Institutional economics*, *Journal of Economic Issues*, Vol.12, No. 4, pp.771-783.
5. Norgaard, Richard B. (1989), *The case for methodological pluralism*, *Ecological Economics*, Vol 1, No.1, pp. 37-57.
6. Porter, Abbot H. (2002), *The Cambridge Introduction to Narrative*, Cambridge University Press, Cambridge MA.
7. Ricoeur, Paul (1981), *Hermeneutics and the human sciences*, Cambridge University Press, Cambridge MA.
8. Røpke, Inge (2004), *The early history of modern ecological economics*, *Ecological Economics*, Vol. 50, No. ¾, pp. 293-314.
9. Røpke, Inge (2005), *Trends in the development of ecological economics from the late 1980s to the early 2000s*, *Ecological Economics*, Vol. 55, No. 2, pp. 262-290.
10. Söderbaum, Peter (2000), *Ecological Economics. A Political Economics Approach*, Earthscan, London.
11. Söderbaum, Peter (2008a), *Only pluralism in economics research and education is compatible with a democratic society*, International Journal of Green Economics, Vol. 2, No. 1.
12. Söderbaum, Peter (2008b), *Understanding Sustainability Economics. Towards pluralism in economics*. Earthscan, London.
13. Toulmin, Stephen (1990), *Cosmopolis. The hidden agenda of modernity*, The University of Chicago Press, Chicago.
14. World Commission on Environment and Development (WCED), 1987. Our Common Future. Oxford University Press, Oxford.

STUDIA UNIVERSITATIS BABEŞ-BOLYAI, GEOGRAPHIA, LIV, 2, 2009

REGIONAL DISPARITIES IN ROMANIA DURING THE LAST CENTURY

J. BENEDEK[1]

ABSTRACT. – Regional Disparities in Romania During the Last Century. The main goal of the study is the analysis of the regional disparities in Romania during the last century. The analysis is undertaken at a county level, the only administrative-territorial level existing in Romania between the national and the local level. Considerable importance is given to the historical background of the existing regional disparities patterns. Finally, we should give an insight into the main question if the development path of different regions influences the contemporary economic and social positions of the regions.

Keywords: *regional disparities, economic development, Romania, historical path trajectories.*

1. THEORETICAL BACKGROUND

There are two different theoretical points of view regarding regional development (Amin, 1999, Bathelt and Glückler, 2000, Benedek, 2006, Nemes Nagy, 1997). The **structural theories** as in the theory of polarization and the theories of dependencies, approach the regional issue from a global perspective, considering regional development as a process determined by a series of macroeconomic and macro-political structures, as well as by the position of regions within a hierarchical centre-periphery type system. Therefore, the the background of a region's development is mostly determined by structural and historical factors that create the so-called development launch, which, once consolidated, are very difficult to alter. Hence, the underdevelopment of a region is the result of the development of other regions within an interrelation system. The ambitions of a region to reach a higher economic status are considerably impeded by the global competitiveness and by the structures of dominance at a global level.

The **regional theories** offer the development process a local perspective on the development process within which the region is illustrated as a well individualized entity, which disposes of enough endogenous abilities for choosing a particular pattern of development. Thus, the fundament of regional development is represented by the inner structure of the region, as well as by a set of interregional relationships. Among the regional theories we also include the dynamic theories of development, the regulation theory, and the historical-evolutionist theories (Rostow, Friedmann etc), as well as the new regionalism. They are all based on the assumption that each region undergoes the same multiphase (cyclic) process of development, in other words, it is a process of development converging towards the insurgence of other similar regional structures. There are *structural differences*,

[1] *"Babeş-Bolyai" University, Faculty of Geographie, 400006 Cluj-Napoca,Romania, e-mail:* jozsef@geografie.ubbcluj.ro

which result from the differentiated inner structures already functional, *historical differences* determined by an unexpected historical event, or differences that result from the ability of the regions to adapt and innovate in various ways.

2. THE GEOPOLITICAL CONTEXT

Regional disparities in Romania, as in other states, represent a fundamental feature of the society's spatiality, whose changes are determined by a set of factors in which regards the size of interregional differences, as well as by the evolution trajectory and socio-economic position of some regions. The discrepancies in the level of development of cultural-historical regions, reported to the level of regions of development as well, are rooted in the different historical and economic conditions of evolution of each region. Therefore, during the modern period, up until 1918, the regions in the Central and Western Romania (Transilvania, Bucovina, Maramureş, Crişana and Banat) were parts of different semi-peripheral state structures such as: The Habsburg Empire - between 1711 and 1867-, The Austrian-Habsburg Empire - between 1867 and 1918-; they have developed on an early industrialization axis– during the 18th century- and they formed several proto-industrial regions, based on mining and metallurgical activities (Bocşa–Reşiţa, Hunedoara–Călan, Zlatna, Baia Mare), textile industry (Transylvania Plateaux), as well as several urban economies relatively diversified, dominated until 1918, by the Western cities, including Timişoara, Arad and Oradea, subsequently, followed by the ones in Transylvania: Braşov, Sibiu, and Cluj-Napoca. Unlike these regions, the Southern and Eastern areas of Romania gravitated around the power centre represented by Constantinople (presently Istanbul), located within a peripheral structure, which determined a later development of proto-industrial regions, only during the 19th century. During the the period following the Union of the princedoms, in 1859, Bucharest, the capital, continuously and cumulatively developed. There were also set the premises for the future development of Prahova Petroleum Region, its centre being located at Ploieşti, and of some waterside locations like Galaţi, Brăila, and, later on, Constanţa.

3. REGIONAL DISPARITIES DURING THE INTERWAR PERIOD

The path of a convergent development of the territorial entities mentioned above has begun after The First World War, moment in which the differences in the development levels were substantial (table 1). Still, the lack of a coherent policy for territorial development, the economic crisis of the period between 1929 and 1933, as well as the short period of time between the two world wars, did not allow a considerable decrease in the differences of interregional development in modern Romania capitalist phase of development (table 2, table 3). If we compare the data registered in 1930 and those registered 1921, period that was characterized by a very dynamic economy, we ascertain an even more obvious dynamics from the economic standpoint in the western provinces, especially in the case of the number of industrial enterprises located there, number that registered an increase of 53,5% in Transylvania, Banat and Bucovina, unlike the ones located in the Old Kingdom with an increase of 22,4%. Hence, in accordance with the data provided by the statistical census in 1930, the highest number of enterprises at 1000 inhabitants was registered by the provinces of Banat (12,1), Transylvania (10,7), Crişana-Maramureş (9,4) and Bucovina (9,1), successively followed by Moldova (7,1), Muntenia and Dobrogea (each one with 6,9), the chain being closed by the least developed provinces, Basarabia and Oltenia, each one with 5,3.

The differences in the level of development of large industry of the historical provinces of Romania in 1921

Table 1

Province	No. of enterprises	No. of employed population	Capital invested (million lei)	Value of production (million lei)
The Old Kingdom	1114	63 326	1 406	6 190
Transylvania	1024	52 211	811	3 152
Basarabia	262	5 244	184	442
Banat	137	29 328	237	1 293
Bucovina	210	7 248	198	633
Total	2747	157 423	2 837	11 711

Source: Romanian Statistical Yearbook, 1922.

The differences in the development of large industry in the historical provinces of Romania in 1930

Table 2

Province	No. of enterprises	No. of employed population	Capital invested (million lei)	Production output (million lei)
The Old Kingdom	1364	76 099	21 479	24 062
Basarabia	211	2723	859	890
Transylvania	1349	58 526	11 596	13 368
Banat	391	24 487	4509	6487
Bucovina	331	12 392	2146	3544
Total	3646	169 172	39 328	46 794

Source: Romanian Statistical Yearbook, 1931–1932.

A more detailed radiography of the 1930 is made in table 3, where the two cultural-historical macro-regions are split into smaller territorial units. After comparing the ratio of various indices, we found rather surprising discrepancies among the levels of development, mentioning here that these indices express the level of industrial development, meaning that the sectors of agriculture and services were completely taken out of discussion. Therefore, we highlight the relatively good position of Moldova as compared to the present situation. Evidently, in this category we can also include other two small provinces, Dobrogea and Bucovina, which insignificantly contributed to the industrial production, but disposing of a small number of population; other three provinces included here are Moldova, Transylvania and Crişana–Maramureş, all of them registering values of industrial production under the values of the total population, though the differences between those two indices, being more reduced in the case of the two last mentioned provinces, which proves again a certain dissimilarity. The pole of underdevelopment during the interwar period was concentrated around Oltenia, which was numbering about 10% of Romania's population, but succeeding to output only about 1,8% out of the value of industrial production, as compared to Bucovina's contribution, which had only about half of Oltenia's

population. At the other end we find Muntenia Province, especially due to the contribution of the Bucharest capital city and Prahova Region, and Banat Province, both with higher values of industrial production as compared to the number of population. There is a special difference especially in the case of Banat Province, which, having about 6,5% out of the total Romanian population, has registered about 15% of the total industrial production of Romania, fact that supports/ strengthens the idea that, during the interwar period, Banat Province represented the most developed industrial region of Romania. Certainly we cannot underestimate the contribution of of the economic sector of services, which was higher in the urbanised regions, as well as the fact that the level of industrial development represents a useful index for measuring the interregional development differences, especially for the interwar period.

The differences of development of large industry in the historical provinces of Romania, in 1930, as compared to the number of population

Table 3

Province	Population (% out of the total number)	Number of industrial enterprises	Number of employed population (%)	Production value (%)
Oltenia	10,64	6,84	4,24	1,83
Muntenia	29,03	23,63	30,82	38,49
Dobrogea	3,02	2,77	1,99	0,94
Moldova	15,81	13,87	11,62	12,14
Bucovina	3,92	2,91	2,79	1,57
Transylvania	22,39	29,23	27,42	21,52
Banat	6,55	9,67	10,44	14,75
Crişana and Maramureş	9,68	11,08	10,68	8,76
Romania	100	100	100	100

Source: Gh. Popescu, 1994, with modifications

4. REGIONAL DISPARITIES DURING SOCIALISM

The period between 1945 and 1989 represents the socialist evolution phase of economy and society in Romania. We consider important that, during this period, there were established the first coherent policies for reducing the development disparities between regions, policies that were implemented especially through programmes of economic investment. We have to notice the relatively significant dynamics of investments in Oltenia, which was the less developed region during the interwar period in which the investments related to the development of the energetic sector, such as: activities of exploitation of coal, oil and natural gases, thermal plants with the largest capacities of production in Romania, as well as the largest hydroelectric power plants at The Iron Gates - Porțile de Fier were concerned; as well as the relatively high number of investments for the development of several industrial branches concentrated around Craiova, Râmnicu Vâlcea, Drobeta Turnu Severin and Slatina. In all the other Romanian regions, the investments were concentrated in

the already developed counties, to which, during de 70s and 80s, were added some other less developed ones, formed around some growth centres reorganized as such by the territorial-administrative restructuring of 1968. Such growth centres were: Zalău – Sălaj county, Bistrița – Bistrița Năsăud county, Giurgiu – Giurgiu county, Miercurea Ciuc – Harghita county, etc.

Certainly, an essential question arises, that is: which was the result of the development policy promoted during the socialist regime and which were its regional effects? A possible answer is suggested by table 4 and figure 1, which display a classification of the Romanian counties according to their level of socio-economic development and according to the level of management of their socio-economic potential in 1985. Both indices were calculated by Gh. Popescu by using 26 respectively 27 indices combined in the method of factorial analysis. These calculi prove to be a good analysis and comparison base for the post-totalitarian period, although the indices used were influenced by the size of the counties, thus being expressed in absolute numbers. Based on these calculi there resulted two county hierarchies. One is based on the socio-economic potential, while the other formed according to the level of socio-economic development. After comparing them, and according to the new economic theories, based on the manner of managing the endogenous socio-economic potential, it resulted a very interesting grouping of the counties. This comparison reflects significant regional disparities regarding the management of the socio-economic potential, the highest value being characteristic to the Transylvanian counties and to the Western counties included in the provinces of Banat and Crişana , out of the first 15 counties, only four being situated outside these regions, and out of the 14 counties, placed at the lower half of the hierarchy, only Maramureş was not included in the Old Kingdom. Unfortunately, there are no empirical studies to provide satisfactory explanations for this situation, but, there can be certainly asserted that these differences become visible not only under the influence of several economic factors but also cultural ones. In which regards the level of socio-economic development, we have to mention the favourable position of Bucharest Municipality, which surpasses the Western counties of the Banat region, which used to be the most developed region of Romania during the first part of the interwar period, or, at least, this region's level of development was almost the same as the development level of the capital city. The explanation for this resides in the accentuation of accumulating resources and industrial and services function in Bucharest, not only as a result of territorial policy, but also due to the advantages of the agglomeration created here, advantages that generated a twisted development process. The regression of Banat Region probably started at the same time the First World War ended, when its main urban centres, Timişoara and Arad, lost an important part of their hinterland, which was then split/divided among Romania, Hungary and Yugoslavia. This process became more visible after 1954, when the process of emigration of German and Jewish population accentuated along with the socialist period's policy of investments. Much more, we can add here the crisis that affected the oldest industrial region of Romania, Reşiţa city, which, unlike other new centres having iron and steel industries, such as Galați or Târgovişte cities, did not manage to restructure. Another factor to be mentioned is the relatively small volume of investments during the communist regime. For example, Arad county benefited from only 1,6% of the total investments, less than any other county in Oltenia, therefore, even in the hierarchy established for year 1985, only Timiş county it is placed on a top rank (the third position), Arad and Caraş-Severin being located about the middle of the hierarchy (the 15th respectively the16th places). Another important fact is the relatively favourable positioning of the counties with a high level of urbanisation and

industrialisation, counties that were polarized by urban centres with regional influence, such as: Braşov, which maintained its leader position, although its territorial structure in 1985 was substantially different from the one in the interwar period, when it had a much more reduced size, comprising Cluj, Prahova, Hunedoara and Sibiu cities. We notice the remarkable boost given to several counties like: Constanța, still not enough industrially developed during the interwar period, but which valorised a geographical territorial position and the favourable economic context (i.e. the increase in the number of exports during the communist period, the development of harbour infrastructure, as well as the impressive volume of investments); Argeş, with the same level of underdevelopment during the interwar period, but benefiting of a series of investments in several innovative branches of great impact such as the construction of automobiles: „Dacia" at Piteşti city, „Aro" at Câmpulung city) and benefiting from the closeness to the agglomeration economy of the capital city; Gorj, with an almost inexistent industrial production during the interwar period, but with a strong economic dynamics after 1945, as a result of changing the economic profile (i.e. mining activities, energetic sector). At the same time, another significant mutation took place, causing the counties in Oltenia region moved up from the last places in the hierarchy, due to the favourable investments policy applied during the socialist period. As a consequence, at the level of the historical provinces, Moldova became the pole of underdevelopment, process that was amplified not only by the regional policy before 1989, but also by the difficulties created by an explosive demographical evolution. Certainly, there are still significant discrepancies within Moldova itself, its Western part being rich, industrialized and urbanized, and overall more developed that its Eastern part, except for Iași County.

The classification of the socio-economic potential and level of development, at a county level, in 1985

Table 4

County rank	Socio-economic potential	Level of socio-economic development	The management level of the socio-economic potential	Difference of ranks
1	Mun. Bucureşti	Mun. Bucureşti	Covasna	29
2	Prahova	Braşov	Sălaj	12
3	Cluj	Timiş	Sibiu	12
4	Braşov	Cluj	Caraş-Severin	11
5	Constanța	Prahova	Harghita	11
6	Timiş	Hunedoara	Brăila	9
7	Iași	Sibiu	Satu Mare	8
8	Galați	Constanța	Arad	6
9	Argeş	Argeş	Alba	5
10	Bacău	Galați	Hunedoara	5
11	Hunedoara	Iași	Gorj	4
12	Dolj	Covasna	Mehedinți	4
13	Bihor	Mureş	Vrancea	4
14	Mureş	Bihor	Timiş	3
15	Suceava	Caraş-Severin	Braşov	2
16	Maramureş	Arad	Tulcea	2

County rank	Socio-economic potential	Level of socio-economic development	The management level of the socio-economic potential	Difference of ranks
17	Dâmbovița	Gorj	Ialomița	1
18	Neamț	Brăila	Mureș	1
19	Sibiu	Bacău	Argeș	0
20	Olt	Alba	Vâlcea	0
21	Gorj	Harghita	Mun. București	0
22	Arad	Maramureș	Bihor	-1
23	Buzău	Satu Mare	Bistrița-Năsăud	-1
24	Vâlcea	Vâlcea	Cluj	-1
25	Alba	Dolj	Galați	-2
26	Caraș-Severin	Dâmbovița	Constanța	-3
27	Brăila	Neamț	Călărași	-3
28	Teleorman	Sălaj	Giurgiu	-3
29	Vaslui	Vrancea	Prahova	-3
30	Botoșani	Mehedinți	Iași	-4
31	Satu Mare	Buzău	Vaslui	-5
32	Harghita	Suceava	Maramureș	-6
33	Vrancea	Olt	Botoșani	-8
34	Mehedinți	Vaslui	Buzău	-8
35	Bistrița-Năsăud	Tulcea	Bacău	-9
36	Călărași	Bistrița-Năsăud	Dâmbovița	-9
37	Tulcea	Ialomița	Neamț	-9
38	Giurgiu	Botoșani	Teleorman	-12
39	Ialomița	Călărași	Dolj	-13
40	Sălaj	Teleorman	Olt	-13
41	Covasna	Giurgiu	Suceava	-17

Sursa: Gh. Popescu, 1994, with modifications.

5. CONCLUSIONS

In conclusion, we can assert that the development policy of the last 50 years definitely re-established equilibrium in the regional hierarchy, without bringing out spectacular turn-over in the hierarchy of regions. Therefore, the territorial structure is presently dominated by the definite location of Bucharest capital city, naturally representing the largest agglomeration economy in Romania, and by the presence of several industrial regions that imposed territorially even from the first phases of the industrialisation process, such as: the Banat region, which includes firstly Timiş county, Arad and Caraş-Severin counties being currently in a process of comparative regression, Hunedoara–Sibiu–Braşov–Valea Prahovei axis, mentioning that Hunedoara and Braşov counties have significant difficulties in restructuring industry, the region of the Lower Danube (Galați–Brăila counties) and the formation Bacău–Neamț counties. During the period after the Second World War, there have been gradually added the axis of Dâmbovița–Argeş counties, as well as Constanța County. On the other hand, just like 100 years ago, we find Oltenia region, yet generally leaving Moldavia somehow behind, except for its Western part, Moldavia's Eastern and Northern part, the Northern area of Dobrogea, Tulcea County, and some areas in Transylvania, Sălaj and Bistrița-Năsăud counties. As expected, it is difficult to realize how much the amplitude of the interregional discrepancies has decreased.

REFERENCES

1. Amin, A. (1999), *An Institutional Perspective on Regional Economic Development*, *International Journal of Urban and Regional Research*, 23, 2, 365–378.
2. Bathelt, H., Glückler, J. (2000), *Netzwerke*, Lernen und evolutionäre Regionalentwicklung, *Zeitschrift für Wirtschaftsgeographie*, 3–4, 167–182.
3. Benedek, J. (2004) *Amenajarea teritoriului şi dezvoltarea regională*, Editura Presa Universitară Clujeană, Cluj-Napoca.
4. Ministerul Industriei şi Comerţului, Direcţiunea Generală a Statisticei (1922), *Anuarul Statistic al României*, Bucureşti.
5. Ministerul Muncii, Sănătăţii şi Ocrotirilor Sociale, Institutul de Statistică Generală a Statului (1932), *Anuarul Statistic al României, 1931–32*, Bucureşti.
6. Nemes Nagy, József (1997), Régiók, regionalizmus, *Educatio*, 3. sz., 407-423.
7. Popescu, Claudia (2000), *Industria României în secolul XX. Analiză geografică*, Edit. Oscar Print, Bucureşti.
8. Popescu, Gh. (1994): Dezvoltarea economică în profil teritorial a României 1900–1985, , Edit. Sincron, Cluj-Napoca.
9. *xxx Recensământul general al populaţiei României din 29 decembrie 1930, vol. II, III, X*, Bucureşti, 1938.

THE 2008 WORLD ECONOMIC CRISIS. ITS EFFECT ON TURDA-CÂMPIA TURZII INDUSTRIAL AREA

CAMELIA-MARIA KANTOR (CHINDRIŞ)[1]

ABSTRACT. – The 2008 World Economic Crisis. Its Effect on Turda-Câmpia Turzii Industrial Area. Few areas in Romania have prospered in recent years as much as Cluj County. Enterprises inherited from the communist period that seemed obsolete 18 years ago, appear to have been reborn out of their own ashes, recording outstanding economic growth. If until recently the smokestacks of Turda Câmpia -Turzii area factories seemed to have fallen asleep, the vast majority of the local population taking the path of foreign countries in search of jobs that could no longer be offered by a decadent industry, recent years made us witnesses of an accelerated revigoration of the industry in the lower basin of the river Aries. But, unfortunately, with the cold winds of autumn, the world economy was suddenly hit by an imminent recession, the industrial sectors being the first areas affected by the crisis. The study deals with the issue of the current economic crisis and its impact on the lower basin of the Aries River, referring especially to the situation before and after the crisis, with an in-depth analysis of the industrial development and equity. It also presents thinking economy models that could lead this industrial area out of an imminent deadlock.

Keywords*: economy, industry, crisis, recession, capitalism, Turda, Câmpia Turzii, Romania.*

1. INTRODUCTION

For a better understanding of the current world situation, an explanation of the phenomenon called "capitalism" would be necessary, as well as of the capitalist models that compete in explaining the causes that led to this crisis, followed by an in-debt analysis of the directions that should be followed to overcome it.

In its pure form, capitalism is a social system, based on the recognition of inalienable rights through which people are free to produce and exchange goods, preconditions of an economic system in which properties are privately owned, and operated to obtain a profit, and where investment, distribution, income, production and the price of goods and services are determined by a market economy. Our era was predominantly influenced by the neoclassical economic thinking model which encouraged an extensive coordination of the market economy and an extremely low involvement or even neutrality from the government in order to maintain property rights against favoring a particular political class or system, this model depending exclusively on private financial capital. In Milton Friedman's opinion, the most fervent supporter of the current neoclassical model, as well as of the majority of contemporary economists' opinion, market economies are stable if they are allowed to act freely, out of own inertia, times of economic instability and depression occurring only as a result of the intervention of the state. These economists support risk, organization of

[1] *"Babeş-Bolyai" University, Faculty of Geography, 400006 Cluj-Napoca, Romania*
"Claflin" University, 29115 Orangeburg, SC, USA, e-mail: ckantor@claflin.edu

production and consumption growth as leaders in a strong capitalist economy. This approach was proved prolific for contemporary economy until recently, when the recent fall of U.S. stock market which has led to a global economic crisis similar to the Great Depression, has revealed the need for new approaches, the role of governments and their involvement in the free market no longer being an option but a necessity. Thus, our attention was directed to another current of thought, a model considered inapplicable and obsolete in the modern market economy: the Keynesian theory.

In 1937 the British economist John Maynard Keynes issued a few theories on capitalism in his "General Theory of Employment, Interest and Money". In this work Keynes considered that the capitalist notion of "laissez-faire" without any state intervention lead to deflation, increasing the demand for liquidity and reducing the demand for goods and interest rates offered by banks. Keynes and his supporters' version sustain "pump-priming" (in deficit spending) in case of recession, especially severe recessions, which would create a multiplying effect (when an economy is faced with high unemployment, an increase of government involvement in the purchase of stock creates conditions for business, increases revenues by encouraging consumption, leading to GDP growth, and implicitly encourages the opening of new businesses and creation of new jobs). Tax reductions, an increase of government loans and encouragement of consumption should also be used as successful Keynesian methods in getting out of the deadlock of a recession. It seems that this philosophy has already been taken into account by most governments worldwide, representing the first steps that were taken at the beginning of the current global economic crisis.

2. BRIEF CONSIDERATION OF THE WORLD CRISIS. STUDY CASE: TURDA CÂMPIA-TURZII AREA

The financial crisis in the US followed by the downfall of the world markets, proved, once again, that the power cannot be held by one hand, the U.S. financial supremacy and other countries' dependence on it being the Achilles' heel for the world's economy. Rise in unemployment, liquidity crisis, and high decrease in the need for goods, companies and banks begging for bailouts, all represent the overall picture of the world approaching the end of 2008.

Romania seemed for a while to resist the current by maintaining its high GDP predictions for the year 2008, while neighboring countries such as Hungary and Ukraine were asking for help, accepting already bailouts from the International Monetary Fund. However, despite its high economic growth for 2008 (8.7%), Romania could not escape the crisis. Also, despite growth forecasts of continuing economic growth, Romania is already experiencing the reversal of fortune (The Washington Post Foreign Service, Nov. 5, 2008). The plunging in value of the Romanian currency, leu, followed by jobless high rates and a slowdown in exports added Romania to the rest of the East- European countries facing an imminent recession. Despite the fact that the Romanian officials still refuse to accept the situation, the recession is very close and needs to be acknowledged. Romania's better situation compared to other country is just a surface balloon that is going to explode sooner or later. With emigrants expected to return home from Western European countries already suffering from the crisis, with an economy highly based on foreign investments and a current-account deficit due to more money coming from the outside than going out, with a low foreign currency credit rate Romania is heading the inevitable.

As previously presented, there are two approaches that could be taken into consideration in addressing the current situation: the neoclassical and the Keynesian models. However, none of these ways of thinking would offer clear solutions for Romania to get out of the impasse. As long as the administration in Romania does not honestly believe in a market economy, continues to consider the state as a source for obtaining and distributing wealth (resources), as long as the old position of command and control of the economy from the "center" is being maintained, one cannot say that Romania has a true and sustainable democracy and market economy. The fact that China, with a legacy similar to Romania in terms of political and social thinking has developed on the basis that a viable market economy cannot exist without true democracy and vice versa, China should be considered as a model to follow and apply in Romania.

The Chinese model applied by Deng Xiaoping helped the Chinese local leaders to start from the bottom up, opposed to Gorbachev's perestroika model by which all the major reforms were designed and made by the president and politicians. It seems that this mechanism has been a real success in China, followed by a spectacular proof of evolution. As applied in Romania, in industrial cities like Turda and Campia Turzii, our area of study, this model would be very efficient, but hard to apply under the present conditions, as the Romanian managers of the industrial establishments cannot decide and evolve independently of the decisions taken at the center, their decisions being still a tribute to political maneuvers. In the case of the Inferior Aries Basin area industry, currently based on international export and foreign investments, the key to success in China and in most economies of developing countries does not look very promising considering the period of crisis and the fact that the developed countries already started reducing consumption and therefore the demand for industrial products.

3. TURDA AND CÂMPIA TURZII BEFORE AND AFTER THE CRISIS

Turda and CâmpiaTurzii are part of the North-Western Development Region, Microregion 1 out of four administrative divisions in Romania, both cities being situated in the Inferior Corridor of the Aries River. The display of rich necessary resources for the development of certain industrial branches, such as a favorable relief of the corridor, water presence, the existence of salt in place, or other resources in the immediate neighborhood (methane gas, limestone, gypsum, quartzite sand, old iron, wood etc.), all added to a well outlined geodemographical potential and a developing communication infrastructure, had as a result the development of Turda- Câmpia Turzii industrial grouping, mostly specialized in the Building Materials Industry and Metallurgic Industry. This industrial area has been going through various changes, ups and downs, from high profits to almost nothing, but it always survived challenges and found ways of sorting out of impasses.

The present situation (fall 2008) in Turda and Campia Turzii seems to cause concern again, in terms of possible mass lay-offs and closing industries. If only few months ago the area was registering economic growth, high profits, and million worth investments were announced in the industrial infrastructure, today’s uncertainty on the market, lay-offs announcements and drastically reduced orders for 2009 seem to freeze the economic plans investments previously planned.

Let’s take a look at the economic situation in the Turda-Campia Turzii area before the fall 2008 economic crisis:

1. Capital Europe (UK investment fund) and Invest4See (real estate projects developer based in Timisoara) announces the construction of a logistics industrial park built in Campia Turzii, near the metallurgical plant complex MECHEL, on an area of 44 hectares, the total value of the investment being estimated as of more than 100 million Euros. The work is expected to be completed by 2011, generating about 6000 jobs for the local population. The main investor (Capital Europe), together with the Romanian partners will invest 20-30% of the total price, the remaining amount being obtained through a mortgage loan. It is estimated that the first buildings will be put into service in May 2009. The industrial park will provide interested companies spaces between 2800 and 34,000 square meters for storage and parking, offices being rented separately. German company Reif Construct LLC will be responsible for the park arrangement, the first businesses interested in renting being machines constructors, companies producing electrical parts or focused on packaging cosmetics and chemicals;

2. September 2008, the German auto group Kolbenschmidt Pierburg AG which owns more than 30 factories in countries such as Germany, England, France, Italy, Spain, Turkey, Canada, USA, Japan, India, China and Brazil changes its location investment in Romania from the industrial park Arc Park Dej, previously announced as possible location by the Germans to the industrial park Reif of Campia Turzii. This will include 4 units of production that will provide jobs for about 700 employees to manufacture components for Porsche, Jaguar and Volvo;

3. Rigips Romania, part of French group Saint-Gobain, already owning a plaster factory and one of gypsum cardboard in Turda, and a unit of gypsum rocks breaking and processing at Cheia, announces its intention to invest over 70 million Euros in a new plant producing panels of gypsum-cardboard at Tureni, twice as big as the one they own in Turda. The company aims to use synthetic gypsum resulting from the process of desulphurization of gas emitted by burning generators groups in Tureni. With the new factory, Rigips Romania will serve both the needs of domestic market of construction materials, as well as those of similar markets in surrounding countries. At the group level, Saint-Gobain has over 1,200 employees in Romania, having developed in Romania a total investment of 200 million Euros up to date;

4. September 2008, the largest cement factory in Europe is to be build near Turda, close to Mihai Viteazu, a nearby village. In order to speed up the bureaucratic process, the actual investment amounting to around 450 million Euros, the County Council issued an emergency Certificate of Urban Planning for the location;

5. Holcim Romania, one of the most important Romanian suppliers of cement and aggregates (stone, sand and gravel) as well as concrete and asphalt, including services for Transylvania, is a subsidiary of Swiss group Holcim, one of the main producers of cement, concrete and aggregates (sand and gravel) worldwide, alongside companies like Lafarge (France) and Heidelberg Cement (Germany), all present on the Romanian market. The group is active in over 70 countries on all continents, owns three cement factories in Turda, Campulung and Alesd, with a total of approximately 1,400 employees. The company sustained investments of 135 million Euros in 2008 to modernize the production units, construction of new stations and buying new trucks, intending to expand its production capacity in Romania with 1.5 million tones in 2008 and 600,000 tones in 2009.

The net profit of Holcim Romania has decreased in 2007 to 34.5%, or 114.5 million lei, but the turnover climbed by 28% to 990 million lei. Company revenues have advanced 18% to 1.03 billion lei, while expenditures rose by 34% to 895 million lei;

6. The steel plant MECHEL Campia Turzii, controlled in proportion of 86.56% by the Russian company MECHEL International Holdings, recorded a business growth of 65.6%, from 369.8 million lei in January-September 2007 to 612.4 million lei in 2008. Net profit was 97.9 million lei, from 2.4 million losses in the same period last year;

7. The Argillon Company Romania, part of the group Argillon GmbH of Germany, manufacturer of porcelain insulators for medium and high voltage, announces conducting a three years 3 million Euros worth investment program to modernize their plant in Turda. The company has already invested in the past three years about 10 million Euros in developing the production capacity of the factory in Turda, producing approximately 6,000 insulators per month.

The Argillon factory in Turda is of great importance for the company due to the fact that other German factories cannot produce certain types of insulators because of lack of equipment. The Germans have acquired the Turda factory in 2004, investing approximately 300,000 Euros in the same year in production capacities. Bought in 2008 by the international Lapp Insulator Group, which occupies third place worldwide in the field, Argillon Romania expected total sales of 14 million for the same year.

From the presentation of the economic situation in the Inferior Aries Basin area previously to the outbreak of the crisis, all the facts seem to lead to one conclusion: the links with the central area and north-west of the country, the access to the railway industry and the perspective of finalizing the A3 motorway which could provide different ways of access (access to high speed on the highway or high-tonnage through the railways industry) seem to have convinced investors of the opportunities offered by the cities of Turda and Campia Turzii, as well as adjacent areas, so that a large number of companies would take into consideration extending their activities with industrial profile in the region.

However, a foreshadowing of future development of the studied area is not so optimistic. The economic crisis has already started to act contrary to expectations and the upswing in economic growth. The strong negative impact of the American stock market fall on the developed markets of Western Europe is already influencing the Romanian market. Decreasing demand on the international market for construction materials and imminent fall of the automobile industry cannot over Romanian industry which relies on exports and external market in high proportion, if not entirely in some sectors. It is natural therefore, that the first sectors to be affected include the manufacture of auto parts, auto parts and accessories, machinery construction, construction materials, the steel mills, and other areas required to reduce their production due to the lack of orders, the euro-US dollars rate and tight credit conditions, lack of liquidity and market instability.

The first information about lay-offs came from Sticla Turda, where the company dismissed 460 people during 2008. In December, Turdeana announces 140 people being lay-off, not a surprising event seen that Turdeana is producing parts and accessories for the automotive industry, supplier of class B + for Renault Dacia Pitesti who had already announced closing sections and temporarily stopping the work. AJOFM Cluj received redundancy notices to 700 employees from three companies in the Turda area: Sticla Turda, CESOM Turda - producer of footwear and Arieşul Turda - the company in the field of tourism.

At MECHEL Campia Turzii, despite the revenue growth of this company, 193 people, workers and personnel TESA, from a total of 2700 employees, were home as unemployed for technical reasons due to the international financial crisis. The company Cercon Ariesul Campia Turzii stopped the production activity for bricks and tiles. Work will only start in February of next year, when only a modernized line will be put into

operation, providing work for only up to 20 employees. Holcim, Rigips Argillon didn't give any signs so far, however the evolution of the situation and the economic crisis of these sectors in the world can be a cause for concern. The fact that these companies are working for export will eventually lead to a reduction in orders followed by lay-offs. Less affected companies are those that have already concluded contracts for next year production, hoping the crisis would be dimmed by the end of 2009.

Deep economic crises have profound effects on firms. Theory and empirical evidence suggest, however, that the effects are uneven. Firms have heterogeneous characteristics, in terms of history, size, ownership, sales orientation, access to technology, and financial arrangements. Their owners too are diverse, in terms of objective functions and entrepreneurial capacities. Moreover, crises are invariably uneven in their industrial and sector impacts, and sometimes regional concentration, meaning that some of the industrial plants of the analyzed area might overpass successfully the crisis, while others might collapse.

There is large literature on the causes and consequences of crisis. We have witnessed already the beginning of this crisis: lay-offs, sharp depreciation of the Romanian lei, financial distress. The worst picture would be the loss of macroeconomic control and high inflation followed by a political crisis given the current political alliances and social tension. Instead of waiting for the inevitable, there is a high need to adopt positions and take intervention measures. The Chinese model is not, unfortunately, applicable in Romania, at least not easily applicable, because the Romanian managers still do not have the power to act as leaders, waiting that most of the problems to be resolved from the top down. The British method, followed by the U.S. and other European governments, stating a need for the infusion of state capital in exchange for equity stakes seem too much of nationalization, word still fresh in the memory of the Romanians as a result of the communist heritage. And anyway, even if this option should be taken into consideration as one of the most effective right now, in order for the state to infuse capital in private corporations, the state should have the capital. It would be easier to choose this option if Romania would be a rich country, but the low GDP requires even better solutions. The most damaging would be the one eliminated buy the U.S. government in time, before making an irretrievable mistake, namely the purchase of debts, mortgages and guarantees by the state to save some companies that are in loss in order to reduce or halt layoffs. Amid the crisis already occurred, this action would only increase high-level corruption, the price being paid again by taxpayers, without any long-term positive result. That would only lead to favoritism, as the state would not have the means to save every company, instead of urging managers to find sustainable solutions.

As a positive factor, since exchange rates are significantly depreciating, while the industry is based mainly on tradable goods, depreciation is also expected to boost competitiveness. However, this isn't a long-term solution as depreciation also brings price uncertainty, the market not being stable enough to encourage major investments.

A factor that might negatively impact the industries would be the financial sector represented by the banks. As increased interest rates are a characteristic of economic crises, the banks are already restricting lending policies, high leveraged companies, with high proportion of short debt being also exposed to collapse. Companies like Holcim, Mechel and Argillon, tightly connected to international markets are more likely to be less affected, unless they are heavily indebted or their headquarters have been also affected by the crisis. Effects might be more severe for domestic owned small industries, as banks are less open to credit insecurity, crediting only companies that can prove their solvency. However, small firms can be more flexible, which can constitute a good advantage, keeping them less

connected to the international falling market. There is no unique solution in sorting out of the crisis as there are too many factors that can concur to collapsing or saving firms. For the moment there are no clear and predictable rules of the game as long as we cannot expect foreign investors to come and boost the economy when they are facing the same problems, as well as there would be no time for economic nationalism if anybody would be interested in buying assets cheaper than before, view the lack of liquidity, as we still need an inviting investment climate. It is also time to pay attention to the wake of authoritarian regimes. The economy needs help, but the price to be paid needs to be well calculated.

Another perspective could lead us to a well known debate on regional development. Currently, disparities between the Romanian regions should be considered in favor of our studied area. Heavy transitions from a planned to a market economy usually lead to regional disparities, as free markets will enhance different levels of prosperity and development. (Robert Barro and Xavier Sala-i-Martin). A region within nation, the North-West Developing Region includes our area of study, its lately development being of great interest in the past years. A regional economical approach, as opposed to political involvement might worsen regional disparities within Romania, but could be a good approach in dealing with the crisis. Local institutions could establish an individual pattern, in favor of a selective regional growth policy. By gaining more regional authority, the North-West Developing Region could use the agglomeration of local resources such as foreign investment, capital, infrastructure, highly qualified human resource and labor and get the return on investments locally instead of spreading profits to other less developed regions. This would be, of course, an extreme situation, increasing regional inequality and enlarging the gap between the different regions, but it would help our analyzed territory survive and, maybe even become wealthier.

4. CONCLUSIONS

Whether we want political institutions' involvement in local development policies, or we decide to continue with further privatization and marketing of urban areas, the long term implications of either way are unclear in the given situation. What is clear though is that, as well as in China, the country taken as a model, in Romania there is no yet established discipline of investment and no fully perfected free market techniques to replace the old economic techniques of planning and budgeting.

There is a need of self adjusting the mechanism against the crisis through action. And this movement cannot be performed by a "socialist" market economy, but within a competition oriented economy, direct planning being replaced by indicator planning as long as goods and services are sensitive to demand. Tax cuts should be offered to industries in order to help them survive. It is not enough to know what you do not want, in our case an extreme crisis and its implications, as long as you don't know what you want, meaning ways of sorting out of the crisis. As the word "crisis" is in on every politician's mouth, but still no sustainable solutions are provided, each company's survival will depend on personal standing and intelligence to find solutions to individual situations.

Also, refusing to acknowledge the existence of the problem doesn't cure it. There is not need to act like Romania is a stable island in the middle of a stormy ocean.

In fact, the best solution at hand for the moment to overcome this moment of crisis would be the awareness of managers and employees of the fact that optimizing costs through reducing spending, maintaining social stability, green investing and calling on

facilities provided by state and European funds could be the best solutions in order to exit from the impasse. The industry in the Turda-Câmpia-Turzii area has already been through tough situations. All we can hope is that it will keep its head up again this time.

REFERENCES

1. Hein, K., Miller, S. (2008), *Good to Go Despite the economic crisis, analysts say private label, entertainment and mass merchandisers will grow*, Vol. 46 ; Part 5, "Across the Board", New York.
2. Julius, D. (2008), *G8 Summit and the international economic crisis*, Vol. 64, Part 6, pg. 16-17, "The World Today", Chatham House.
3. Keynes, John Maynard (1973), *The General Theory of Employment, Interest, and Money*, "McMillan", London.
4. Kotz, David (2008), *Contradictions of Economic Growth in the Neoliberal Era : Accumulation and Crisis in the Contemporary U .S . Economy*, Vol. 40, Part 2, pg. 174-188,"Review of Radical Political Economics".
5. Narjoko, Dionisius, Hill, Hal. (2007) *Winners and Losers during a Deep Economic Crisis: Firm - level Evidence from Indonesian Manufacturing*, Vol.21 Issue 4,p343-368 "Asian Economic Journal".
6. Nicolas Véron, Matthieu Autret and Alfred Galichon (2006), *Smoke & Mirrors, Inc.: Accounting for Capitalism*, "Ithaca", New York.
7. Pop, P. Gr. (2002), *Probleme ale industriei din Bazinul Inferior al Arieşului*, Studia UBB, Geographia, Anul XLVII, 1, Cluj-Napoca.
8. Pop, P. Gr. (2007), *Județele României. Județul Cluj*, Edit. Academiei Române, București.
9. Robert Barro, (1987) *The Determinants of Economic Growth*, Harvard University Press, Boston.
10. Robert, B, Martin S. (1991, 1995), *Convergence* and *Economic Growth*," *Journal of Political Economy*, McGraw-Hill.
11. Surd Vasile, Zotic Vasile (2003), *The Demographic Risk in The Aries Inferior Basin*, "Rural Space and Regional Development", Editura Studia UBB, p. 407 – 446, Cluj-Napoca.
12. Tian, Yu Cao (2005), *The Chinese Model of Modern Development*, "Routledge".
13. Thompson, Michael J. (2002), *China and Development: The Political Economy of Uneven Development: the Case of China. Wang Shaoguang and Hu Angang; The Transition of China's Urban Development, Jieming Zhu*, Vol. 32, Issue 4,**"**Review of Radical Political Economics", New York, Review Essay.
14. Wade, Robert (2008), *Financial Review Change*, Vol. 53 "New Left Review".
15. Zwass, Adam (1995), *From Failed Communism to Underdeveloped Capitalism: Transformation of Eastern Europe, the Post-Soviet Union, and China*; M.E. Sharpe.
16. Zhiyue, Bo (2002), *Chinese Provincial Leaders/Economic Performance and Political Mobility since 1949*; "M.E. Sharpe".

STUDIA UNIVERSITATIS BABEŞ-BOLYAI, GEOGRAPHIA, LIV, 2, 2009

THE GEOGRAPHICAL REALITIES DEFINED BY THE STATE OF DISPARITY. MODELS APPLIED TO SĂLAJ COUNTY (ROMANIA)

C. C. POP[1]

ABSTRACT. – The Geographical Realities Defined by the State of Disparity. Models Applied to Sălaj County (Romania). Located in North-Western Romania, at the junction between the Easterm and Western Carpathians, Sălaj County is known from ancient times as the Land of Sylvania or the Land of the Forests. The county stretches over 3850 square metres and its neighbours are the counties of Satu Mare, Maramureş in the North, Bihor in the West and South-West, and Cluj in the South and South-East. Sălaj County is a region with hills and valleys along the rivers Almaş, Agrij, Someş, Sălaj, Crasna and Barcău. The town of Zalău, situated on the river with the same name, in the centre of the county, is the county seat of Sălaj. The first historical records of Zalău date from year 1220, being one of the first towns in Transylvania, although there are traces of dwellings dating back to year 900. The other towns in the county are Jibou, Cehu Silvaniei and Şimleu Silvaniei. The county comprises 56 communes and 281 villages. In Sălaj County, there are the following human concentration areas according to the geographical organization, the charge and the requests of the European Union: forestry areas, tourism areas, vineyard zones, agricultural zones, transit axis etc. The Someş valley axis is ranked first in the North-East of Sălaj County; another group defined by Agrij and Almaş valleys, developed on a South-North direction, that can be interpreted as lower ranked, and polarizes the South-East of Sălaj County; the Crasna valley areas, that define the West and North-West part of Sălaj County; the central area of the county, defined by the geographical axis of Zalău valley that also concentrates the county seat; the areas given by the concentration along the Sălaj valley, polarizing the central and northern part of Sălaj; the South-West part of the county developed on the axis given by Barcău valley, defined by a high concentration of settlements.

Keywords*: disparity, models, human concentration, statistics, regions, geographical axis.*

1. INTRODUCTION

From a geographical point o view, the territory of Sălaj County is mainly the same with the boundary territory between the Western and Eastern Carpathians, tectonically highly fragmented and known as the Someş Platform. The landform units of the county are: Meseş Mountains (Măgura Priei Peak 997 m), Plopiş Mountains (Măgura Peak 915 m), also known as Şes Mountains, Copper Mountains, Măgura Şimleului (596 m), Măgura Chilioarei (420 m), Dealu Mare-Prisaca Range (664 m), Dumbrava Hill, the peak of Sălaj, the Peak of Prisnel (663 m), Purcăreț-Boiu Mare-Jugăstreni Basin, Şimişna-Gârbou Hills, Toglaciu and Sălaj Piedmont, the depressions of Zalău, Şimleu and Sălaj, the depressions of Guruslău and Almaş-Agrij, and the Someş Corridor. The variety of the natural resources is strictly related to the geographical and landform conditions. From an economical point of

[1] *"Babeş-Bolyai" University, Faculty of Geography, 400006 Cluj-Napoca-Romania, e-mail: ccpop@geografie.ubbcluj.ro*

view, the most important natural resources are the lignite deposits (Sărmăşag-Chieşd, Ip), the brown coal deposits (spread in the depression of Almaşu), oil (Lesmir and Şumal), gypsum (Jibou, Stana, Gălăşeni), limestones (Cuciulat, Prodăneşti), andesite (Moigrad), sand and gravel from the Someş river bed, and last but not least mineral waters (Bizuşa, Jibou etc.), thermal waters (Boghiş and Valcău de Jos) and therapeutic mud (Stoboru). The tourism potential of Sălaj County is a special one. As it benefits from diverse and various landform elements, harmoniously interwaved on the whole territory of the county, gifted with rich floral and faunal elements, spa objectives, numerous historical, art and architectural monuments, Sălaj County may be included among the convergent tourism areas of the land. The wooden churches of Baica, Ciumărna, Fildu de Sus, Letca, Păuşa, Poarta Sălajului and Vădurele are included on the list of historical monuments of national interest, and they are considered objectives with heritage value. From the natural tourism objectives we can mention the natural reservation of Grădina Zmeilor (The Garden of Dragons) from Gâlgău Almaşului, Poiana cu Narcise (Narcissi Glade) from Racâş, the reserve of Tusa, Calcarele din Rona (The Limestones of Rona) and Lunca cu Laleaua Pestriță (The Flood Plain with Patchy Tulip) of Cehu Silvaniei.

2. STATISTICAL DATA AND THE STATE OF DISPARITY

Located in North-Western Romania, at the junction between the Easterm and Western Carpathians, Sălaj County is known from ancient times as the Land of Sylvania or the Land of the Forests. The county stretches over 3850 square metres and its neighbours are the counties of Satu Mare, Maramureş in the North, Bihor in the West and South-West, and Cluj in the South and South-East. Sălaj County is a region with hills and valleys along the rivers Almaş, Agrij, Someş, Sălaj, Crasna and Barcău. The valleys are the areas used for agriculture as well as for living. The Plopiş and Meseş Mountains are situated in the South – West, being a continuation of the Western Carpathians. According to the last census, the population of the county was 258,109 inhabitants, of which 70,842 lived in Zalău. The other towns have a population of around 20,000 people each. Of the total population, 72% are Romanians, 24% Hungarians, 3% Roma, 0.6% Slovaks, and 0.4% other nationalities. At the end of 2005, the active population of Sălaj numbered 99.836 people. The number of employees at that time was 42,146 persons, and there were 6090 unemployed people. The rate of unemployment ranged between 5.9 to 6%. Most of the unemployed are the unskilled workers, the mechanics, the carpenters, the merchandisers, lathe operators, teemers, electromechanic workers. The average wage at the end of 2005 was around 200 Euros per month, whereas the minimum wage for the entire economy is around 100 Euros. The town of Zalău, situated on the river with the same name, in the centre of the county, is the seat of Sălaj. The first historical records of Zalău date from year 1220, being one of the first towns in Transylvania, although there are traces of dwellings dating back to year 900. The other towns in the county are Jibou, Cehu Silvaniei and Şimleu Silvaniei. The county comprises 56 communes and 281 villages. The railway network is well developed, especially in the northern part of the county. Jibou is an important railway junction, having links with the major cities of the country. The road network is 1128 km long, of which 227 are national and international roads while the rest are county roads. By train, Zalău is at 159 km from Cluj-Napoca, at 81 km from Baia Mare and at 124 km from Satu Mare. By car, Zalău is at 84 km from Cluj-Napoca (DN1/E81), at 90 km from Baia Mare (DN1H and DN1C) and at 90 km from Satu Mare (DN1F/E81 and DN19) and 130 km from Oradea (DN1H, DN1). For air

transport, Zalău uses the airports of Cluj-Napoca, Satu Mare, Baia Mare and Oradea. As a tourism region, the county represents an attraction because of its over 70 wooden churches, dating back between the 15th and 18th centuries. They indicate the religious dedication of the Romanians in the county and are included among the protected monuments by the state. Other tourist attractions are Boghiș and Bizușa spas, appreciated for their thermal waters of over 42 degrees Celsius and rich in bicarbonate sulphurs.

3. THE HUMAN CONCENTRATION IN SĂLAJ COUNTY AND THE STATE OF DISPARITY

The human concentrations from depressions, valleys or large communication lines indicate axis-type concentrations, and do not refer only to the population taken separately, but to the whole territory, in this case that of Sălaj County: independent variables (the Someș valley, the Meseș and Plopiș Mountains); the primary natural organisation (the geographical sites); capacities (the capacity to polarize the human concentrations); needs (the essential ones), supply (industry, high studies), and the linear point of view (at the European level, Central European regions); at the national level - administrative reorganization; at the regional level - central place but also isolation; at the local level - charging: viticulture, tourism, breeding, land but also capacity and opportunity etc); the development directions, according to the requests of our times and the European Union, concerning viticulture and breeding; spiritual (ancient and medieval resources), cultural and mental charges; legislation (not favored regions, political decisions etc.); the future organisation of the flows imposed by the highway that is being built together with the territorial reorientation that it would generate. In this paper we can talk about the concentration of the industry, of the human groups but also other realities, like the linear development characteristic to Sălaj County (fig. 1).

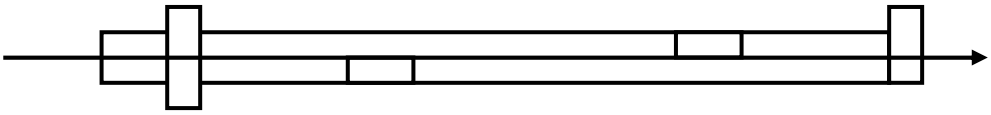


Fig.1. The linear development.

In Sălaj County, there are the following human concentration areas according to the geographical organisation, the charge and the requests of the European Union, distinguishing forestry areas, tourism areas, vineyard zones, agricultural zones, transit axis etc:

a) the Someș valley axis ranked first in the North-East of Sălaj County;

b) another group defined by Agrij and Almaș valleys, developed on a South-North direction, that can be interpreted as lower ranked, and polarizes the South-East of Sălaj County;

c) the Crasna valley areas, that define the West and North-West part of Sălaj County;

d) the central area of the county, defined by the geographical axis of Zalău valley that also concentrates the county seat;

e) the areas given by the concentration along the Sălaj valley, polarizing the central and northern part of Sălaj;

f) the South-West part of the county developed along the axis given by Barcău valley, defined by a high concentration of settlements.

4. THE URBAN STRUCTURE AND THE STATE OF DISPARITY

The geographical axis may be defined as being a force space-time line, *a line which allow space-temporally the diagnosis and prognosis of a geographic territory, a territory which may embody different geographic shaping and dimensions in accordance with the components capacity of polarisation* (Pop, 2003). The urban structure Jibou-Zalău-Şimleu Silvaniei-Cehu Silvaniei is a functional territorial axis, defined by the following component elements: an urban nucleus, structured onto four unequal segments which consists of the dominant urban localities, the defining ones (Jibou, Zalău, Şimleu Silvaniei and Cehu Silvaniei); the territory corresponding to the urban territory (periurban), which is linked with the urban from an economic, social and natural point of view; a rural functional nucleus, structured in accordance with the capacity of the rural geographic space of the axis, with the commune centres respectively; rural functional nuclei, the villages corresponding to the axis; the natural space, given by the vertical and plan-spaced extremities of the axis. Actually, the urban Jibou-Zalău-Şimleu Silvaniei-Cehu Silvaniei structure is an environment which historically belongs to the Land of Sylvania, and it is integrated administratively to the County of Sălaj; regionally to the North-West region; geographically to the Western Hills, and of the Silvano-Someşene Hills; topoclimatically (acording to Vintilă Mihăilescu), to the Sălaj type (the area of Jibou, Zalău, Şimleu Silvaniei), and Satu Mare type (the Cehu Silvaniei zone); periglacially (Ichim, 1980), to the transitory domain between the discontinuous permafrost and the mountain permafrost (the area of Jibou, Zalău, Şimleu Silvaniei), and to the discontinuous permafrost (the Cehu Silvaniei zone); from the point of view of the zone (from the point of view of the landforms), to the Someş-Guruslău, the Sălaj Hills Depression, the Zalău Depression, the Şimleu Depression, the Camăr Hills and the Sălaj Corridor; hydrologically, to the Tisa Basin; economically, on the national level, to the poor spaces; from the point of view of the forests (of the frequency of the forests), between the values of 20 and 30 %; according to the location of the agricultural production, to the zone of breeding animals for milk and for potato crops (Jibou area), to the zone of vines and breeding animals for milk (Zalău area), to the zone of fruit growing and of the vines (Şimleu Silvaniei area) and to the zone of breeding animals for meat and for cereal crops (Cehu Silvaniei area); from the urban point of view, to the towns and middle-sized cities; from the point of view of human landscapes (Giurcăneanu, 1973), to the cereal landscapes from the low forest zone (the Someş Plateau); from a tourism point of view, to the areas with a medium-large potential, but a low level of actualization, which consequently requires further study, analysis and mapping; according to the functional zones of the North-West region, to the critical zones (Zalău and Şimleu Silvaniei) and to the disadvantaged zones (Jibou and Cehu Silvaniei). In conclusion, the axis type geographical systems are the beneficiares of some memories where, depending on the above characteristics, a series of essential parameters of different states, in their most efficient form accumulate so that they enrich the statuses having in view the lasting of the systems (the perfection of these statuses).

The axis as a whole, but especially the axis with its main components may be read from the point of view of integration (but also of analysis), under the following cognitive hypostasis: *union*, of several sub-systems in order to form the axis for common interests and purposes, from an economic, social and natural point of view. We return the fact that even the formation of the major systems and sub-systems takes place through the union process too. Another hypostasis are the *globalisation*, meaning that the major components

are globalised, they are compressing parts of the axis, in such a way that the sub-components are integrated within the statuses superiority organised up to the level of ultrastructures; *inclusion*, considering that any element of the axis belongs to the four main components, in such a way that the elements which give the major components their structure belong to the subsystems too; *fusion*, understood in the case of the axis by the unification of the forms (subsystems), in the background, so that the axis becomes a unique system which functions according to the new status; *superposition*, which implies the explanation of the dichotomy, a moment in which the axis as a whole coincides with the subcomponents and reversibly, the subcomponents coincide with the axis , meaning we may speak about the axis and see if through the components or speak about components at the level of the axis; *belonging (non-belonging)*, meaning the components are constitutive subsystems of the axis system, be them considered punctually or arreally, yet we retain that some of the sub-components of the four major components may not belong to the axis area, the some way they way belong totally or just to be opined to the axis.

5. THE PART PLAYED BY ZALĂU TOWN IN THE URBAN STRUCTURE AND IN THE SUSTAINABLE DEVELOPMENT OF SĂLAJ COUNTY

By reporting the city of Zalău to the requirements of sustainable development, from a natural and especially from a socio-economic point of view, we may outline a series of distinctive peculiarities, such as: at the level of infrastructure and other potentials (distances etc.), one may remark a very good level of endowment of the city, which may rival with other urban regional centres in the North-West region, with the aim of being provided the title of regional administrative centre; the entire socio-economic assembly raises the question of a sustainable development at a regional level; the setting up of a programme for sustainable development on a regional level seems to be a solution for the future in the context of regional integration; the favourable geographic position and its connectivity-complementary within the Silvano-Someşene Hills and within the North-West region of Zalău Depression would allow its overtaking the role of coordinator on a regional level; Zalău Depression registers at present superior valences due to the fact that it facilitates the passage between the mountain units and the valley units on a local level, and it is situated at the contact of the Western Hills with the Transylvanian Depression on a regional level, while on a national level, it is located at the junction between Transylvania, Crişana and Maramureş.

6. THE COMPARISON WITH OTHER COUNTIES AND REGIONS. CONCLUSIONS

The comparison with the counties belonging to the North-West development region gives a sense to this subject. Maramureş County presents a human concentration organization in two major groups. In the North-East, historical Maramureş is divided in two big axes by the volcanic mountains with a polarization direction from South-East to North-West, while in the South-West of the county there is a grain type concentration on the axis generated by the Someş valley. Cluj County has the Someş valley axis from the North-East to the West and the Crişu Repede axis as a secondary axis. In Bihor County, the organization is much simpler, realized on three axes East-West oriented, defined by Crişu Negru, Crişu Repede and Barcău, completed by the North to South axis, developed at the contact between the plain and the hills. If we analyze the state of human concentration from

other counties, the things seem to get clearer. For instance in Bacău County, the human concentration organization is given by two parallel axis on a North to South direction along the Siret Valley and the Trotuș Valley, having a grain shape. In Mureș County, there are three axes developed on an East to West direction along the Mureș Valley and along the two Târnave rivers. By regions, Moldavia's organization is characteristic from this point of view, with a grain type organization on a main axis developed along the Siret Valley, but also on Jijia Valley and Bârlad Valley.

REFERENCES

1. Apostol, P. (1977), *Viitorul*, Edit. Ştiinţifică şi Enciclopedică, Bucureşti.
2. Giurcăreanu, C., (1973), *Peisaje umane*, Buletinul Societății de Științe Geografice, nr. 3, Bucureşti.
3. Ichim, I. (1980), *Probleme ale cercetării periglaciarului din România*, Studii şi cercetări de Geografie, nr. 1, Bucureşti.
4. Mac, I., Pop, C. C. (2003), *Despre dimensiune în Geografie*, Studia UBB, nr.1, Cluj-Napoca.
5. Pop, C.C. (2003), *The correlation between geography and territorial planning*, Rural space and regional development, Edit. Studia, Cluj Napoca.
6. Pop, C.C. (2003), *Dimensiunea geografică a axei Jibou-Zalău-Şimleu Silvaniei-Marghita. Studiu de geografie integrată*, Edit. Silvania, Zalău.
7. Pop, C.C. (2005), *The integrated properties in the geographical axis Jibou-Zalău-Şimleu Silvaniei-Marghita*, Studia UBB, nr. 1, Cluj Napoca.
8. Pop, C.C. (2007), *The conceptual geography*, RR Bowker LLC, Chicago-USA.
9. Pop, C.C. (2007), *Concept. Science. Geography*, Studii şi Cercetări Geology-Geography, nr. 12, Bistrița.
10. Pop, P. Gr. (2005), *România. Dealurile de Vest şi Câmpia de Vest*, Edit. Universității din Oradea, Oradea, 2005.

STUDIA UNIVERSITATIS BABEŞ-BOLYAI, GEOGRAPHIA, LIV, 2, 2009

THE ELECTIONS OF MAYORS IN CLUJ COUNTY, ROMANIA, IN JUNE 2008

GR. P. POP[1], V. BODOCAN[1]

ABSTRACT. – The Elections of Mayors in Cluj County, Romania, in June 2008. The territorial-political complexity of the subject under consideration urged us to study in this paper only the way of electing the mayors in those 81 administrative-territorial units of the Cluj County: the cities of Cluj-Napoca, Turda, Dej, Câmpia Turzii and Dej, the town of Huedin and the 75 communes. As a result of the elections, held in two rounds (1st of June 2008, with the election of 32 among the mayors and 15 of June 2008, with the election of the reminder of 49 mandates), the 81 mayor offices went to the following political parties: the Liberal Democratic Party (LDP, with 28 mandates, respectively 34,6 %), the National Liberal Party (NLP, 23 and 28,4 %), the Social Democratic Party (SDP, 17 and 21,0 %), the Democratic Union of Hungarians from Romania (DUHR, 8 and 9,9 %), Independent Candidates (IC, 3 and 3,7 %), the New Generation Party-Christian Democratic (NGP-CD, 1 and 1,2 %) and the Democratic Force (DF, 1 and 1,2 %). The dominance of the Liberal Democratic Party (Cluj-Napoca, Turda, Câmpia Turzii and Gherla) can be noticed in the urban centers of the county, and also a territorial distribution of the mandates according to proximity and neighborhood effect.

Keywords: *local elections, mayor, Cluj County, political and ethnic party.*

1. INTRODUCTION

As resulted from the bibliography referred to this study, the period after 1989 has allowed, on the one hand, the emergence of social-political conditions "... to elect the leaders (mayors) of territorial-administrative units by direct vote, elections for this purpose being held in February, 1992 by representatives of various political and ethnic parties occurred in Romania, as a result of its total unchaining after almost half a century of communism" (Gr. P. Pop, V. Bodocan, 1991, p. 66) and on the other hand, it is found that the geographical analysis of the phenomenon of free elections for various bodies of the administrative-territorial units became possible, as well as at national level for the legislative chambers in Romania (Chamber of Deputies and Senate).

The complexity of the subject under consideration, namely the local elections, which means the establishment by voting of the mayors, county council chairmen and members of county councils, municipalities, towns and communes, has determined us to take into consideration the election of the mayors only, for the 81 administrative-territorial units of Cluj County, the cities of Cluj-Napoca, Turda, Dej, Câmpia Turzii, Dej and Huedin and the 75 communes.

[1] *„Babeş-Bolyai" University, Faculty of Geography, 400006 Cluj-Napoca, Romania, e-mail: grigor@geografie.ubbcluj.ro; voicu@geografie.ubbcluj.ro*

Situation being known, the following results are analyzed for local elections held in two rounds (the 1st and the 15th of June, 2008): firstly, the frequency of the votes for the elected mayors by parties, at the county level (table 1 and Fig. 1) and secondly, the distribution of the mayors on administrative-territorial units (cities, towns and communes) (table 2 and fig. 2). Here, as a generalization, it is noted that 3183 mayors were elected nationally, 81 (2.54%) of them from the Cluj county.

2. THE DISTRIBUTION OF MAYORS BY PARTIES, IN CLUJ COUNTY

The 81 mayors from the county of Cluj were elected (2008-2112 mandate) in two rounds but only 32 (39.5%) of them in the first round (on June the 1st, 2008). At party level, the affiliation is as follows: 12.3% back LDP, 13.6% NLP, 8.6% SDP and 4.9% DUHR. Besides these four parties with mayors elected in the first round, other 3 were added in the second (held on June the 15th, 2008), the situation of all mayors elected indicating as follows: 22.3% LDP, 14.8% NLP, 12.4% SDP, 4.9% DUHR 1.2% NGP-CD 1.2% DF and 3.7% independents.

Distribution of Mayors after Party Affiliation at Local Elections, Cluj County, Romania, June 2008

Tabel 1

Parties	First round	Second round	Total	%
LDP	10	18	28	34,6
NLP	11	12	23	28,4
SDP	7	10	17	21,0
DUHR	4	4	8	9,9
NGP-CD	-	1 (Huedin)	1	1,2
DF	-	1 (Valea Ierii)	1	1,2
IC	-	3 (Poieni, Sic, Moldoveneşti)	3	3,7
Total	**32**	**49**	**81**	**100,0**

LDP = Liberal Democrat Party; NLP = National Liberal Party; SDP = Social Democrat Party; DUHR = Democratic Union of Hungarians in Romania; NGP-CD = New Generation Party - Christian Democrat; DF = Democrat Force; IC = Independent Candidate.

Regarding the situation in the first ballot, it can be noticed that a number of mayors have met the overwhelming options of the electorate: over 80% in Chinteni and Viişoara (SDP), Recea-Cristur and Vultureni (NLP) and Sâncraiu (DUHR) and between 70 to 80% in Cluj-Napoca, Jucu and Rişca (LDP), Aluniş, Borşa and Cornesti (NLP), Aiton, Cămăraşu and Cătina (SDP). Compared to the first round, in the second one the vast majority of mayors (out of 49) were elected with values falling in the percentage spread of 50-60%. Values between 60 to 70% were registered only in Câmpia Turzii, Gherla, Maguri-Răcătău and Petreştii de Jos (LDP), Dej and Ciucea (SDP), Cățcău (NLP), and Mihai Viteazu and Săvădisla (DUHR).

As it comes out from Table 1 and Figure 1, by far the most numerous mandates (84% of the total territorial-administrative units) have returned to the following parties: Liberal Democrat Party (LDP), with 28 mayors (34.6%), National Liberal Party (NLP) with 23 (28.4%) and Social Democrats (SDP) with 17 (21.0%). The remaining 16% (13 seats) of the mandates were won by the Democratic Union of Hungarians in Romania (DUHR), with 8 mandates (9.9% of those 81 of the county, New Generation Party-Christian Democrats (NGP-CD) one Democratic Force (DF) with one office each (1.2%) and Independent Candidates (CI) with 3 mayor mandates (3.7%).

Two months after the elections held on the 1st and 15th of June 2008, the elected mayor Alan Giurgiman (NGP-CD) of the town of Huedin (50.3% of the total valid votes cast, in competition with LDP candidate, Mircea Moroşan), has submitted his resignation, citing health reasons. Following this, on 26 October the 28th, 2008 partial local elections were held to fill the post of mayor of the city, the mandate being won in the first ballot, by the representative of the Liberal Democratic Party, Mircea Morosan, with 54.5% of the 3466 options validly cast, with a turnout of 44.5% of total registered voters on the permanent electoral lists (7781 prsoane). The other candidates were representing SDP (23.2%), independents 12.1% and NLP (10.2%). With these new elections, the Liberal Democratic Party has reached 29 mandates, representing 35.8% of the 81 the administrative-territorial units of the county with the New Generation Party-Christian Democrats erased from this list.

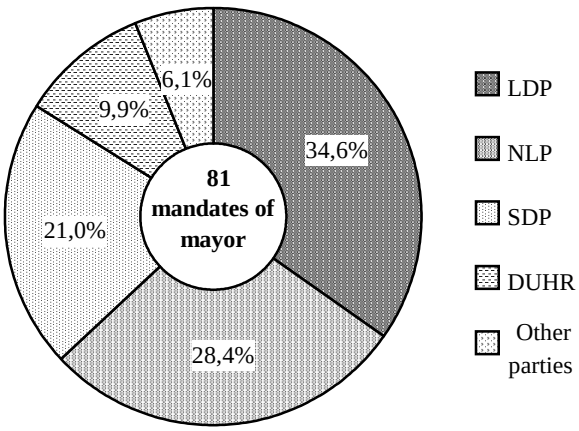


Fig. 1. The repartition of mayor's mandates on political parties, at elections in June 2008, Cluj County, Romania.

3. TERRITORIAL DISTRIBUTION AND DEMOGRAPHIC STRUCTURES OF THE MAYORS IN CLUJ COUNTY

The following are considered as general aspects regarding representativeness, gender and ethnic affiliation of the county mayors in urban and rural areas.

3. 1. Mayors by type of residence

Regarding the structure of the mandates by type of residence, six (7.4%) out of 81 mayors belong to the urban municipalities: in the city of Cluj-Napoca and Turda mayors were elected from LDP in the first round with 76.2% and 56.5% respectively, of the total valid votes cast (113,701 in Cluj-Napoca and 17,311 in Turda) and in the second round in the other four urban centers of Dej (SDP, 61.6%, of the 13,212 valid votes cast in competition with a LDP candidate), Câmpia Turzii (69.6% of 8532 votes against DF

candidate), Gherla (65.8% of 7923 votes cast, with competitor from SDP) and the town of Huedin (NGP-CD 50.2% of 3919 votes in competition with an LDP candidate who finally became mayor after by-elections.) Of those outlined, we may conclude that elections held in June 2008 have produced a majority of Liberal Democrat Party in 5 municipalities.

In those 75 communes of the county, the political party with the most seats won was Liberal Democratic Party in 24 communes (32% out of total), followed by National Liberal Party in 23 communes (30.7%), then Social Democratic Party (16 communes, 21.3%), Democratic Union of Hungarians in Romania (8 communes, 10.7%), Democratic Force (1 at Valea Ierii) and three Independent mayors in Poieni, Moldoveneşti and Sic.

The Elections of Mayors in Cluj County, Romania, June 2008

Table 2

No. crt.	Municipalities, towns, communes	Total no. of valid votes	Surname and first name of the chosen mayor	Political Party	Round	Valid votes	%	Opponent Political Party, in the second round
1	Cluj-Napoca	113701	Boc Emil[2]	LDP	1	86657	76.21	-
2	Dej	13212	Morar Costan	SDP	2	8145	61.64	LDP
3	Turda	17311	Ştefănie Tudor	LDP	1	9775	56.46	-
4	Câmpia Turuii	8531	Vasinca Ioan	LDP	2	5934	69.55	DF
5	Gherla	7923	Drăgan G. Ionel	LDP	2	5213	65.80	SDP
6	Huedin[1]	3919	Giurgiuman Liviu	NGP-CD	2	1980	50.53	LDP
7	Aghireşu	3301	Lehene S-Gelu	LDP	1	1842	55.80	-
8	Aiton	730	Făgădar Nicolae	SDP	1	517	70.82	-
9	Aluniş	747	Sav Nicolae	NLP	1	577	77.24	-
10	Apahida	4183	Fărcaş Ionel	NLP	2	2133	50.99	LDP
11	Aşchileu	764	Porumb Ioan	LDP	1	418	54.71	-
12	Baciu	3333	Pop Ioan	LDP	2	1804	54.12	DUHR

[1] For the situation in Huedin, see the note at the page 3.

[2] Office remained vacant from the date of 5 January 2009, following the resignation of Mayor Emil Boc, who was appointed Prime Minister of the Government of Romania on 22 December 2008, after the parliamentary elections of 30 November 2008. By-elections were scheduled for 15 February 2009, when the voter turnout was 29.83% from the total of 274 300 persons inscribed on the permanent electoral lists. From those present at this poll (81 833 electors), the votes validly expressed were 81 403, distributed as following: 60.48% for the candidate *Apostu Sorin* (vice-mayor of Cluj-Napoca till that date), representative of LDP, the second place went to the candidate Nicoară Marius (NLP), with 24.78%, and the third place to Puşcaş Pop Teodor (SDP), with 7.40%, while the other six candidates gathered together only 7.34% from the votes validly expressed.

13	Băişoara	1271	Luca M. Susana	LDP	1	712	56.01	-
14	Beliş	927	Crainic Viorel	NLP	1	595	64.18	-
15	Bobâlna	1072	Mureşan Augustin	LDP	2	559	52.14	NLP
16	Bonţida	2415	Baciu Vasile	LDP	2	1361	56.35	NGP-CD
17	Borşa	861	Secară Mariana	NLP	1	685	79.55	-
18	Buza	853	Czegher Ştefan	DUHR	1	504	59.08	-
19	Căianu	1142	Pop Vasile	SDP	2	600	52.53	DUHR
20	Călăraşi	914	Racolţa Ioan Vasile	LDP	1	570	62.36	-
21	Călăţele	1468	Toadere Petru	SDP	2	762	51.90	LDP
22	Cămăraşu	1228	Mocean I. Marcel	SDP	1	914	74.42	-
23	Căpuşu Mare	1731	Bodea Ionel	NLP	2	892	51.53	LDP
24	Câţcău	1395	Mureşan Călin	NLP	2	892	63.94	NIP
25	Căşeiu	1863	Boldor Silviu	SDP	1	1158	62.15	-
26	Cătina	1009	Bota Alexandru	SDP	1	711	70.46	-
27	Ceanu Mare	1807	Păcurar Virgil	LDP	2	1026	56.77	SDP
28	Chinteni	1342	Suciu M. Lucia	PSD	1	1116	83,15	-
29	Chiuieşti	1554	Mihuţ Gavril	NLP	2	865	55.66	LDP
30	Ciucea	999	Popa Ioan	SDP	2	648	64.86	LDP
31	Ciurila	861	Popa T. Cristinel	LDP	1	484	56.21	-
32	Cojocna	2027	Ranga Sorin Radu	LDP	2	1137	59.09	CDNPP
33	Cornești	857	Chifor Cornel	NLP	1	634	73.97	-
34	Cuzdrioara	1449	Bătinaş Nicolae	NLP	2	743	51.27	LDP
35	Dăbâca	663	Petrindean Valer	SDP	2	350	52.79	LDP
36	Feleacu	1690	Balea Nicolae	LDP	2	963	56.98	IC
37	Fizeşu Gherlii	1136	Mureşan V. Marinel	SDP	2	591	52.02	NLP
38	Floreşti	3317	Vancea Ioachim	LDP	2	1797	54.17	SDP
39	Frata	1631	Trif Vasile	NLP	1	885	54.26	-
40	Gârbău	1647	Broaina Gh. Lucian	NLP	2	860	52.21	DUHR
41	Geaca	1113	Miron Ioan	NLP	2	562	50.49	SDP
42	Gilău	3638	Sfârlea Dumitru	SDP	2	1975	54.28	LDP
43	Iara	2290	Popa Ioan Dorin	LDP	2	1223	53.40	SDP
44	Iclod	2100	Mureşan Maria	LDP	2	1091	51.95	NLP
45	Izvoru Crişului	922	Antal Ioan	DUHR	2	475	51.51	IC
46	Juchişu de Jos	847	Moncea Ioan	LDP	2	474	55.96	SDP
47	Jucu	1782	Pojar Ioan Dorel	LDP	2	1336	74.97	SDP
48	Luna	1930	Giurgiu Aurel	LDP	2	1021	52.90	NLP
49	Măguri-Răcătău	1136	Prigoană Petru	LDP	2	752	66.19	SDP
50	Mănăstireni	913	Coldea Petru	LDP	1	614	67.25	-
51	Mărgău	1085	Suciu Mircea Sorin	NLP	2	600	55.29	SDP

52	Mărişel	893	Mariş I. Traian	NLP	2	459	51.39	LDP
53	Mica	2044	Goron Pavel	NLP	2	1198	58.61	SDP
54	Mihai Viteazu	2470	Zeng Ioan	DUHR	2	1592	64.45	SDP
55	Mintiu Gherlii	1904	Oltean Dumitru	SDP	1	1043	54.77	-
56	Mociu	2058	Horváth Márton	DUHR	2	1072	52.08	LDP
57	Moldoveneşti	1696	Kanyaró Paul	IC	2	892	52.59	DUHR
58	Negreni	1244	Manea Constantin	LDP	1	767	61.65	-
59	Panticeu	902	Lungu Aron	SDP	2	492	54.54	NLP
60	Pălatca	705	Hulduşan Ioan	LDP	2	392	55.60	SDP
61	Petreştii de Jos	1088	Pîrv I. Ioan	LDP	2	716	65.80	NLP
62	Ploscoş	434	Sabău Ioan	NLP	2	228	52.53	LDP
63	Poieni	2440	Boca Constantin	IC	2	1400	57.37	SDP
64	Recea-Cristur	930	Rus L. Alexandru	NLP	1	795	85.48	-
65	Rişca	1074	Morar Ioan	LDP	1	859	79.98	-
66	Săcuieu	749	Potra Aurel	SDP	2	415	55.40	LDP
67	Sănduleşti	744	Pădurean Fl. Traian	LDP	2	394	52.95	SDP
68	Săvădisla	2383	Tamás G. Andrei	DUHR	2	1517	63.65	LDP
69	Sic	1507	Sallai Ioan	IC	2	858	56.93	IC
70	Sâncraiu	1102	Póka A. Gheorghe	DUHR	1	925	83.93	-
71	Sânmărtin	1182	Fărtan Ioan	NLP	1	817	69.12	-
72	Sânpaul	1150	Colceriu Ovidiu	NLP	1	653	56.78	-
73	Suatu	1102	Szobo Mihai	DUHR	1	562	50.99	-
74	Tritenii de Jos	2117	Saşa Valer	SDP	2	1141	53.89	LDP
75	Tureni	1290	Mănăilă E. Daniela	NLP	2	712	55.19	LDP
76	Ţaga	1070	Mîrza Romulus	NLP	1	684	63.92	-
77	Unguraş	1519	Mureşan Ildiko	DUHR	1	766	50.42	-
78	Vad	1309	Prunean David	NLP	1	745	56.91	-
79	Valea Ierii	687	Duma G. Alexandru	DF	2	403	58.66	LDP
80	Viişoara	1973	Roman Ioan	SDP	1	1579	80.03	-
81	Vultureni	812	Mureşan Eugen	NLP	1	661	81.40	-

LDP = Liberal Democrat Party; NLP = National Liberal Party; SDP = Social Democrat Party; DUHR = Democratic Union of Hungarians in Romania; NGP-CD = New Generation Party-Christian Democrat; DF = Democrat Force; NIP = National Initiative Party; CDNPP = Christian Democrat - National Peasants' Party; IC = Independent Candidate.

3. 2. Gender structure

Women have low representation as candidates and seats won in the county of Cluj. This is demonstrated by the only 6 mayor mandates won (out of 81) in the communes of Băişoara (Luca Minodora Susana from the LDP, the condition fulfilled in the first round, with 56% of valid votes cast), Borşa (Secară Mariana, NLP, 79.5% in the first round), Chinteni (Suciu Magdalena Lucia, SDP, 83.2% in the first round), Unguraş (Mureşan

Ildiko, DUHR, 50.4% in the first round), Iclod (Muresan Maria, LDP, second round, with a share of 52% of valid votes cast) and Tureni (Mănăilă Elena Daniela, NLP, second round, 55.2%).

3. 3. Territorial distribution of the mandates in Cluj County

The territorial distribution of the mayors at county level, by political affiliation, as shown in Fig. 2, is characterized by a high degree of heterogeneity. However, a territorial specificity may be found at county level: the Liberal Democrat Party is present in almost all cities and in the surrounding communes of Cluj-Napoca, Turda, Câmpia Turzii and Gherla

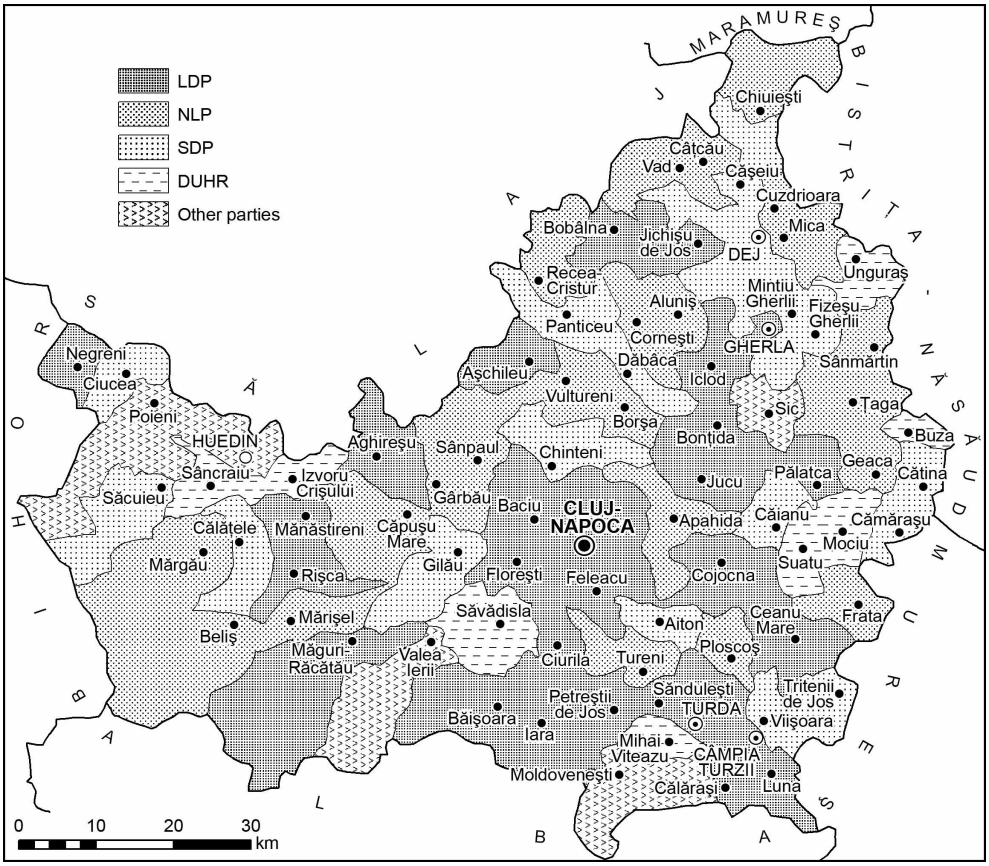


Fig. 2. Territorial distribution of the mayors, by parties and by administrative-territorial units, in Cluj County, at local elections in 2008.

and in the mountain and hilly area; National Liberal Party, with its 23 mayors is mostly present in Transylvanian Plain, Cluj and Dej Hills and even in the mountain region; Social Democrat Party has the office in Dej and 16 of county communes, the most numerous in Transylvanian Plain; DUHR managed to win eight of the mayoral offices, usually where the

Hungarian population is dominant: Izvoru Crişului (80% Hungarians and 20% Romanian in 2002), Săvădisla (50.7% and 47.5%), Sâncraiu (75.2% and 24.6%), Suatu (50.8% and 43.1%), and Unguraş (59.8% and 36.6%) but also in some communes where the majority belongs to the Romanians: Buza (51.5% Romanians and 47.7% Hungarians), Mihai Viteazu (71.2% and 27.4%) and Mociu (74,1% and 17.0%). This is due to the voter turnout which may be different among communities but also to the individual performance of the candidates.

4. CONCLUSIONS

As a general conclusion on the local elections in Cluj County, held in June 2008, it can be said that major offices were mostly won by two right parties (LDP and NLP), which managed to hold together, 51 (63 %) of the 81 mayor offices in the county, while the remaining 30 being hold by other competitors according to local political and social cultures (table 1).

R E F E R E N C E S

1. Pop, Gr., Bodocan, V. (1991), *Opţiuni electorale pentru alegerea primarilor în Banat, Crişana-Maramureş şi Transilvania*, Studia Universitatis Babeş-Bolyai, Geographia, nr. 2, Cluj-Napoca.
2. Pop, Gr. (1992), *România. An Electoral Geography (September-October, 1992)*, Studia Universitatis Babeş-Bolyai, Geographia, 1-2, Cluj-Napoca.
3. Pop, Gr. (1997), *România. Geografie Electorală (Noiembrie, 1996)*, Studia Universitatis Babeş-Bolyai, Geographia, 1-2, Cluj-Napoca.
4. Pop, P. Gr. (2001), *România. Geografie Electorală (noiembrie-decembrie, 2001)*, Revista Română de Geografie Politică, Anul III, nr. 1, Edit. Universităţii din Oradea.
5. Pop, P. Gr. (2006), *România. Geografie Electorală (Noiembrie-Decembrie, 2004)*, Studia UBB, Geographia, LI, 1, Cluj-Napoca.

THE EVOLUTION OF THE POPULATION FROM THE SOMEŞUL MIC VALLEY IN THE PERIOD 1850-2002

P. MÎNDRU [1]

ABSTRACT. – The Evolution of the Population from the Someşul Mic Valley, in the Period 1850-2002. The Somesul Mic Valley, the result of the river with the same name, spread between Gilău and Mica, with a total length of 75 km and an area of 210 square meters, is entirely situated on Cluj County's territory. Between 1850-2002, the population of the valley was situated in a fast growing position; hence, its number has increased 10 times over a period of 152 years. The result was an increased annual average of 5,7%, so that, during a period of only 15 years, the population's number has increased with the amount of the one registered in 1850. This growth in number is considerably higher in the urban area (9% annual average rhythm), the greatest annual average growth being registered in the city of Cluj Napoca (10%), where it has grown 16.2 times. In the rural area the population's number has increased by 2.2 times, in an annual average rhythm of 0.8%. From the 23 existing settlements of the valley (2 urban areas and 21 rural areas), three of them have known a decrease in the population's number: Petreşti village (with 94% considering the number of its population in 1850), Iclozel village (60% compared with the results from 1850) and Sub Coastă village (79% compared with the year 1956, the first time when this village was subject to separate census). Depending on the social-politic factors and on the time when these censuses were taken, this period includes four stages: 1850-1910, 1910-1948, 1948-1992, and 1992-2002. The population of the valley has known the highest increase of the annual average (3.3%) in the third stage (1948-1992), followed by the first stage (2.3%) and the second one (1.8%). The fourth stage (1992-2002) is the only one during which, given the situation created by the 1989 events, a decrease in the population's number is observable (-0.2% annual average). Taking into consideration the configuration of the relief from this area, the valley includes three sectors (taken from the upstream to the downstream): the Gilău – Cluj-Napoca sector, that had and has the smallest amount in the percentage of the valley's population (12.7 in 1850 and 3.5% in 2002); the Cluj-Napoca – Gherla area, the largest sector, the one that includes the greatest number of localities (13), where the amount of population has increased from 71.2% in 1850 to 89.3% in 2002; the Gherla – Mica sector with seven localities (an urban one and 6 rural settlements), where the population is characterized by a decrease from 17.3%in 1850 to 7.16% in 2002. Compared with the population of the Cluj district, the population of the valley has known a considerably growth. Hence, the population from the valley has gradually increased from 16.5% (1850) to 53.4% (2002).

Keywords: *Someşul Mic Valley, population's evolution, period of time, stages, intervals, sectors, factors, indicators.*

1. INTRODUCTION

The analysis of the population in a territory allows us to have a general view of the demographical phenomena that took place, as well as of the evolution in time of the geodemographical potential. In the Someşul Mic Valley there are traces of the emergence and

[1] *"Babes-Bolyai" University, Faculty of Geography, 400006, Cluj Napoca, Romania, e-mail: mindrupetru@yahoo.com*

evolution of man during several millennia, beginning from the *neolithical age* and continuing in the bronze and iron age, showing the *continuity* in the inhabitation of this geographical area.

2. THE EVOLUTION OF THE NUMBER OF INHABITANTS

The period to be analyzed in this study is 1850-2002, since it is for this period of time that we have data published after the censuses made by the authorities. Since we are dealing with such a long period of time – 152 years – the evolution of the population in the Somesul Mic Valley was subject to influence from a series of natural, political, social, economical, cultural, psychological and demographical *factors*, which resulted in rather significant fluctuations from one stage to another. The statistical data in question can offer both a general view of the *demographical status* of the valley in this period, as well as making different *comparative analyses* of this territory. By *correlating* the information regarding the current demographical phenomena with the demographical and socio-economical data provided by the statistics, we can understand and explain the demo-economical and demo-cultural rapports that took place during this period of time.

The population in the Valley, in this period of over a century and a half has grown almost 10 times (9,6 times), from 38916 inhabitants in 1850 to 373301 inhabitants in 2002 (table 1), which gives us an absolute increase of 336383 inhabitants (864,4 %), meaning a theoretical annual growth of 2213 people (5,7 %) or that during 15 years, the number of inhabitants in the Valley grew with the number of the population in 1850.

The evolution of the number of inhabitants between 1850-2002

Table 1

Year	**1850**	**1857**	**1880**	**1900**	**1910**	**1930**	**1941**
No. inhab.	38916	40272	54946	78260	92062	135629	148329
%	100	104	141	201	237	349	381

Year	**1948**	**1956**	**1966**	**1977**	**1992**	**2002**
No. inhab.	156035	190661	227928	315056	384671	375301
%	401	490	586	810	989	964

The comparative analysis of the evolution of the number of inhabitants for the whole period of time, by stages, intervals or years, as well as by towns, administrative units and sectors was made throughout the use of synthetical basis ***indicatives*** (table 2): *the absolute growth* of population (**Ag**); *the rhythm of growth* of the population (**Rg**); *the annual average growth* of the population (**Aag**) and *the average rhythm (rate) of growth* of the population (**Arg).** The study of the population's evolution was made by taking into account the configuration of the Valley's relief, comprising three widened sectors, where the population of the Valley is located. These ***three sectors*** of the Someşul Mic Valley, from upstream to downstream are: the *Gilău-Cluj-Napoca sector*, comprising three rural localities: Gilău, Luna de Sus and Floreşti; the *Cluj-Napoca – Gherla sector*, comprising 13 localities (an urban one and twelve rural ones): Cluj-Napoca, Apahida, Sânnicoară, Sub Coastă, Jucu de Mijloc, Juc Herghelie, Jucu de Sus, Răscruci, Bonţida, Fundătura, Iclod, Iclozel and Livada; the *Gherla – Mica sector,* which has seven localities (an urban one and six rural ones): Gherla, Hăşdate, Mintiu Gherlii, Petreşti, Salatiu, Mănăstirea and Mica.

Indicators of the population's evolution between censuses

Table 2

Period	Ag (inhab.)	Rg (inhab.)	Aag (%)	Arg (%)
1850-1857	1356	194	3.5	0.5
1857-1880	14674	638	36.4	1.6
1880-1900	23314	1166	42.4	2.1
1900-1910	13802	1380	17.6	1.8
1910-1930	43567	2178	47.3	2.4
1930-1941	12700	1155	9.4	0.9
1941-1948	7706	1101	5.2	0.7
1948-1956	34626	4328	22.2	2.8
1956-1966	37267	3727	19.5	2.0
1966-1977	87128	7921	38.2	3.5
1966-1992	69615	4641	22.1	1.5
1992-2002	-9370	-937	-2.4	-0.2

Ag = absolute growth; **Aag** = annual average growth;
Rg = rhythm of growth; **Arg** = average rhythm (rate) of growth..

The evolution of the Valley's population was not even. There were moments of normal evolution, moments of growth and in some situations the population's number decreased. The data that we have concerning the evolution of the Valley's population during this century and a half allow us to divide this period of time into several *stages*.

3. STAGES OF THE POPULATION'S EVOLUTION

The division into stages of the Valley's population evolution during this period of time can be made by taking into account several factors which favourized or stopped the natural course of the demographical phenomena. *The factors* that influenced the evolution of the Valley's population and thus gave every stage its particularities were: socio-political, economical, natural or psychological factors. By taking into account the predominance of the socio-political factors, we divided this period of time according to these ones.

Thus, according to the socio-political factors and to the intervals between censuses, we divided this period of time into four *stages*: 1850-1910, 1910-1948, 1948-1992, 1992-2002.

3. 1. The first stage (**1850-1910**) comprises the development of the Valley in the second half of the 19th century and the beginning of the 20th century, when, given the fact that the area was under a foreign ruling and that the industry and communications developed and because of the demographic transition, the dynamics of the population was in a continuous evolution, characterized by *high numerical growth*, as a result of colonizing the area with people from other parts of the Austro-Hungarian Empire, especially in the towns with a well-developed industry at the end of the 19th century and the beginning of the 20th century, such as Cluj-Napoca. The stage is characterized by a *high demographic dynamics*, comprising a *high spatial mobility* – there was a high level of immigrations, which especially until the beginning of World War I, were mainly directed to America. The natural growth of the population was high during this stage, which was due to the beginning of the *demographical transition in this part of Europe* and to the fact that the general death rate declined after the 8th decade of the 19th century, a decade in which, especially in the first part of it, a series of unfavourable phenomena took place, including a *cholera epidemics*, thus generating a high death rate. The result of the *demographic upsurge* which accompanied the *economic development* (relying mainly on the development of the mining industries, of the forestry operations and wood processing, as well as being supported by massive development of the highways and railroads) is reflected by the population growth after 1880.

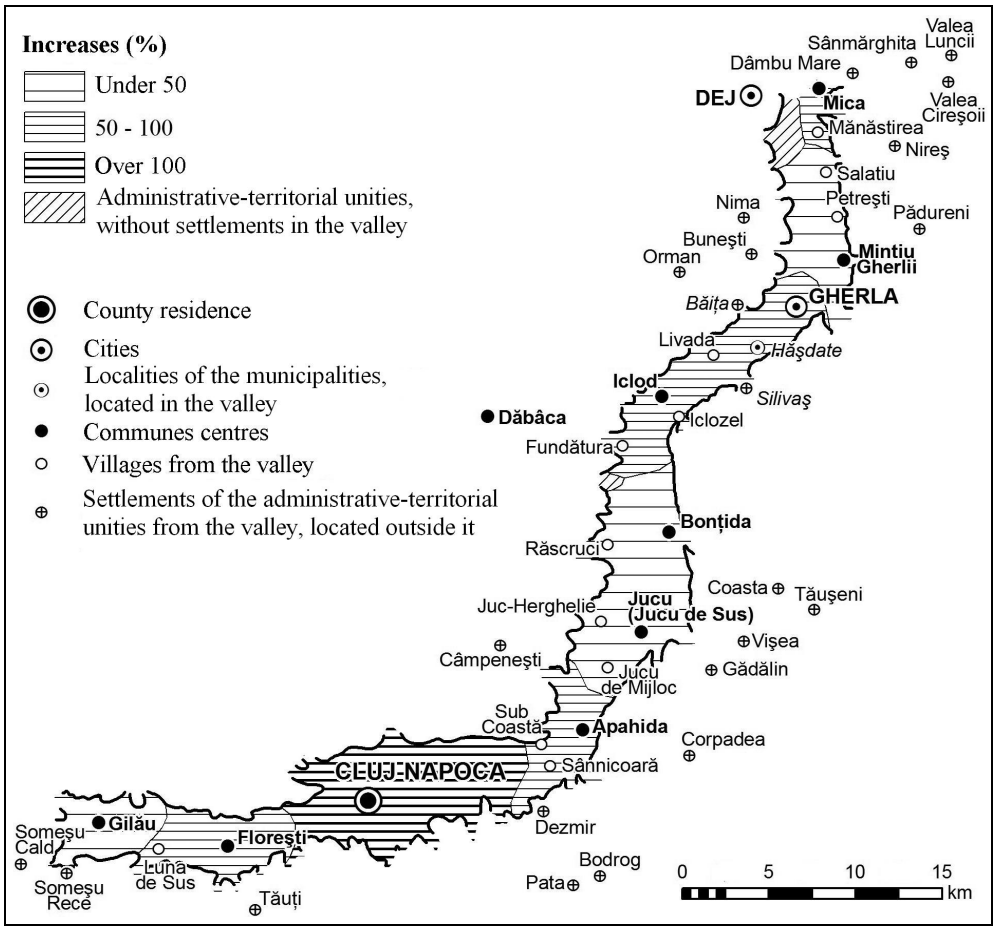


Fig. 1. Population's evolution by administrative units between 1850-1910.

Thus, analyzing the evolution of the Valley's population in the six decades, we can see a growth of the number of inhabitants from 38916 to 92062, which means an absolute growth of 92062 people (137 %), correspondent to a medium annual growth of 2,3 %.

Correspondent to this growth of population in the entire Valley, we have in the *urban* environment a growth of 70637 people (203,4 % as opposed to1850) with an annual medium rhythm of 3,4 %, whereas in the *rural* area the growth is far more modest, with a number of 5794 people (37,1 %), in an annual medium rhythm of 0.6%.

The population's evolution by *localities* points out the fact that no locality from the Valley has encountered population decreases in this stage (1850-1910), but, however, the growth was not uniform.

The two towns of the area had different rates of population growth. The biggest rate was in Cluj-Napoca (43121 people), 220% more than in 1850, meaning an annual growth of 3,7%, whereas Gherla's population had a growth of 2822 people (70%) in annual medium rhythm of 1,2%.

In the *rural area* the biggest growth was in Apahida (85 %), Jucu de Mijloc (78,7 %), Fundătura (76,9%), Luna de Sus (65%), Mica (61,9%), Răscruci (59,2%), Iclod (57,8%), Mănăstirea (55,5%). A population growth between 40-50% was registered only in Sânnicoară (47,9%) and Floreşti (47%), and a growth between 30-40 % was registered in Gilău (38,2%), Jucu de Sus (37,3%), Iclozel (34,8%), Petreşti (34,5%), Mintiu Gherlii (32,1%), Hăşdate (31%) and Bonțida (30,4%). The lowest population growth in this stage were registered in Livada (25,6%) and Salatiu (20,2%). This stage is the longest one of the four (60 years) and the second relative to the population's growth rhythm, both concerning the population growth on the whole stage ((136,6%), as well as regarding the annual medium rhythm (2,3%).

3. 2. The second stage (**1910-1948**) covers the time of the two World Wars, includes the greatest economical system crisis etc., which had important consequences both

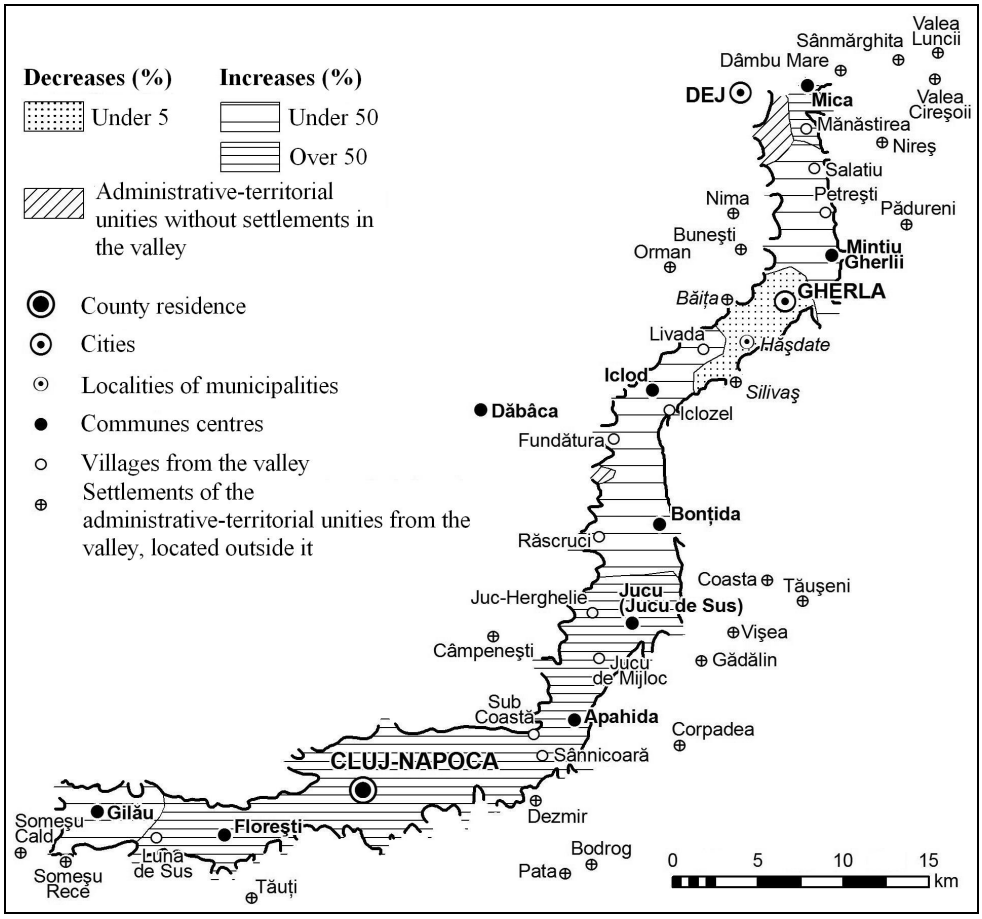


Fig. 2. Population's evolution by administrative units between 1910-1948.

in the *political* field (the fall of former empires and the constitution of national states in this part of Europe, including the Great Union of the Romanians on 1 December 1918, the coming into being of new political regimes), *economic* (the development of the processing industries), *demographical* (great population losses, low birth-rate and high death-rate) etc. The Valley's population, though it had a general growth from 92056 to 156035 inhabitants, i.e. a growth of 63979 inhabitants (69,5 %), the annual medium rhythm was of only 1,8 %, as opposed to 2,3% in the first stage (1850-1910). It is the third stage of the four in this century and a half relative to the general growth level as well as to the annual medium growth rhythm.

During the 38 years of this stage, the population in the two environments had the closest growth values from all four stages. Thus, the population in the *urban environment* grew by 53941 people (76,4 % at an annual medium rhythm of 2%), and the one in the *rural area* grew by 10032 people (46,8 % at an annual medium rhythm of 1,2%). Only four *localities* had population decreases, the others had a population growth that reached even 88% (Cluj-Napoca). The biggest population decrease was in Gherla (-2,8 %), followed by Petreşti (-2,1 %), Hăşdate (-0,7 %) and Bonţida (-0,1 %). The other rural localities from the Valley had different growths. The biggest population increase in a rural locality was in Sânnicoară (75,6 %), followed by urmată de Jucu de Sus (59,5 %), Mica (42,5 %), Apahida (39,6 %), Floreşti (34,1 %), Răscruci (33,5 %), Salatiu (29,6 %), Mănăstirea (26,6 %), Jucu de Mijloc (24,8 %), Livada (18,7 %), şi Luna de Sus (24,8 %). Increases between 10 % and 20 % were in Fundătura (14,8 %), Gilău (13,4 %), Mintiu Gherlii (10,7 %), Iclod (10,5 %). The smallest increase was in Iclozel (10,1 %).

3. 3. The third stage **(1948-1992)** covers the time between the installment and the change of the communist regime, including the political changes (the existence of only one political party), the economical ones (nationalization, founding of cooperatives, the centralization of economy), the demographical changes (abortions are forbidden) etc. The decrease of the death-rate, especially of the infantile one, due to the improving of the healthcare system is determined , in the context of birth-rate growth, the highest population growth in the Someşul Mic Valley, which reached a number of 384671 inhabitants from 156035 inhabitants, thus increasing by 228636 inhabitants (146,5% at an annual medium rhythm of 3,3,%). It is the second stage considered from the length point of view (44 years), but the first of the four respective to the absolute growth of the number of inhabitants, as well as of the annual medium percentage of this growth.

It is also the stage of the opposites, since it shows the greatest discrepancy between the evolution of the population in the urban and rural area. The rural population of the Valley had the smallest annual medium growth of all the four stages (-0,05 %), whereas the population in the urban environement had the biggest annual growth (4,2 %). When comparing the population's evolution, we can see that this is the only stage with a decrease in the rural population, as opposed to the other three stages which showed growths in this respect. This phenomenon is caused by the exodus of the population (especially of the fertile one) from the rural area to the urban environment, an exodus far greater than in the other three stages and determined by the need for workforce in the urban environment. Thus, in the *urban environment* the population grew from 124578 to 353886 people, meaning an absolute growth of 229308 people (184,1 % at an annual medium rhythm of 4,2%). As opposed to the urban environment, population in the *rural area* decreased by 672 inhabitants, from 31457 to 30785 people (-2,1 % at an annual medium rhythm -0,05 %).

The evolution of the population related to the *localities* shows that the two towns in the Valley had the biggest annual medium growth, the record for the whole period being held by Gherla (6,4 %), with an absolute growth of 18621 inhabitants (112,6 %), leading to a fourfold of its population (from 6663 to 25284 inhabitants). Cluj-Napoca's population grew from 117915 to 328602 inhabitants, with an absolute growth of 210687 people (55,8 % at an annual growth of 4,1 %), thus being the second in this respect after Gherla. From the 21 rural localities of the Valley, 11 had population loses, leading to the aforementioned

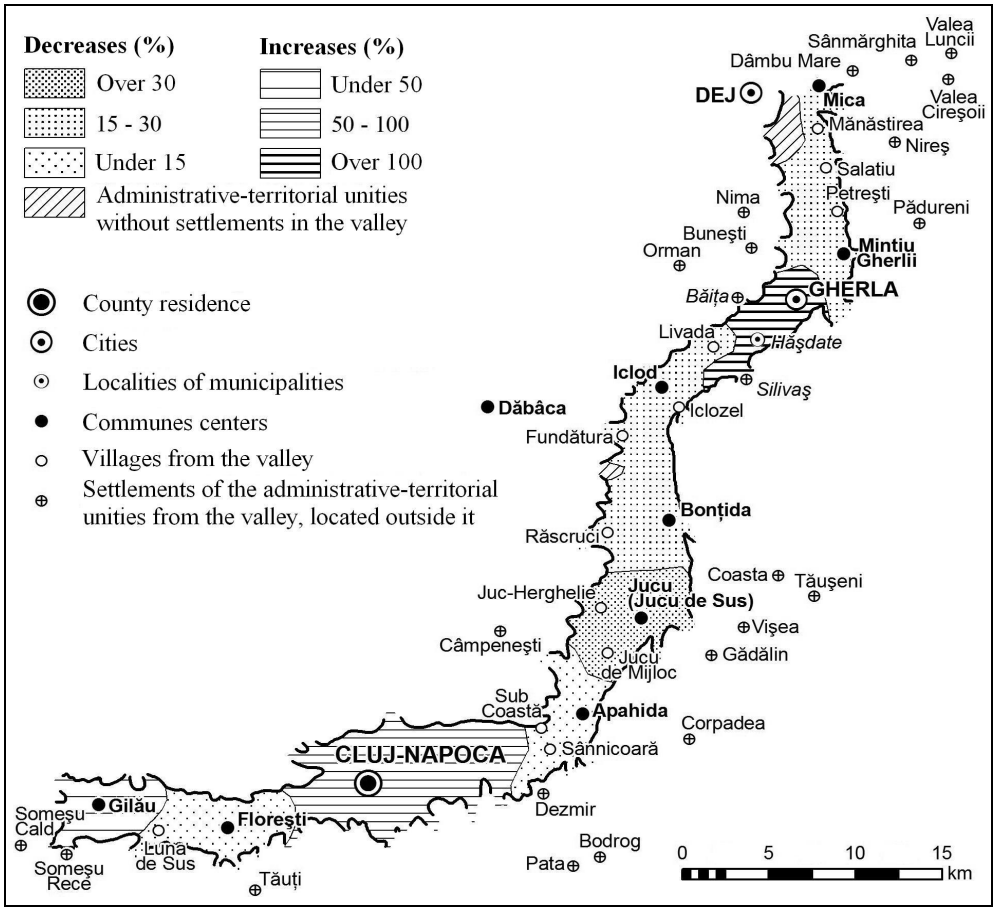


Fig. 3. Population's evolution by administrative units between 1948-1992.

situation. The biggest population decrease was in the village Iclozel (-60 %), followed by Sub Coastă (-47,3 %), Salatiu (-39,1 %), Jucu de Sus (-36,7 %), Petreşti (-32,6 %), Jucu de Mijloc (-30,5 %), Fundătura (-29 %), Mănăstirea (-21,6 %), Răscruci (-21,6 %), Mintiu Gherlii (-18,9 %) şi Mica (-7,3 %). The other rural localities had population growths, the mos important being in Sânnicoară (93,1 %), followed by Apahida (84,2 %), Gilău (69,7 %), Jucu Herghelie (35 %), Floreşti (11,2 %), Iclod (10,5 %), Livada (9,7 %), Bonțida (9,3 %), Hăşdate (5,1 %). The smallest population growth was in Luna de Sus (2,4 %).

3. 4. The fourth stage **(1992-2002)** has evolution characteristics that can be seen even in present. It is a stage of political disturbances, comprising reorganizations in society as a whole and also an economical, saocial and demographical decline. It is the only stage in which the Valley's population decreased. Over a period of ten years the population decreased by 9370 people (-2,4 %), from 384671 to 375301 inhabitants, in a rhythm of -0,2 % per annum. The rural and urban areas had different evolutions.

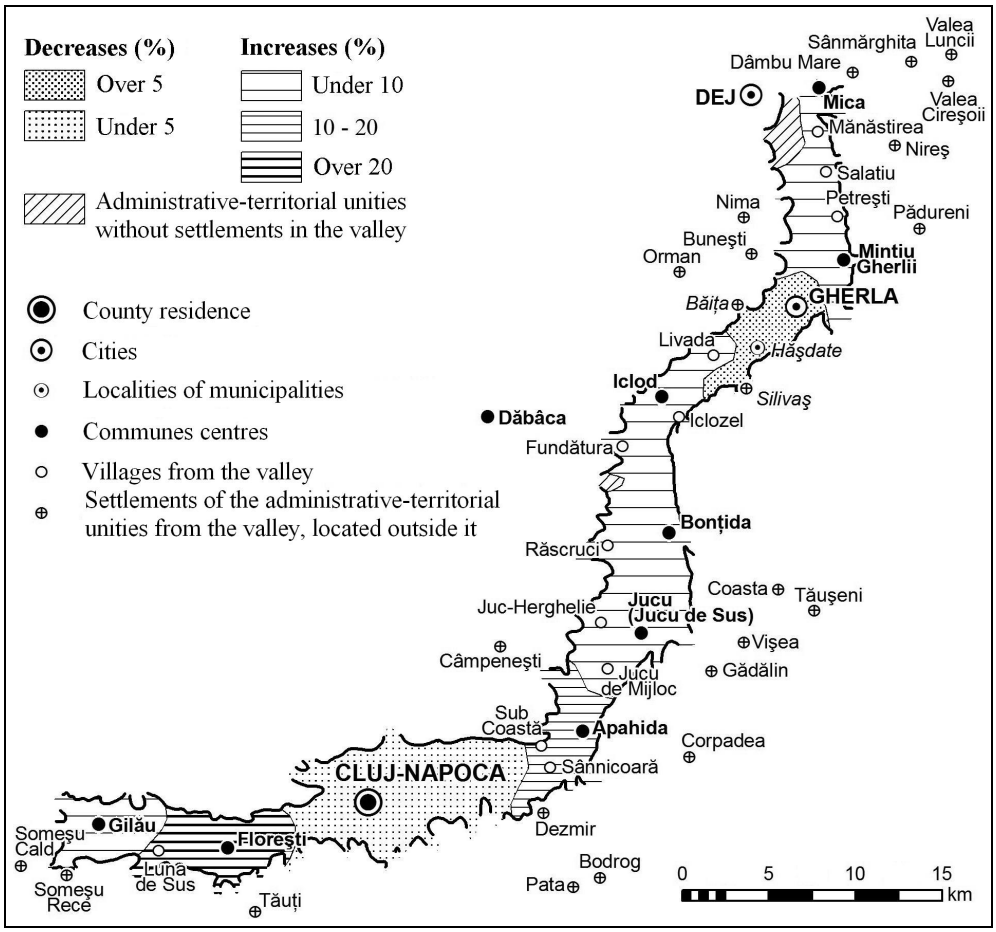


Fig. 4. Population's evolution by administrative units between 1992-2002.

For the first time, the *two cities* in the Valley have population decreases in the same interval. Even more peculiar is the fact that for the first Cluj-Napoca has a population decrease from 328602 to 317953 inhabitants, so 10649 fewer (-3,2% at an annual medium rhythm of -0,3%). Gherla is the locality with the biggest population decrease in the Valley ((-8,6 %, at an annual average of -0,8 %), ging from 25284 inhabitants to 23108, 2176 inhabitants fewer.

The rural area has a population evolution which might seem odd at a first glance, compared to the one in the urban environment, since the number of inhabitants of the rural area grows from 30785 to 34240 inhabitants, meaning a net growth of 3455 inhabitants (11,2% with an annual growth of 1,1%). This growth of the rural population happened against the background of the population's return from the towns to the rural areas, due to the reorganizing of the local economy, especially the reduction of the workers in industry (retired or fired personnel). At the same time, a part of the urban population goes back to the rural area not only for economic reasons, but also for reasons related to well-being (they are searching for a less polluted environment, for a less anthropic space). Only in three rural localities population decreases were registered: Mica (-8,3 %), Iclozel (-2,4 %) şi Fundătura (-0,1 %). Population growths were signaled in all other rural localities. The biggest growth was in the village Sub Coastă (50,7 %), followed by Floreşti (34,1 %), Sânnicoară (24,6 %), Salatiu (21,3 %), Apahida (17,4 %), Juc Herghelie (14 %), Mănăstirea (13,7 %), Livada (12,6 %), Jucu de Mijloc (9,5 %), Răscruci (8,6 %), Bonţida (8,4 %), Mintiu Gherlii (7,5%), Hăşdate (6,5 %), Jucu de Sus (6,2 %), Petreşti (6 %), Gilău (2,3 %), Luna de Sus (2,1%) and Iclod (1,9 %). As the society settles down the demographic evolution will also gain a new equilibrium.

4. THE EVOLUTION OF THE VALLEY'S POPULATION

The analysis of the population's evolution in the three sectors of the Valley, in the administrative units that comprise the rural and urban localities of the Valley and in the four stages of this period of time point out a few very interesting aspects.

Thus, the ***administrative units*** that include the localities from the Valley suffer on the whole of this *period* of a century and a half only growths of population. It is worth mentioning that the most significant average population growths were in the two *urban* localities: Cluj-Napoca (10%) and Gherla (3%), whereas the *rural* administrative units had lower annual average population growths. The biggest average population growth in an administrative unit was in Apahida (2,8 %), followed by Gilău (1,1 %), Floreşti (1,1 %), Mica (0,6 %), Jucu, Bonţida and Iclod (0.4% each), followed by Jucu (0,4 %) and Mintiu Gherlii (0,1 %), which had the lowest annual average population growth (table 3).

The annual average population growth rhyth (Aapgr) of the localities in the Someşul Mic Valley

Table 3

Localities	1850-1910	1910-1948	1948-1992	1992-2002	1850-2002
Gilău	0,6	0,4	1,6	0,2	1,1
Floreşti	0,9	0,7	0,2	2,3	1,1
Cluj-Napoca	3,7	2,3	4,1	-0,3	10,0
Apahida	2,2	1,2	1,8	2,0	2,8
Jucu	1,9	1,2	-0,7	0,8	0,4
Bonţida	1,5	0,3	-0,1	0,8	0,4
Iclod	3,3	0,3	-0,2	0,4	0,4
Gherla	1,7	-0,1	6,1	-0,8	3,0
Mintiu Gherlii	1,4	0,3	-0,5	0,9	0,1
Mica	2,0	0,9	-0,3	0,2	0,6

By ***stages*** (table 4), the Valley's population had the biggest annual average growth (3,3%) in the third stage (1948-1992), followed by the first stage (2,3 %) and the second

one (1,8 %). The fourth stage (1992-2002), is the only one in which, because of the situation generated by the events in 1989, the Valley's population decreased (-0,2 % of the annual average).

In regard to the ten administrative units of the Valley, the population's evolution was different. Thus, in what concerns the *urban* administrative units, Cluj-Napoca had an annual average decrease of -0,3 % only in the fourth stage (1992-2002), whereas in the other stages there were population growths and Gherla had annual average decreases of -0,1% in the second stage (1910-1948) and of -0,8 % in the fourth stage (1992-2002).

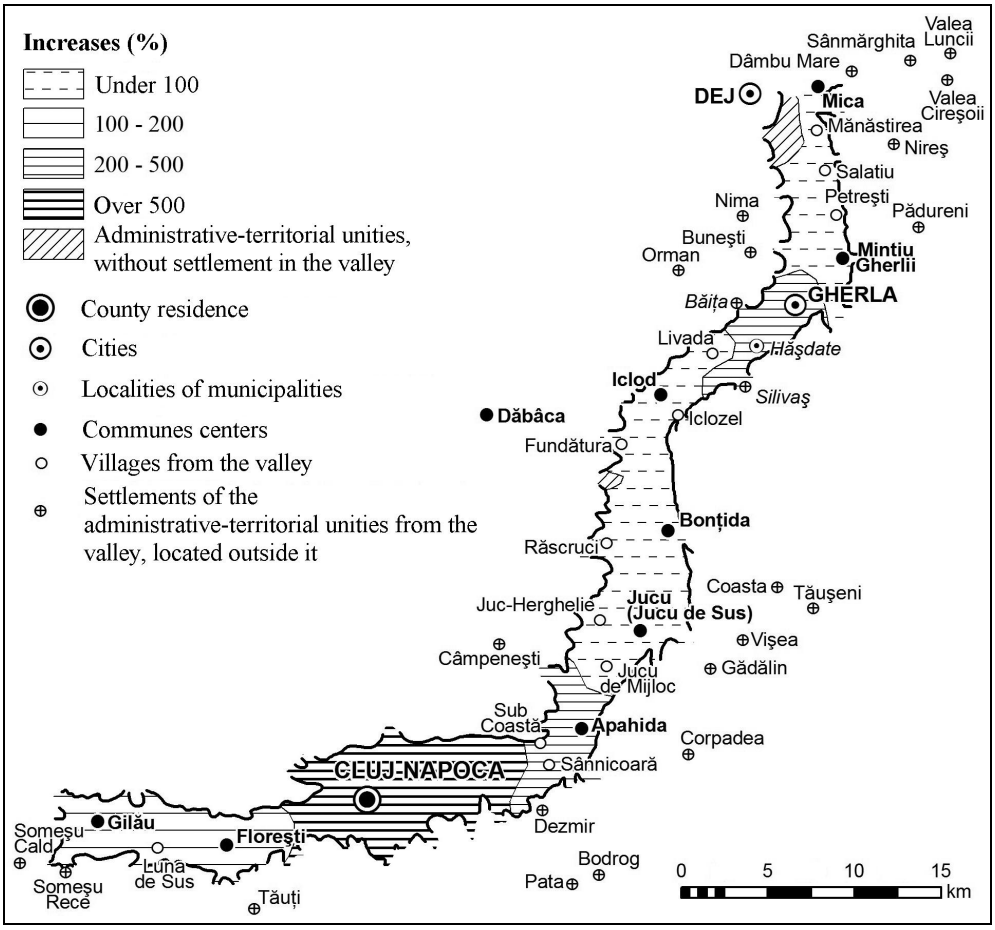


Fig. 5. Population's evolution by administrative units between 1850-2002.

From the eight *rural* administrative units, three of them (Apahida, Gilău and Floreşti) hadn't had population decreases in any stage, being favourized by their position in the Valley, and the other five had population decreases only in the third stage (1948-1992) when the exodus of the population towards the urban area took place.

These five localities are: Jucu – with the biggest annual average decrease of -0,7%, Mintiu Gherlii (-0,5 %), Mica (-0,3 %), Iclod (-0,2 %) and Bonțida – the lowest annual average decrease of -0,1%.

Indicators of the population's evolution by stages

Table 4

Indicators/Stage	1850-1910	1910-1948	1948-1992	1992-2002
Absolute growth (Ag) inhab.	53146	63973	228636	-9370
Growth rhythm (Gr) %	136,6	69,5	146,5	-2,4
Annual average growth (Aag) inhab	886	1684	5196	-937
Annual average growth rhythm(Aagr) %	2,3	1,8	3,3	-0,2

By ***sectors*** (table 5), the Valley's population evolved differently, especially in the sectors that comprise at least two urban localities.

Thus, the *Gilău – Cluj-Napoca sector*, including the rural population of only three villages had and has the smallest amount of the Valley's population, decreasing from 12,7 % in 1850 to 3,5 % in 2002. This sector has only population growths in what concerns the component administrative units (the villages Gilău and Florești), as well as regarding the whole of the period (1,1% medium annual growth).

Indicators of the population's evolution between 1850-2002

Table 5

Sector/Area	Nr. inhab.		Population's evolution			
	1850	2002	Ag	Aag (%)	Rg	Agr (%)
Gilău – Cluj-Napoca	4933	13108	8175	165,7	54	1,1
Cluj-Napoca – Gherla	27705	335303	307598	1110,3	2024	7,3
Gherla – Mica	6720	26890	20170	300,1	133	2,0
Rural	15631	34240	18609	119,1	122	0,8
Urban	23285	341061	317776	1364,7	2091	9,0
Total	**38916**	**375301**	**336385**	**864,4**	**2213**	**5,7**

Ag = absolute growth; **Aag** = annual average growth; **Rg** = rhythm of growth; **Arg** = average rhythm (rate) of growth..

The *Cluj-Napoca – Gherla sector*, has the widest area, having the biggest number of localities (13) and the population's amount grew from 70,1% in 1850 to 89,3% in 2002, thus having the biggest average annual growth (7,4%). Of the thirteen localities, only in the villages Iclozel and Sub Coastă the population decreased during the 152 years by an annual average of -0,3 %, respectively 0,4% (the biggest decrease in the Valley). In all the other villages the annual average growth was between 3% in Apahida and 0,3% in Fundătura. Cluj-Napoca had the biggest average annual growth on the whole period of time (10%), not only in this sector but in the entire Valley, the amount of the population in this important town raising from 50,4% in 1850 to 84,72% in 2002. It is the only locality in the Valley whose population amount grew, all the others suffering decreases of the amount of population relative to the Valley's population. Cluj-Napoca, because of the capacity to polarize population functioned as a "vacuum cleaner" for the population of the Valley, as well as for the neighbouring units.

The *Gherla-Mica sector* comprises seven localities, of which six are rural and one urban (Gherla). The amount of the population in this sector diminished from 17,3 % in 1850 to 7,2 % in 2002. The annual average growth of the population in this sector was of 2%, the highest growth rate being in Gherla (3,1%). Among the rural localities, the highest growth rate was in Mica (0,6%) and the lowest in Salatiu (0,1%). Petreşti village is the only one in this sector with a decrease in population (-0,04% annual average).

In the two ***areas***, urban and rural, the population growth a different evolution.

The growth is definitely bigger in the *urban environment*, where the population went from 23285 inhabitants in 1850 to 341061 in 2002, meaning a growth of 14,6 times, with an absolute growth of 317776 (1364,7 %) and an annual average rhythm of 2091 people (9 %).

The biggest *growth* was in Cluj-Napoca, which, from a population of 19612 inhabitants in 1850 reached 317953 in 2002, meaning a growth of 16,2 times, with an absolute growth of 298341 inhabitants (1521,2 %) and an annual average rhythm of 1963 (10%). Gherla also had a high population growth: from 4035 inhabitants in 1850 it reached 23108 in 2002, thus having a growth of 5,7 times with an absolute growth of 19073 inhabitants (472,7 %) and an annual average rhythm of 125 inhabitants (3,5 %).

The difference between the population growth in the urban area and the one in the rural area is substantial. The urban population grew by an average annual percentage which is by 8,2% bigger compared to the rural area.

So, in the *rural area* the population grew from 15631 inhabitants in 1850 to 34240 in 2002, a 2,2 times growth with an absolute growth of 18609 people (119,1 %) and an annual average rhythm of 122 people (0,8%).

The biggest population growth in the rural area (6,2 times) was in the village Sânnicoară, whose population grew from 261 inhabitants in 1850 to 1631 in 2002, meaning an absolute growth of 1370 people (524,9%), the annual average growth being of 9 people (3,5 %). The case is the same for Apahida, whose population grew 5,6 times between 1850-2002 from 820 to 4582 inhabitants, meaning an absolute growth of 3762 people (458,8 %) with an annual average growth of 25 people (3%).

Three localities in the Valley had annual average growths between 1-3% in this period of time: Floreşti, whose population grew 2,9 times, from 1769 to 5198 inhabitants, with a growth of 3429 people (193,8%) and an annual growth rate of 23 people (1,3%); Jucu Herghelie (which was subject to separate census from 1956) whose population grew 1,5 times, from 311 to 479 inhabitants, with a growth of 168 people (54%) and an annual average growth of 4 people (1,2%); Gilău had a growth of population of 2,7 times, from 2150 to 5852 inhabitants, the absolute growth being of 3702 people (172,2%) and the annual average growth was of 24 people (1,1%).

Most of the rural localities in the Valley (12) had an annual average growth of population under 1%. Thus, in Luna de Sus the population grew two times, from 1014 to 2058 inhabitants, which means a growth of 1044 people (103%) and an annual average growth of 7 people (0,7%).

Three localities had an annual average growth of 0,6%: Iclod, whose population grew 2 times, from 939 to 1844 inhabitants, with an absolute growth of 905 people (96,4%) and an annual average rhythm of 6 people (0,6%); Mica, whose population also grew two times, from 349 to 684 inhabitants, with an absolute growth of 335 people (96%) and an annual average growth of 2 people (0,6%); Livada, whose population grew 1,8 times, from 544 to 1002 inhabitants, the absolute growth being 458 people (84,2%) and the annual average growth 3 people (0,6%).

Another three localities had an annual average growth of 0,5%: Răscruci's population grew 1,7 times from 909 to 1653 inhabitants, the absolute growth being 744 people (81,8%) and the annual average growth 5 people (0,5%); Mănăstirea's population

grew 1,8 times, from 420 to 737 inhabitants, the growth being of 317 people and the annual average rhythm of 2 people (0,5%); the third is Jucu de Mijloc which had a populations growth of 1,7 times, from 450 to 763 inhabitants, the absolute growth being 313 people (69,6%) and the annual average growth of 2 people (0,5%).

Bonțida had an annual average growth of 4%. The population grew 1,5 times, from 1807 to 2789 inhabitants and the absolute growth was of 982 people (54,3%) and the annual average growth was of 6 people (0,4%).

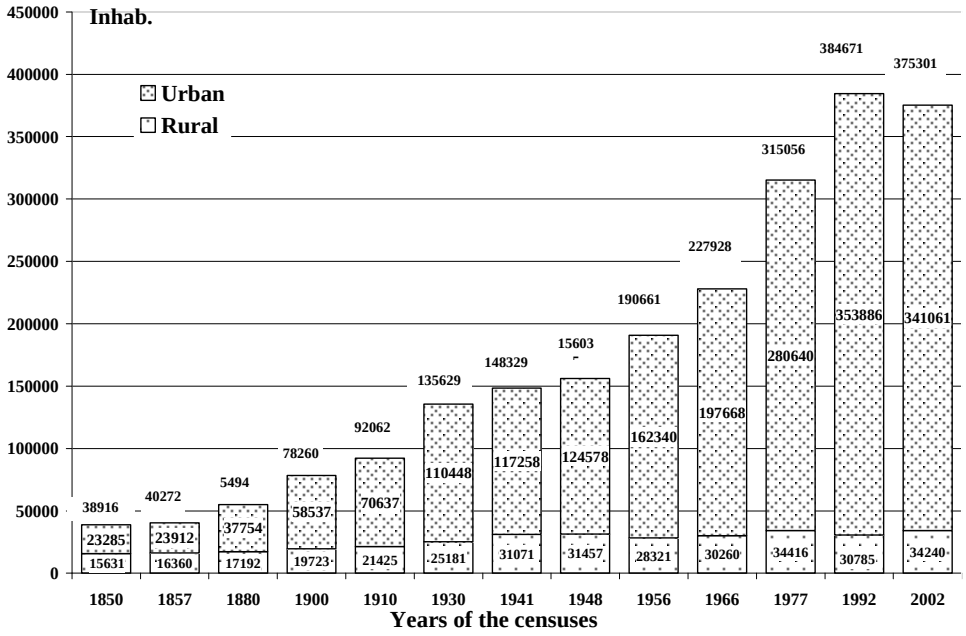


Fig. 6. The evolution of the population in the Someșul Mic Valley (total, rural and urban), between 1850-2002.

The next group of localities had a very small population growth, in the amount of 0,3%. These are: Jucu de Sus, including the population of the village Jucu de Jos, which was last subject to separate census in 1966, and whose population grew 1,5 times, from 1079 to 1588 inhabitants, thus having an absolute growth of 509 people (47,2%) in an annual average rhythm of 3 people (0,3%); the village Hășdate, which is in the administrative jurisdiction of Gherla, had a population growth of 1,5 times, from 226 to 329 inhabitants, with a growth of 103 people, the annual average rhythm being one person (0,3%), as well as the village Fundătura, which had a population growth of 1,4 times, from 497 to 715 inhabitants, thus having an absolute growth of 218 people (43,9%) and an annual average growth which is also one person (0,3%).

Two localities have an almost insignificant population growth during this period of time: Mintiu Gherlii, whose population grew 1,3 times, from 1173 to 1497 inhabitants, thus having an absolute growth of only 324 people (27,6%) and an annual average growth of 2 people (0,2%) and the village Salatiu, whose population grew 1,1 times, from 233 to 268 inhabitants, with an absolute growth of 35 people (15%) and an annual average growth of 0,1%.

Three localities from the valley find themselves in a special situation by having a *decrease* of the population's number. These are: the village Petreşti, whose population diminished from 284 to 267 inhabitants (approximately 94% compared to 1850); the village Iclozel, whose population decreased from 345 inhabitants in 1850 to 200 inhabitants in 2002 (under 60% relative to 1850) and the village Sub Coastă (first subject to separate census in 1956) whose population had the biggest downfall of all the 23 localities in the Valley, from 131 inhabitants in 1956 to 104 inhabitants in 2002 (79% compared to 1956).

3. CONCLUSIONS

The population of the Someşul Mic Valley over this century and a half increased *tenfold*, a phenomenon that was mainly due to the presence of the attraction pole which is Cluj-Napoca. This evolution wasn't uniform.

Thus, in the *urban* area, the population grew 14,6 times, whereas in the *rural* one only 2,2 times, therefore emphasizing the lack of balance between them. The urban area, whose infrastructure developed continuously, attracted like a magnet the working population, unlike in the rural area, where the investments were considerably lower, which determined this area to stay behind under all aspects, thus having a baneful influence in the demographic aspect as well. Therefore, if at the beginning of the period the amount of the rural population in the Valley was of 38,7% and the one in the urban area was of 61,3%, in 2002 the amount of the rural populations lowered to 9% and the urban one reached 91%. There were two exceptions from this evolution but they had no influence on this course of events which favoured the urban area. These happened between 1850-1857, when the rural population grew from 38,7% to 40,2%, with a decrease in 1880 to 30,1% and in the 1992-2002 interval, when the amount of rural population grew from 7,9% to 9%. This growth was caused by the decline of industry which absorbed the work-force, as well as by the exodus of the town-folk to the home villages or to the villages neighbouring the two towns in the Valley, and, last but not least, by the emigration in search of a place to work.

All this time, the sector whose population was predominant in the Valley was the *Cluj-Napoca-Gherla sector*, which has the widest area and the most localities, followed by the *Gherla-Mica sector* and then by the *Gilău – Cluj-Napoca sector*. The highest annual average growth rhythm (3,3%) of the Valley's population was in *the third stage* (1948-1992) and the lowest (-0,2%) in the last stage (1992-2002).

Also, the growth of the Valley's population was higher than that of Cluj county, which led to the gradual growth of the *amount of the Valley's population* related to that of the county, from 16,5% in 1850 to 53,4% in 2002. Thus, in 2002 the Valley had more inhabitants (375301) than the other part of the county (327454 inhabitants), the proportion being 53,4% to 46,6% in favour of the Valley.

BIBLIOGRAPHY

1. Maier, A. (2001), *Podişul Someşan. Populaţia şi aşezările*, Edit. Gh. Barițiu, Cluj-Napoca.
2. Pop, P. Gr., Bodocan, V. (1999), *Oraşele Transilvaniei în ultimul secol şi jumătate (1850-1999)*, Studia UBB, Geographia, 2, Cluj-Napoca.
3. Pop, P. Gr. (2007), *Judeţele României. Judeţul Cluj*, Edit. Academiei Române, București.
4. Pascu, Șt. (1974), *Istoria Clujului*, Consiliul Popular al Municipiului Cluj, Intreprinderea Poligrafică Cluj.
5. xxx *Recensămintele populației din 1850, 1857, 1880, 1900, 1910, 1930, 1941, 1948, 1956, 1966, 1977, 1992, 2002.*

STUDIA UNIVERSITATIS BABEŞ-BOLYAI, GEOGRAPHIA, LIV, 2, 2009

THE EVOLUTION OF THE NATIONAL STRUCTURE OF THE POPULATION IN THE CITY OF CHIŞINĂU

ELENA SOCHIRCĂ[1]

ABSTRACT. – The Evolution of the National Structure of the Population in the City of Chişinău. The historical particularities of the appearance and the development of urban settlements in the Republic of Moldova determined the inhomogeneous nature of the national structure of population. The migration processes of the 19th century particularly strengthened the multi-national structure of the urban population. Over time there were changes in the national structure of Chişinău, where a multi-national population lived. The history of Chişinău contains events, processes, phenomena, demographic reorganizations and changes that have affected and altered the structure of the original national population. Being started in 1812, when Moldova between Prut and Nistru was incorporated into the Russian Empire, the ethno-demographic processes in Bessarabia, and in particular, in the urban area would have to be supplemented with new features and particularities. From the national point of view, the population of the city of Chişinău is not homogeneous. According to the census conducted in 2004, representatives of over 95 nationalities lived in the city, although only representatives of four national groups (Romanians/Moldovans, Ukrainians, Russians and Bulgarians) had a share of more than 1%. The representatives of other national groups were rather small in number. The latest census data showed a uniformity of the national structure of the population. The greatest part of the population was represented by three national groups - Romanians, Russians and Ukrainians. The Gagauz and Bulgarians were present in a smaller number. The predominant population was, of course, of Romanian origin.

Keywords: *national structure, Chişinău, census, Romanian/Moldovan.*

INTRODUCTION

The national identity is the consciousness of belonging to an national group, which is revealed both in the relationship between individuals and in the interior forum of those belonging to the group. It is an ontogenetic process that supposes an individual building of the national identity along its cultural and human setting up, and a historical process, because it implies that each generation assumes a certain number of common traits of the original stock and, in its turn, adds new ones. The key features to identify an nationality are nationality and mother tongue.

The methodology and documentation are reduced to the use, as a primary source, of the population censuses conducted in Bessarabia. In many cases, the obtained data does not reflect the real situation. There is the so-called psychological mechanism in declaring nationality and mother tongue. Therefore, the critical analysis combined with the use of other information is

[1] *The Academy of Economic Studies of Moldova, Chair of Economical, Political and Socio-Human Geography, Chişinău, Republic of Moldova, e-mail: esochirca@yahoo.com*

a binding way in doing it. Another source of documentation on nationality consists of the monographs of historical, geographical, ethnographic, and linguistic character. As examples, we enumerate the studies on the Romanians and the national co-inhabiting in Bessarabia and also in Chişinău, written by Z. Arbore, I. Simionescu, I. Nistor, L. Berg and others.

In the evolution of the national structure of the population of the municipality of Chişinău we can highlight several stages. Delimitation of the stages was made according to the main historical events that had occurred on this area and as well as to the carried out censuses: *1. The period from the appearance of the settlement to 1897, the first census conducted by the Russian Empire; 2. The period from 1897 to 1939; 3. The period from 1939 to 1989; 4. The period from 1989 to 2004.*

1. THE PERIOD FROM THE APPEARANCE OF THE SETTLEMENT TO 1897, THE FIRST CENSUS CONDUCTED BY THE RUSSIAN EMPIRE

Until the mid-19th century there are no official statistics about the national composition of the population of the region and of the city of Chişinău. As a statistical reference point we considered the censuses conducted in 1772-1773 and 1774. Although these censuses were not aimed at highlighting the national national structure of the population of the Moldovan State, yet they offered some information about the nationalities that lived in this area and offered a more objective and exact assessment of the national structure of the population. According to the data presented by these censuses, the majority of the free population of the little market town of Chişinău was represented by Romanians/Moldovans (approximately 73%). The well-known historian Nicolae Iorga mentioned in one of his works that, "... the statistics from 1798 show Armenians, Jews, Serbs, Greeks, Lippovans ... in Chişinău". But their weight and number was insignificant, so that these Jewish and Armenian merchants, set here at the end of the 17th century, could not change the national appearance of the city. So, we can say with certainty that by the year 1812, Chişinău had been a pre-eminent Romanian settlement. Most changes in the national structure of the population occurred in the 19th century, after Bessarabia's annexation to the Russian Empire. The Romanian character of the population of Chişinău before the annexation of Bessarabia was attested in the works of many scientists, also of Russian origin: A. Zashciuk, N. Lashkov, V. Zelenciuk etc. N. Lashkov in his work "*Бессарабия. К 100-летию присоединения к России 1812-1912" (Bessarabia. After 100 years of annexation to Russia 1812-1912)* mentioned that "the basic nationality, the most rooted in these lands is made up of Moldovans."

In the 19th century, the study of the national structure of population became difficult because of lack of complete and systematic data, the non-conformance of data in various sources, the presence of exaggerate and subjective data. As a rule, the censuses carried out in Bessarabia did not indicate the national structure of the population. Therefore, the data obtained from various secondary sources reduced their reliability, especially due to the fact that different information for the same year was given by different sources and by different researchers. A clearer statement of the national structure of the population appeared only in 1897. But for this census the spoken language, but not nationality was taken into account in determining the national structure. However, the percentage and number of the national structure of the population of the city of Chişinău were rendered in 1844, 1860, 1862, 1894, 1902, and 1918, and by the censuses conducted in 1897, 1930, 1959, 1970, 1979, 1989, and 2004.

In the mid 50's of the 19th century, the Russian scientist V. Kabuzan showed the following national structure of Chişinău: 30% Romanians/Moldovans, 47.2% Jews, 8.3% Russians and 7.5% Bulgarians. These data are considered "far from accurate." Z. Arbore presented the data from Census 1860. According to them the share of Romanians in the city was a little greater - 50%. This value was lower than the share of Romanians in the county of Chişinău. It constituted 79.4%. The share of Jews grew to 20%, and that of the Russians was of 10%. The same data are presented in the work "Istoria Kishinewa".

The data presented in Table 1 indicate a dramatic decrease in the number of the Bulgarians and Moldovans in a very short period of time and a spectacular increasing of the share of Russians. We tend to believe that these data are of tendentious character, and the share of the population of Russian origin is overstated. In the years reflected in the table there was no census, and the data were of a subjective nature.

The national structure of the population in the city of Chişinău between 1844 and 1862

Table 1

Census	Romanians/ Moldovans	Jews	Russians	Ukrainians	Bulgarians	Other nationalities
1844	37.4	30.1	9.0	10.7	6.3	6.5
1862	19.6	24.6	36.8	13.8	1.4	3.8

Since the end of the 18th century, in Chişinău the share of the population of Jewish origin increased. Originally, the settled here Jews were migrants from the western (Austrian and Polish) provinces, the cities of Hotin, Tighina, Izmail, and others. In the 20-30's of the 19th century the inflow of Jews from the Ukrainian provinces and Crimea increased. The first information about the existence of the Jews in Chişinău was given by D. Cantemir in "Cronica vechimii romano-moldo-vlahilor" (The Chronicle of the Age of the Romanians from Moldova, Transylvania and Walachia) and reflected the situation at the beginning of the 18th century. In 1774, 540 Jews (7% of the population of the city) lived in Chişinău. They were an nationality with a high degree of urbanization (47.8% in the urban areas of Bessarabia and 45.9% in Chişinău in 1897). It can be explained by the fact that the Jews were forbidden to establish in rural areas, to rent land and to employ in agriculture. An exception was only a few Jewish colonies, among them Hulboaca and Gratiesti, and nowadays included in the municipality. The establishment of Jews especially in the urban areas of the province was conditioned by the policy of colonization promoted by the Russian Empire. We must mention that the legislative measures taken by the Russian Empire at the beginning of the 19th century contributed to the preservation of the religious and cultural identity of the Jews if we compare them to the rest of Bessarabia's population. Between 1837 and 1843 the Russian government has decreed a large number of "Imperial ukases", due to which there were given many advantages both to the indigenous population, and especially, to the foreigners wishing to settle in Bessarabia. The High Ukase given to the governing Senate on 26 September, 1830, granted all Jews willing to settle in the cities of Bessarabia a number of commercial facilities such as free certificates of commercial release for a period of two years and no taxes for a period of five years. Another ukase on 22 December, 1832, allowed the settlement of peasants and people of other ranks who do handicrafts or trade in the cities of Bessarabia. In 1839 there were introduced a number of facilities, exclusively only for Chişinău, this one becoming attractive for a large number of Jewish traders. Pursuing the denationalization of the Romanian land between Prut and Nistru, the Russian government did not stop at the

organization of the immigration process of the population of Jewish origin, but offered its protection to all foreign immigrants, opening for them the borders of the new province. Therefore privileges given to the Jews were also offered to the foreign traders, who received the Russian citizenship and settled in Bessarabia, particularly, in the urban areas of the province.

After 1812, in Chişinău, the number of the Armenian increased (from 363 to 700 in 1841), as well as that of the Greek (from 146 to 247 in 1841). The Armenian had settled in Bessarabia since the times of Alexander the Good, who allowed them to settle in the cities of Chişinău, Orhei, and Hotin. Since in 1809, 113 Armenian families were registered in Chişinău, the 2nd after the city of Ackerman according to the Armenians' share of the total population. In accordance with the legislation, the Armenian had no right to hold leadership positions, so they went in for trade and handicraft. According to 1897 Census, in Chişinău there were concentrated 17.7% of all the Armenian from Bessarabia. After the inclusion of Bessarabia in the Russian Empire, the Armenian obtained Russian citizenship.

An nationality whose representatives were increasing in number is the Bulgarian. A group of Bulgarians established in Chişinău even before the Russo-Turkish war of 1806-1812. Z. Arbore highlights the existence of 521 Bulgarian families in 1819. However, in the 1897 Census the share of Bulgarians was of only 0.9%.

In the second half of the 19thcentury, although the number of population was increasing on a high rate, the ratio between the national groups was changing slowly and insignificantly due to the fact that the migration of population slowed down and the number of inhabitants was on natural increase. This situation continued until the end of the century.

The degree of urbanization of various national groups was determined by certain factors. The large share of the representatives of the Russian nationality was conditioned by the presence of a large number of officials and soldiers (also their families) in the city, and by the Russian language as language of communication. Thus they had to cover all areas of public activity (administrative, educational, financial, and other institutions). The 1897 Census took into account the spoken language and assigned to the category of "Great Russians" the inhabitants belonging to different national groups, but using Russian as a means of communication. As an argument related to the above mentioned situation was the statement of William Mc-Michael (1817) quoted by N. Iorga, "Regarding the representatives of the Russian nationality, there are no others than the officers who walk along the streets of Chişinău."

V. Butovici (1916), the researcher of the ethnographical processes in Bessarabia, made a statement in connection to this fact, "The fourth in number, the real share of "the Grand Russians" nationality is lower than that one mentioned in the carried out censuses since the intellectual elite in the province is attributed to this nationality and uses the literary Russian language as a means of communication". An argument were the data of the Encyclopedic Dictionary from Sankt-Petersburg published a few years before the 1897 Census, where they wrote that almost half of the population of Chişinău are Moldovans - 54,000 (42%), followed by Jews - 26,120 (20.3%).

The low degree of Moldovans' urbanization was determined by the migration processes of the 19th century, when the increase of urban population occurred mainly due to the colonization policy approved by the state, and less due to the influx of rural population. The influence of the Russian Imperial administration in Bessarabia affected especially the national structure of urban population.

The officials of the Russian Empire aimed at knowing, from the demographic point of view, the numerical evolution of the population, its social and religious structure, but not

the national one, although this empire included a conglomerate of national groups. This was an explanation of the poor Russian statistics referring to this kind of information. The tendency not to reflect the national aspect of Russia's population had an undesirable impact on the general census of population in 1897. The Soviet demography emphasized that "the insufficient ethnographic study of Russia's population", as well as other causes "conditioned a series of lack of precision of the statistical data from the 1897 Census regarding the national structure of Russia's population, a circumstance noticed by many researchers."

The colonization policy with heterogeneous elements affected first of all the urban population. At the end of the 19th century (the 1897 Census), the greatest share in the national structure of the population was of the Jews - 45.9%, followed by the Russians - about 27%.

Doing a comparative analysis of the national structure of the city's population during 1844-1897 we noticed that the share of the population of Romanian origin decreased twice - from 37.4% to 17%, and the share of the population of Jewish and Russian origins increased. According to the 1897 Census the most urbanized nationalities of the province were the Russians, the Poles, and the Jews.

The national structure of the population of the city of Chişinău according to 1897 Census

Table 2

Census	Romanians	Ukrainians	Russians	Jews	Gagauz[2]	Bulgarians	Poles	Other nationalities	Total
1897	19,081	3,393	29,299	49,829	38	925	3,247	2,671	108,483
	17.6 %	**3.1 %**	**27.0 %**	**45.9 %**	**-**	**0.9 %**	**3.0 %**	**2.5 %**	

There was a direct connection between the level of urbanization and the degree and power of nationalism. It was significant, in this context, the national structure of Bessarabian cities, which proves the modest urban presence of the Moldovans. However, the Moldovans, if settled in an urban area, used to settle in outlying districts. In the urban areas - lack of national cohesion, whose basis was irreversibly destroyed since 1812. During the 19th century the basic trend in the ethno-demographic process evolution was the decrease of the Romanians/Moldovans' share in the total population, although the number of the representatives of this nationality was constantly increasing, especially at the beginning of the 20th century. The interest in this geographical area from the part of the Russian Empire largely influenced the national structure. The representatives of many nationalities were encouraged by it to populate the territory between Prut and Nistru. Thus they were tempted by the colonization policy and the benefits offered to them (religious freedom, agricultural land, the liberation from military obligations etc.).

[2] *Gagauz - Orthodox Turks in Dobrudja or South Bessarabia.*

2. THE PERIOD FROM 1897 TO 1939

This was the time between two censuses that included the Union of 1918 and the incorporation of Bessarabia into Romania, changes and implications in the national structure of the population of Chişinău.

Despite a deliberate process of denationalization methodically promoted by the Imperial Russia's governments during the 19th century, the population of Bessarabia had been retaining a strong Romanian character, so that Romanians/Moldovans continued to hold a majority of 64% of the total population. However, the consequences of the tsarist colonization policy of Bessarabia with heterogeneous elements in order to create a multinational component of the population were obvious, especially for the urban settlements. In the opinion of Prof. St. Ciobanu, "During the 19th century, Chişinău appeared as a foreign city for Russians, mainly inhabited by Romanians and Jews".

At the beginning of the 20th century, the majority of the population of Romanian origin was concentrated in rural areas. In 1900-1901, we found a distribution of the population according to the nationality in Gh. Codrean's work, *Bessarabia, istoriko-geograficheskii ocherk (Bessarabia, a Historical and Geographical Essay)* "in 1900-1901 in Chişinău live 116,120 persons, inclusively Moldovans - 37,556 - 32.3%, Jews - 33,520 - 28.86%, Little Russians - 18,762 - 16.15%, Grand Russians - 16,700 - 14.38%, Poles – 2,920 - 2.51%, Armenians – 2,440 - 2.1%, Gypsies – 1,600 - 1.37%, Greeks – 1,260 - 1.08%, Germans - 660 - 0.56%, Bulgarians - 650 - 0.55%, Swiss – 40, Arnauts[3] - 12. Another situation was described by the Z. Arbore a year later: "In 1902, in Chişinău (131,300) lived more than 60 thousand Jews, 70 thousand Russians, Carpatho-Russians, Serbs and Bulgarians and only nearly 25 thousand Romanians." Although a census was conducted in 1897, the data presented by Gh. Codrean and Z. Arbore differed from one another and from the Census' data. The data provided by Z. Arbore were as percentage and numerically closer to the data of the census of 1897.

Between 1903 and 1905, the wave of pogroms against Jews that involved Russia and, then, Chişinău, did not affect the ratio and number of the representatives of this nationality. In the long run, all trade of the county, the capital, the industrial life, more required professions ended up in the hands of the Jews.

The national structure of Chişinău in the 20th century was pre-eminently determined by migration processes. The intensification of the demographic processes, especially of migration, under the influence of urbanization led to the complication of the national structure of urban population.

Year 1918 was a decisive moment in the formation of the Romanian National Unitary State by including all the Romanian territories, held until then under foreign domination. By adopting the Declaration by Sfatul Țării on the 27th of March/the 9th of April 1918, the population of Bessarabia voted the union with Romania according to the principle of peoples' self-determination. At the moment of Unification it was not exactly known neither the number of inhabitants, nor the ratio of nationalities of the population. It was known that the population of Romanian origin had the majority. The Regional

[3] *Arnaut - An inhabitant of Albania and of neighboring mountainous regions, specifically one serving as a soldier in the Turkish army.*

Statistical Service in Bessarabia determined the national structure of the population of Chişinău in 1919: Romanians constituted 30%, almost twice if compared to the data from the 1897 Census; the predominant nationality continued to be represented by Jews - 46.6%. Indeed, a large number of refugees coming in Bessarabia in the early years after the Union were the Jews. Their number reached in the autumn of 1921 nearly 21 thousands, and most of them settled in Chişinău (nearly 18 thousand persons). The data of 1919 also highlighted the presence of a large number of Germans (10,000 or 7.5%). These statistics were regarded by Prof. St. Ciobanu "far from the truth." The last figures (according to Prof. St. Ciobanu), as a result of the lack of Registrar Offices and of some general adequate population censuses in Chişinău, "cannot be considered even approximate" as the number of Germans was exaggerated, the number of Poles, Armenians and Greeks was missing, and the number of Bessarabian Romanians was intentionally reduced. According to some Russian statistics, in 1894-97, in Chişinău there were 54.8 thousand Bessarabian Romanians, which was nearly half of the city. Thus the number of natives, despite all artificial and directed colonization processes under the leadership of the Imperial Russian administration, and, later, of the Soviet Russian one, continued to increase in absolute number. Although in some years their percentage decreased, it always numerically prevailed if compared to any allogeneous group established there many centuries later.

The national structure of the population of the city of Chişinău according to the 1897 and 1930 Censuses

Table 3

Census	Total	Romanians	Ukrainians	Russians	Jews	Gagauz	Bulgarians	Poles	Other nationalities
1897	108,483	19,081	3,393	29,299	49,829	38	925	3,247	2,671
		17.6 %	*3.1 %*	*27.0 %*	*45.9*	-	*0.9 %*	*3.0 %*	*2.5 %*
1930	114,896	48,456	563	19,631	41,065	34	541	1,436	3,170
		42.2 %	*0.5 %*	*17.1 %*	*35.7*	-	*0.5 %*	*1.2 %*	*2.7 %*

This situation had changed by the 1930 Census. Table 3 shows the changes in the national structure of Chişinău between 1897 and 1930. The most notable change undoubtedly was the almost tripled share of the Romanian population from 17.0% in 1918 to 42.2% in 1930. Moreover, one could notice a decrease in number of the population of Jewish origin.

However, in the inter-war period, Prof. Ion Simionescu characterized Chişinău as "an national mosaic, planted on the Romanian fund." Chişinău became to his opinion "completely alienated," in which the foreign language thrust so deep roots even in the homes of the Moldovans, that today it is difficult to be entirely replaced." In this context Prof. St. Ciobanu remarked in 1925 that "Bessarabia's towns are totally alienated to the soul of the Romanian people between Prut and Nistru; ...the commercial and industrial Chişinău, composed of a conglomerate of nationalities, Jews, Armenians, Greeks, Bulgarians, Russians, etc., does not have an ethnographically precise physiognomy. Over these nationalities it had past the gilding of the Russian culture, and they lost their national origin, but could not rise to the level of the genuine Russian culture. Conglomerate of nationalities gathered at a place by

a foreign regime, which has destroyed their national origin, without giving anything in turn, has broken down their connection with their national culture…".

In 1915, Prof. Ion Simionescu reflected the presence of over 13 national groups in varying proportions in the city of Chişinău. Still, during this period the share and the number of Russians and Ukrainians reduced as a result of the migration processes. This decrease was evident, especially, for the Ukrainians, from 5.3% (1918) to 0.5% (1930). The sudden decrease in the share of the Ukrainians not only in Chişinău, but all around Bessarabia was explained by the fact that during the first years after the province was made a part of Romania an important part of the Ukrainian masses left Bessarabia.

The 1930 Census showed certain reminiscences of the colonialist policy promoted by the Russian Empire in the years of its dominance. Besides the prevalence of different nationalities in Chişinău, we underlined the fact that the people with Romanian conversational language had a lower ratio than the entire Romanian population. This situation pointed out that a part of the inhabitants of Chişinău, though they had identified their nationality as Moldavian, continued to use another language, usually, the Russian one.

3. THE PERIOD FROM 1940 TO 1989

This period was characterized by radical changes in the national structure of the population. It was a period disturbed by tragic political and military events: the Soviet occupation of Bessarabia in 1940-1941 followed by the setting up of MSSR; the taking back of the territory by Romania (1941-1944) during World War II; the next Soviet occupation in 1944; the famine of 1946-1947. All these caused the transfer of population, deportations, and systematic colonization, and, at the same time, the genocide of some national and social groups. The development of MSSR as part of the USSR was the period of forced emigration of the native population and the intense immigration to MSSR of the population from the Soviet area for reasons of necessity of specialists for the industrialization of the country. These events had directly influenced the national structure of the urban population, especially of Chişinău - the most attractive urban centre of MSSR.

World War II and the establishment of the communist regime in the Republic of Moldova engaged the national structure of the population of Chişinău in substantial changes. First of all, the Russian and Ukrainian population increased up to 32.2%, and to 12% of the total population of the city (in 1959), respectively. This increase would seem unnatural if we did not take into account the steady decrease of the share of the Romanian and Jewish population. Their place was taken after the war by many immigrants from the Soviet area. This conditioned the increase of Russian and Ukrainian population in the following decades. The massive inflow of personnel from other republics of the Soviet Union was a defining moment for the scale and intensity of russification of the administration of Chişinău. The new comers - officials from the USSR - usually settled in urban centres, which made the russification of the cities to be faster than that of the countryside. Human losses during World War II were partly set off by the arrival in the country and in the city of the population of other nationalities. The over-increased necessity of qualified human resources in the postwar years could not entirely be satisfied on the account of the local population, mostly an agricultural one. Therefore conditions appeared for the intensive migration of the labour force from central regions of the USSR into MSSR. The absolute majority of immigrants was made up by the Russians, the Ukrainians and the Byelorussians who settled mostly in the city of Chişinău. In the period from 1930 to 1959, the share of the Romanian population decreased from 42.2% in 1930 to 32.3% in

1959, although this decrease was more dramatic in the postwar years. The reasons for this percentage decrease were broadly ranked by V. Trebici (1991), Al. Ungureanu (1997) who brought a few additional details: the human losses during World War II, that was the natives enrolled in either the Romanian or the Red Army and fallen on the battle fields or dead in the prisoner camps; the famine of 1946-1947; the refuge movements to Romania; the deportations and assassinations of the Romanian population by the Soviet regime in 1940-1950 (according to V. Dobrinescu and I. Constantin, about 300,000 deported persons from Bessarabia, 25,000 of them from Chişinău); losses among the civilian population, caused by deprivation and epidemics; stimulated and forced emigration of the Romanians' "volunteering" to work in various regions of the Soviet Union.

Also practiced by the tsarist regime before the Soviet one, the deportations were the most efficient and, at the same time, savage administrative method used to denationalize the national groups. Condemned by all civilized peoples, the deportations were the most direct attack against the national substance of the Romanians in Bessarabia.

The national structure of the population in the municipality of Chişinău from 1959 to 1989

Table 4

Etnicity	1959	1970	1979	1989
Romanians/ Moldovans	70,688	137,942	213,541	366,468
	32.7 %	*38.0 %*	*42.3 %*	*51.4 %*
Ukrainians	26,012	51,103	75,752	98,190
	12 %	*14.0 %*	*15.0 %*	*13.7 %*
Russians	69,632	110,449	151,795	181,002
	32.1 %	*30.3 %*	*30.0 %*	*25.3 %*
Jews	42,936	49,930	42,350	35,787
	19.8 %	*13.7 %*	*8.4 %*	*5.0 %*
Gagauz	1,476	2,666	3,790	6,155
	0.7 %	*0.7 %*	*0.7 %*	*0.9 %*
Bulgarians	1,811	3,855	6,039	9,224
	0.8 %	*1.1 %*	*1.2 %*	*1.3 %*
Other nationalities	4,541	7,996	11,782	17,221
	1.9 %	*2.2 %*	*2.4 %*	*2.4 %*
Total	**217,096**	**363,940**	**506,000**	**714,928**

Obviously, the highest demographic deficit was recorded by the Jewish population. During 1918-1940 the Jews in Chişinău suffered of anti-Semitism, but their number increased due to the Jews who run away from the Ukrainian pogroms during the Civil War. Depriving many Jews in Chişinău and Bessarabia of citizenship (1924), the state authorities condemned them to misery. In spite of the social and institutional anti-Semitism, the cultural activity and Jewish associations knew a broad development in Chişinău. Since 1940 most Jewish institutions were closed and the Zionist activity prohibited. Among the many imprisoned and exiled inhabitants of Chişinău there were thousands of Jews. The decreasing number of Jews started immediately after World War II. About 70 thousand Jews lived in the city before the Nazi occupation of Chişinău (July, 1942). At the same time with the entrance of the German troops on the 16th of July 1941, in the city started a pogrom that lasted several days. In early August the Jews from Chişinău were moved to camps and ghettos. About 53 thousands died. The Jews started their exodus immediately after the establishment of the communism and the set up of the state of Israel. The number of Jews who remained in Chişinău has continuously decreased over the years.

A complete analysis of the evolution of the number of the Romanians in Bessarabia, inclusively Chişinău, during the mentioned period should consider the following factors:

the Romanian refugees in 1940 and 1944; the Romanians deported in 1940-41 and after 1944; the Romanians assassinated in 1941; the Romanians died in the Soviet gulags; the Romanians enrolled in the Red Army in 1941 and 1944-45 and the evaluation of the number of the dead and of the missing ones; and the evaluation of the results of the denationalization process of the Romanians that lead to their decreasing in number. Unfortunately, the contribution of these factors to the numerical evolution of the Romanian population was known fragmentarily, without having – as it is desirable – the quantitative expression of each part. In the Soviet literature, we found data on the number of people who died during the war in Chişinău (1941-1944) - nearly 20 thousand people, and taken into exile by fascists - over 10 thousand people. There are no data on the number of people who were deported to the Soviet concentration camps and of those enrolled in the Red Army. By 1945 in Chişinău there were registered one sixth of the people who had lived here until the beginning of the war.

During 1959-1979, the Ukrainians increased from 12% to a maximum of 15%. From 1979 a steady decrease followed, a slow and continuous one, of the representatives of this nationality. In the 1989 Census the Ukrainians had a share of 13.7% and in 2004 it was of 8.3%. The evolution of the Russian population was similar to the Ukrainian one, and had a slow decrease from 30.3%, in 1970, to 25.3%, in 1989. This decrease was a result of the emigration of a significant number of the representatives of these national groups after the independence of Moldova.

Data from table 4 indicate a continuous decrease of the Jews. In the period from1959 to 1989 their share fell with 14.8%, but there was recorded a slight increase of the representatives of the Gagauz and of the Bulgarian nationalities. At the same time, at the category “other nationalities”, we noticed an increase in the degree of inhomogeneity, from 45 national groups, in 1959, to 70 national groups, in 1989.

4. THE PERIOD FROM 1989 TO 2004

The transition period of the ex-communist territory of the Central Europe had caused a number of great and thorough changes not only in the political, economic, and social fields, with effects more or less positive on the quality of life, but also on the national structure and the inter-national relationship in mixed communities.

The census conducted in 1989 showed the increasing share of the population of Romanian origin, along with the decrease of the ratio of other national groups. Thus, the Romanians/Moldovans accounted for 51.4% of the city in 1989, recording an increase of 9.1% as compared to 1979. Although the Russian and Ukrainian population increased in number between 1979 and 1989, their share of the total population decreased to 25.3% and 13.7%, respectively.

The data from the 2004 Census, the first one after the collapse of the socialist-communist regime give us the image of the national and religious structure after the totalitarian regime’s decade, which also marked the demographic evolution. We noticed a strong decline to almost quasi-extinction of the Jews. The share of Jews continued to be declining, but the decrease in this period was not as dramatic as it was observed in the previous one, or the one that followed. The share of Jews decreased from 41,065 (35.7%) in 1930. During the 2004 Census, the Jews were included in the category of “other nationalities”, their share, being very small, was included in 11,605 (1.6%) other nationalities.

Apart from slow decrease in number since the middle of the 20th century, the ratio of only 5.0% of the total population, as the Jews were representing in 1989, had some socio-political factors like deportation to camps and work camps in Germany during World War II, etc. On the other hand, beyond the lower birth rate of this nationality, it should be mentioned the massive emigration after 1948 towards the State of Israel that had contributed to the enhancing of Jewish population's decrease in Bessarabia, including Chişinău.

The data from the 1959, 1970, 1979, 1989, and 2004 Census showed that the share and number of the Romanian population increased. It increased from 32.2% in 1959 to 72.1% In 2004. Its rate of increase was higher than that of other national groups. The data from the 2004 Census did not announce significant changes in the national structure of the city from those of the 1989 Census. The increase of the Romanians' share took place due to a slight decrease of the Ukrainian and Russian population. It is obvious the numerical regress of Jews due to their emigration. Gagauz and Bulgarians were characterized by stability. Their share and number remained virtually unchanged.

National minorities registered in the municipality of Chişinău from 1989 to 2004 (in %)

Table 5

Nationality	1989	2004	Nationality	1989	2004
1. Byelorussians	36.9	22.3	10. Georgians	2.9	2.4
2. Jews	basic	22.9	11. Chuvashes	2.2	1.1
3. Poles	6.2	7.3	12. Azerbaidzanies	4.6	3.1
4. Armenians	7.1	7.5	13. Uzbeks	3	1.1
5. Tartars	6.9	4.1	14. Kazaks	1.9	0.7
6. Germans	4.2	6.4	15. Arabians	0.1	2.0
7. Greeks	1.5	2.4	16. Turks	-	0.9
8. Mordvans	1.7	0.5	Other nationalities	17.6	10.9
9. Gypsies	3.2	4.4	**Total national minorities**	**100**	**100**

Regarding the evolution of national minorities, their share was actually reduced at all mentioned nationalities except Poles, Germans, Greeks, and Gypsies who experienced a slight increase. The largest decrease was established for Byelorussians, Mordvins, Uzbek, Tartar, and Chuvash as a result of their emigration to the native countries. Among other national groups, it should be mentioned the growing number of Arabians (from 0.1% in 1989 to 2.0% in 2004) and Turks (0.9% in 2004).

According to the general population census conducted in the republic in 2004, the major population in the most urban areas of the municipality of Chişinău was formed by Romanians/Moldovans - 69.9%, whose share rose from 50.9% in 1989, followed by Russians - 15.1% and Ukrainians - 8.8%. In the rural area the share of Romanians was 92.6%, increased with 4.5% from Census 1989. In all urban areas of the city the share of Romanian population increased. The greatest increase occurred in Chişinău - with 19.5%, and Vatra - with 19.2%. The Romanian population represented majority in Sangera - 94.8%, Durlesti -88.9%, and Codru - 84.9%, and only in Vatra the share of the Romanians was the lowest - 68.1%.

In all rural areas of the city, with the exception of three villages, the population of Romanian origin holds a share of more than 80%. For example, in the village of Fauresti the Romanians constitute 98.9% of the total population, in the village of Revaca - 98.6%, in the village of Cruzesti - 98.5%. In three rural areas of the city the Moldavians' share is less than 80% of the total population: Buneti (70.2%), Goian (79.0%) and New Goian (65.3%). In the village of Buneti it is higher the Ukrainians' share - 28.1%, but with 22.5% less than in the census of 1989. In the village of Goianul Nou in 1989 the representatives of the Ukrainian nationality had a share of 39.5% and of the Romanian nationality - 54%, in 2004 the share of the Romanians has increased to 65.3%, while that of the Ukrainians decreased to 24.2 %. The share of the Russians is 8.1%.

The population of the municipality of Chişinău according to their mother tongue (in %)

Table 6

Nationality	Known and spoken											
	Own national language				The Romanian language				The Russian language			
	1959	1979	1989	2004	1959	1979	1989	2004	1959	1979	1989	2004
Romanians/ Moldovans	91.2	87.5	88.9	91.2	-	-	-	-	8.5	12.5	10.9	8.6
Ukrainians	55.3	45.9	41.2	30.5	09	0.9	1.6	4.7	43.8	53.1	57.1	64.6
Russians	99.6	99.6	99.4	98.0	0.3	0.3	0.5	1.8	-	-	-	-
Gagauz	67.5	57.7	59.5	55.9	9.5	5.2	6.0	6.5	22.7	36.8	34.2	36.1
Bulgarians	55.7	48.1	47.3	43.2	4.7	2.8	3.7	9.3	38.9	48.8	48.5	46.9
Jews	43.1	28.8	22.3	9.9	0.7	0.4	0.8	7.0	55.7	70.5	76.5	82.1

The increase of the share of the Romanian population in the urban and rural areas of Chişinău was a result of Moldova's independence (1991), the awakening of the national consciousness of the Romanian population and not only, the increased interest in the Romanian language and the Moldavian culture, not discouraged any more identity of the official population. Another cause would be the migration of Russian and Ukrainian population to their native places or the involvement of a significant number of representatives of the Russian nationality in the Moldavian linguistic and cultural environment.

Closely linked to nationality was the mother tongue. Defining for the national identity through culture and membership to the spiritual models language may lead to the assimilation or the estrangement of some nationalities. In the 2004 Census, the number of people who identified Romanian/Moldovan as their mother tongue was of 482,5 thousands or 67.7% of the population of the municipality of Chişinău; 475.8 thousands or 98.6% of them were Romanian/Moldovan. To be noticed that a number of 36.8 thousands Moldovans and 37.2 thousand Ukrainians identified Russian as their mother tongue. But 1.9 thousand or 1.9% of Russians declared the Romanian/Moldovan language their mother tongue. The national minorities that highly use the Romanian language as their mother tongue were Gypsies (31.9%), Germans (11.5%), Poles (8.0%), and Ukrainians (4.9%).

The analysis of table 6 highlighted that in the 70's – 90's of the last century it was noticed the linguistic assimilation of the indigenous population, and of other national groups co-inhabiting in the municipality. The ethno-linguistic assimilation power of the Russians proved to be much higher than that of Moldovans, demonstrating a remarkable resistance. In the 1959 Census, nearly all the Russian population spoke Russian and only 0.3% knew and spoke the Moldovan. This trend has been preserved until now; however, registering an insignificant increase of the ratio of the Russians who speak Romanian - 1.9% in 2004. The Russians and other minorities did not consider a necessity to learn Romanian because they identified themselves with the victorious nation who was not obliged to know the language of the natives. Although all Moldovans knew their mother tongue, the fields of its use were reduced more and more obviously. This was very strong in the municipality where the process of Russification was more accelerated. The language began to be considered by an important part of Moldovans, especially, of those moved to the city, an archaic thing, more convenient from the social point of view, to get rid of. The Moldovans allowed to be assimilated from the ethno-linguistics point of view, so that in the 1979 Census, 12.5% of Moldovans spoke Russian. The process of russification intensified in the first post-war decades and extended to other national groups which established in the municipality. The phenomenon was explained by the Soviet sociologists by intensified socio-cultural contacts and the use of the Union's Russian language from generation to generation, so that mother tongues were less and less used by some nations, particularly Ukrainians, Gagauz, Bulgarians, and others. For example, in the 2004 Census, 65% of Ukrainians, 47% of Bulgarians, and 82% of Jews living in Chişinău consider Russian their native language. The ratio of Moldovans who consider Russian language as mother tongue reduced from 10.9% in 1989 to 8.6% in 2004.

The national diversity of the population has been, for 15 years, in a process of decreasing in the municipality, a process to which it contributed first of all the increase of the Romanians' percentage, the net decrease of the Hebrew, Ukrainian and of the Russian communities, which, although, had been living in Chişinău for several generations left irreversibly for their countries of origin. The national structure highlighted the fact that throughout the 20th century the population of Romanian origin had been constantly increasing along with a corresponding decrease of other minorities.

The Romanian population had increased in number and percentage from 69,722 persons/32.2% (1959) to 513,520 persons/72.1% (2004). Over the time the share of Romanians increased and this was not due to a higher birth rate, but due to an emigration movement of the minorities (especially of Jews, and recently of Russians and Ukrainians) and to the process of assimilation, that was many mixed marriages that produced children declared more often as Romanians. The emergence of national minorities in Chişinău was the result of the colonization processes of the province of Bessarabia, and especially of the cities, by the Russian Empire and that took place over the 19th century.

During postwar period the external migration directly influenced the national structure of urban population. Thus, if the Romanians in the rural settlements made up the majority (80-90%) of the population, in the municipality this index was 72.1%. Another particularity of the national structure was that during the 20th century, the Jews were on a constant regressive line.

CONCLUSIONS

Keeping the national identity in the evolution of events means the maintenance of self-consciousness, personality's integrity on the background of profound changes, having as

a support the general human values that have provided and ensured the perpetuation of the human species beyond inauspiciousness of the historical circumstances. National identity is not a process ended once and for all, it is an open process available for each individual and generation. This suggests the interaction between the individual and collective identities in a psycho-social process that preserves the essential features of both processes.

REFERENCES

1. Arbore, Z. (2001), *Basarabia în secolul XIX*, Edit. Novitas, Chişinău.
2. Arbore, Z. (2001), *Dicţionarul geografic al Basarabiei*, Edit. Museum, Chişinău.
3. Cazacu, P. (1992), *Moldova dintre Prut şi Nistru 1812-1918*, Edit. Viaţa Românească, Iaşi.
4. Ciobanu, Şt,(1996), Chişinăul, Edit. Museum, Chişinău.
5. Constantin, I. (1994), *Basarabia sub ocupaţie sovietică de la Stalin la Gorbaciov*, Edit. „Fiat Lux", Bucureşti.
6. Enciu, N. (1996), *Populaţia Basarabiei în perioada interbelică,* Academica, N3, Bucureşti.
7. Iorga, N. (1912), *Basarabia noastră*, Edit. Neamul Românesc, Vălenii de Munte.
8. Simionescu, I. (1925), *Oraşe din România*, Edit. Cartea Românească, Bucureşti.
9. Trebici, V. (1991), *Basarabia şi Bucovina*, Academica, N12, 4 p.
10. Ungureanu, A. (1996-1997) *Aspects géographiques de l'évolution de la structure ethnique de la population de la République de Moldavie dans les années 1930-1970*, Analele Ştiinţifice ale Universităţii „Al. I. Cuza" Iaşi, Tom XLII-XLIII, s.II.c.Geografie, 1.
11. Бабилунга, Н. (1990), *Население Молдавии в прошлом веке: миграция? ассимиляция? русификация ?*, Edit., Штиинца, Кишинёв.
12. Берг, Л. (1918), *Население Бессарабии. Этнографический состав и численность*, Петроград.
13. Бутович, В. (1916), *Материалы для этнографической карты*, Киев.
14. Защукъ, А. (1862), *Материалы для географии и статистики Россіи, Бессарабская область*, первая часть, Санкт-Петербург.
15. Зеленчук, С. (1973), *Население Молдавий*, Edit. Штиинца, Кишинёв.
16. Жуков, В. (1975), *Города Бессарабии (1861-1900 гг.)*, Edit. Штиинца, Кишинёв.
17. Кабузан, В. (1974), *Народонаселение Бессарабской области и левобережных районов 18. Приднестровья (конец XVIII - первая половина XIX в.)*, Editura Штиинца, Кишинёв.
18. Кодрян, Г. (1901), *Бессарабия, историко-географический очерк*, Кишинёв.
19. Лашков, Н. (1912), *Бессарабия. К 100-летию присоединения к России 1812-1912*. Кишинёв.
20. Матей, К., Прока, В. (1985), *География населения Молдавской ССР и демографические процессы*, Edit. Штиинца, Кишинёв.
21. ***(1997), *Chişinău, Enciclopedie*, Edit. Museum, Chişinău.
22. ***(1996), *Chişinăul în enciclopediile lumii*, Basarabia N 7-8, 3 p.
23. *** (1966), *История Кишинёва* (1466-1966), Edit. Картя Молдовеняскэ, Кишинёв.

STUDIA UNIVERSITATIS BABEŞ-BOLYAI, GEOGRAPHIA, LIV, 2, 2009

THE STRUCTURE OF THE POPULATION IN THE SOMEŞUL MIC VALLEY ACCORDING TO GENDER, AGE GROUPS AND LIVING ENVIRONEMENT BETWEEN 1850-2002

P. MÎNDRU [1]

ABSTRACT. – The structure of the population in the Someşul Mic Valley according to gender, age groups and living environment between 1850-2002. The structure of the population in the Someşul Mic Valley according to gender, age groups and living environment has a number of peculiarities that show its relative individuality. The analysis **by gender** shows the fact that in this century and a half, there was a growth in the female population, from 50,60% in 1850 to 52,14% in 2002, while the masculine population decreased from 49,40% in 1850 to 47,86% in 2002. Therefore, the *female population index* (the number of women relative to a 100 men) grew from 102,4 in 1850 to 108,5 in 2002. Thus, between 1850-2002, the total growth of the women's share was of 1,54%, with a clear dominance in the *urban environment* (from 51,54 % in 1850 to 52,34 % in 2002), while in the *rural area* the situation has reversed compared to 1850, when there was a male predominance (50,80%), so that in 2002 there is a women predominance (50,11%). The evolution of the Valley's population by **age groups** shows a decrease of the *young* population (0-19 years of age) by 21,4%, from 43,6% in 1857 to 22,2%, an increase by 11% of the *adult* segment (20-59 years of age), from 51,3% in 1857 to 62,3% in 2002, as well as of the *older* one (over 60 years of age), which had the highest increase (10,5%) from 5,1% in 1857 to 15,6%. To sum up, this means a decrease to half of the young population and a three-folding of the old one, with the mention that in the rural area the growth of the older population is bigger (21,8%) than in the urban environment (40,2%). In what regards the situation of the Valley's population according to the **living environments** we can see that this has a special status, as, even since 1850, the share of the urban population was higher (59,8%) than of the rural one (40,2%). After 152 years, in 2002, there is an exaggerate growth of the difference rural-urban, as the great majority of the population (90,9%) is now living in the urban area and only a small part (9,1%) in the rural one. Thus, out of ten inhabitants of the Valley, only one lives in the rural area, which shows an overcrowding of the urban environment, thus having negative consequences on the life's quality.

Keywords: *the structure of the population according to gender, age groups and environments; female population index, ageing index, age pyramid, population share.*

1. INTRODUCTION

The study comprises the analysis of the population's structure in the Someşul Mic Valley according to some of the relevant categories such as gender, age and living environments, thus offering the possibility to bring forward its quality.

2. THE GENDER STRUCTURE

Following the structure of the Valley's population according to gender (table 1), we can see that in 1850 the percentage of the male population (49,40%) was almost equal to the one of

[1] *PhD Candidate of "Babes-Bolyai" University, Faculty of Geography, 400006, Cluj Napoca, Romania, e-mail: mindrupetru@yahoo.com*

the female population (50,60%), whereas in 2002 the male population decreased up to 47,86% and the female one grew up to 52,14%. In all this time period we can notice that only in the 1900s censuses the male population was more numerous than the female one. The biggest difference between genders in the Valley was in 2002, when the women were more with 4,28% than the men, and the smallest difference was in 1910, when there were 0,05% more males than females.

When analyzing the gender structure of the population in the two living environments, a rather interesting aspect is shown. Whereas in 1850 the male population in the *urban environment* had a share of 48,46%, in 2002 this one dropped at 47,66% and was, in all these censuses smaller than the female one, with only one exception, the year 1900, when the share of the male population was higher (50,54) than of the female one (49,46%). The biggest difference between the two genders, in the urban area, was in 1857, when there were 6,41% more females than males, and the smallest one in 1910 when there were only 0,27% more females than males.

Someşul Mic Valley. Population structure by gender (1850-2002)

Table 1

Area	Urban			Rural			Valley		
Year	Total	Males	Females	Total	Males	Females	Total	Males	Females
1850	23285	11285	12000	15631	7941	7690	38916	19226	19690
%	100	48,46	51,54	100,0	50,80	49,20	100,00	49,40	50,60
1857	23912	11190	12722	16360	8129	8231	40272	19319	20953
%	100	46,80	53,20	100,00	49,69	50,31	100,00	47,97	52,03
1900	58537	29582	28955	19723	9959	9764	78260	39541	38719
%	100	50,54	49,46	100,00	50,49	49,51	100,00	50,53	49,47
1910	70637	35223	35414	21425	10830	10595	92062	46053	46009
%	100,00	49,86	50,14	100,00	50,55	49,45	100,00	50,02	49,98
1930	110448	54966	55482	25181	12691	12490	135629	67657	67972
%	100,00	49,77	50,23	2996	50,40	49,60	100,00	49,88	50,12
1956	162340	78127	84213	28321	14113	14208	190661	92331	98421
%	100,00	48,13	51,87	100,00	49,83	50,17	100,00	48,43	51,62
1966	197668	96636	101032	30260	15230	15030	227928	111866	116062
%	100,00	49.89	51,11	100,00	50,33	49,67	100,00	49,08	50,92
1992	353886	172703	181183	30785	15544	15241	384671	188247	196424
%	100,00	48,80	51,20	100,00	50,49	49,51	100,00	48,94	51,06
2002	341061	162536	178525	34240	17084	17156	375301	179620	195681
%	100,00	47,66	52,34	100,00	49,89	50,11	100,00	47,86	52,14

In regard to the situation in the *rural area*, there is a higher balance between genders, an aspect which is constant almost throughout the entire time period. As an example, we can see that here the male population had, in 1850, a share of 50,80% and in 2002 49,89%, as opposed to the female one, which had in 1850 a share of 49,20%, reaching in 2002 a share of 50,11%. We can see that in 2002 the share of the two genders is almost equal (49,89% to 50,11 %). In the rural area, the biggest difference between the two genders was in 1850, when there were 1,61% more males than females, and the smallest in 2002 when there were 0,21% more females than males.

From this evaluation of the population's share by genders we can see that the degree of females in the population has risen, in 2002 being the highest ***female index*** (the number of females correspondent to 100 men) from all the nine stages analyzed throughout this period of time (108,5 women corresponding to 100 males). The smallest female index was in 1900, when there were only 97,9 females to 100 males.

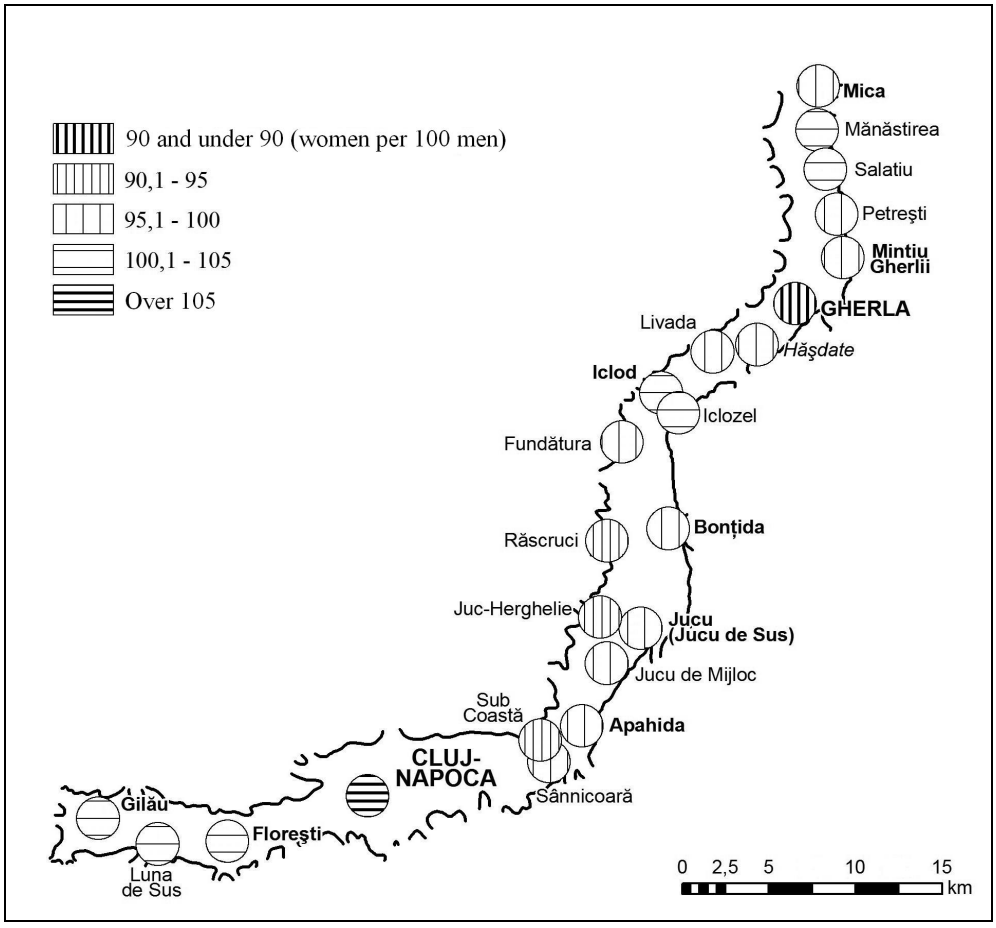


Fig. 1. The female index in of the localities in the Someşul Mic Valley in 2002.

In regard to living environments, the female index in the urban area is higher than in the rural area. Thus, in the *urban area* the average female index is 105,1 women for 100 men, with a maximum of 113,7 women for 100 men in 1857 and a minimum of 97,9 women for 100 men in 1900.

The two towns in the Valley have an average female index of 96,8 women for 100 men in Gherla and 106 women for 100 men in Cluj-Napoca. In 2002 in Cluj-Napoca there were 111 women corresponding to 100 men, the situation having for a reason the specific character of the activities in this large urban agglomeration from the Valley.

The maximum female index in Cluj-Napoca was in 1857 (115,2 women corresponding to 100 de men). Gherla had in 2002 a female index of 89,2 women corresponding to 100 men, a situation influenced by the existence of a prison in town. The minimum in Gherla was in 1900 (83,1 women corresponding to 100 men) and the maximum in 1910 (100,5 women to 100 men).

In the *rural area* the situation is more balanced, so that the average female index is of 98,4, with a maximum in 1857 (101,3 women to 100 men) and the minimum in 1930 (94,9 women to 100 men). In 2002 the female index in the rural area was 100,1.

At a locality level, the female index is higher in the villages: Iclozel (104,3), Floreşti (102,4), Salatiu (102), Gilău (101), Mănăstirea (100,6), Luna de Sus (100,4), Iclod (100,3), Apahida (100), and lower in the villages: Petreşti (99,5), Bonţida (99,4), Livada (98,9), Hăşdate (98,6), Mica (98,1), Jucu de Mijloc (97,8), Sânnicoară (97,6), Fundătura (97,5), Mintiu Gherlii (97), Jucu de Sus (95,3), Răscruci (95), Sub Coastă (93,1), Jucu Herghelie (92,2), the explanation being the higher migration of the male population from these localities.

At county level, the average female index is 100,7, with the maximum value in 2002 (105,8) and the minimum one in 1910 and 1930 (98,1). The county's female index in the urban area is 105,2 and in the rural area 101,4. It is to be noticed that in 1966 the average female index of the county was higher, 103,1 in 1966 and 1992 and 105,8 in 2002.

At the Valley's level, the average female index is higher (103,5) than at the county's level, in 1966 and 1992 being 103,7 and 104,3, and in 2002 the index was 108,5.

3. STRUCTURE BY AGE GROUPS

The analysis of the population in the Someşul Mic Valley according to age groups shows the changes that occurred during this time period and allows us to know and bring forward some very important aspects concerning the share of the productive and non-productive population, the generational replacement capacity, the life's needs and the planning of the resources that the community has.

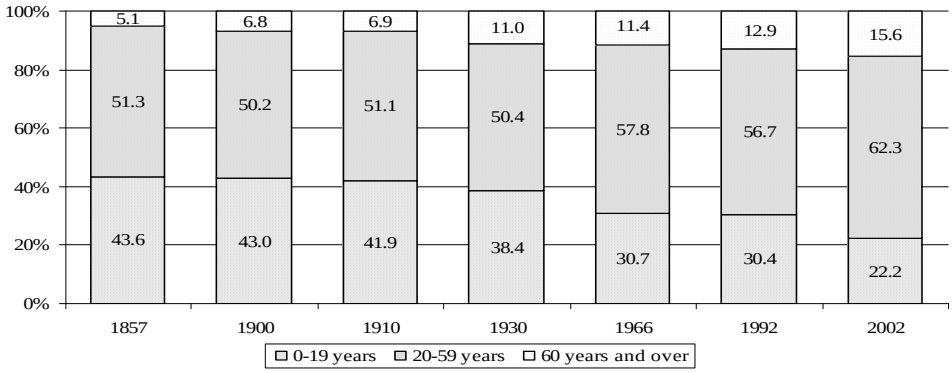


Fig. 2. The evolution of the population by age groups.

Thus, in 1857, the share of the three age groups in the Valley is as follows: *the young population* (0-19 years) was 43,6% of the total, the *adult* one (20-59 years) 51,3% and the *old* one (over 60 years old) was 5,1% of the total. In 1992 the three groups had a rather different aspect, respectively 30,4 %, 56,7 % and 12,9 %, whereas in 2002 the share was of 22 %, 62 % and 16 %. We can see quite clearly the decrease by 13,2% of the young population (0-19 years), the increase by 5,4 % of the adult one (20-59 years) and the increase by 7,8% of the old one (over 60 years old).

We can also notice that the decrease was continual in what concerns the young population, for the adult population it was stabilized at the 1966 and 1992 censuses (57,8%, respectively 56,7%), and the old population grew in number continuously, with the mention that in the third decade of the XXth century, the share of this group was of more than 10% of the total population.

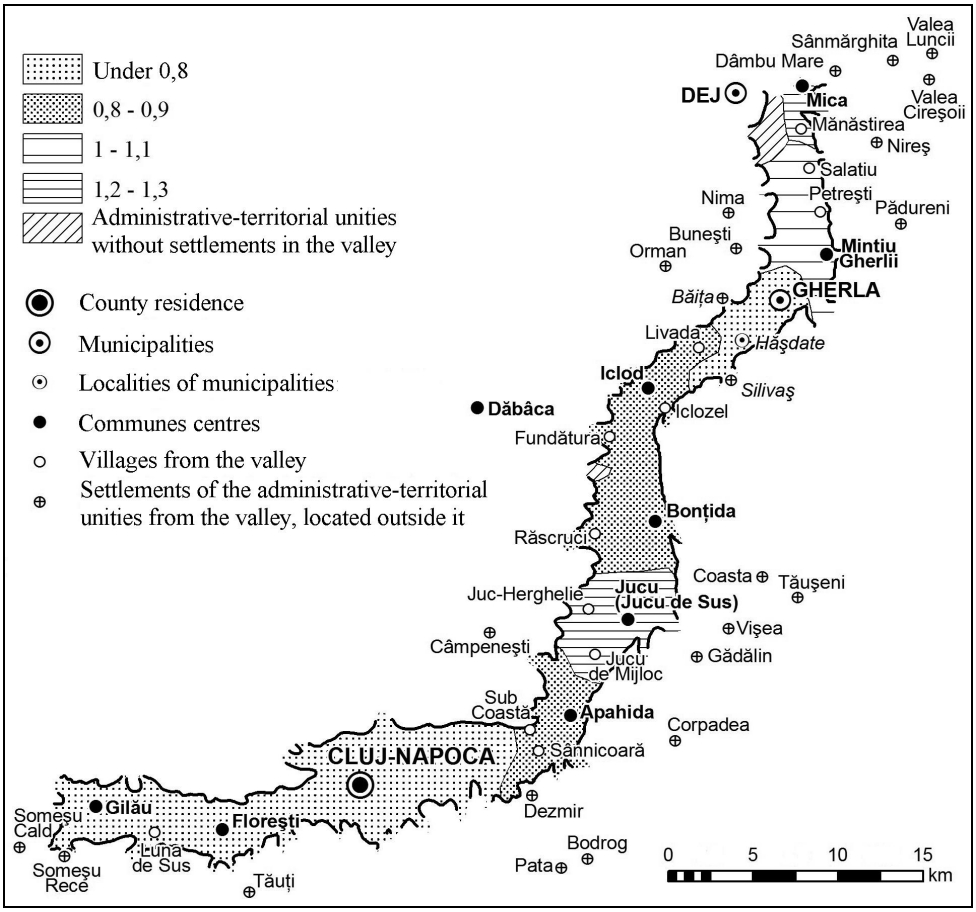


Fig. 3. The geodemographic ageing index in the administrative units of the Someşul Mic Valley in 2002.

In what concerns the structure of the urban and rural population by age groups in the Someşul Mic Valley, we can see an inversion of the situation in 1857 as to 1992. To be more exact, in 1857 the young population had a higher share (46,2%) in the rural area and a lower one (41,7%) in the urban area, the adult population had the closest values (49,9% and 52,3%), and the old population was less numerous in the rural area (3,9%) than in the urban one (6%).

In 1992 the young population has a higher share (30,5%) in the urban area and lower (29,7%) in the rural one, the adult population group in the urban area grows even more (57,2%) as opposed to the rural area (50,8%), and the old population group has a higher share in the rural area

(19,5 %) than in the urban one (12,3 %). Thus, we have between 1857 and 1992 a five times growth of the old population in the rural area as opposed to a two times growth of the urban one.

This more accentuated ageing of the rural population compared to the urban one occurred especially after World War II. This phenomenon was mainly due to the continuous exodus of the working population from villages to towns, following official decisions like the extensive industry development and its placing in the urban area, the cooperative agriculture etc.

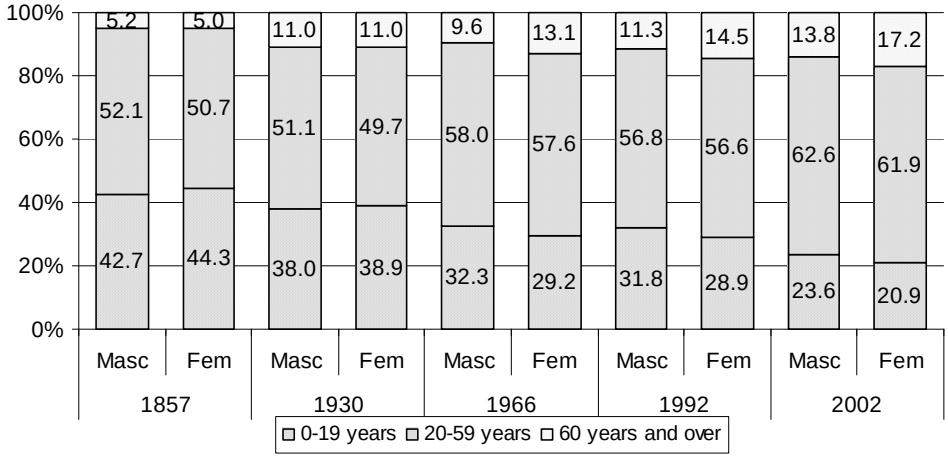


Fig. 4. The population's structure evolution according to age groups and gender.

In 1857 the young *male* population from the rural area (45,5%) had a share higher by 4,8% as opposed to the one in the urban area (40,7%), the adult one in the rural area (50,4%) was smaller by 2,9% than the one in urban area (53,3%), the same being the case of the old rural population (4,1%), lower in share by 2% than the urban one (6,1%). In 1992 the situation changed substantially, the young male population from the villages (31%) having a share lower by one percent than the urban one (32%). The same is the case with the adult male population from the rural area (51,2%), lower by 6,2% than the urban one (57,4%). If in the other groups the difference was smaller, at the old male population, the difference is of 7,1% between the rural one (17,8%) and the urban one (10,7%).

The three big age groups of the female population in the Valley, had in 1857, a share of the young female rural population higher (47%) than the urban one (42,6%), thus higher by approximately 4,4%. The adult female population group in the rural area (49,4%) was smaller by 1,1% than the one in the urban area (51,5%), the same being the case for the olf female population, where the share of the rural one (3,6%) was smaller by 2,3% than the urban one (5,9%). In 1992 the female population has a similar situation to the male one, meaning that the young and adult female population from the rural area had a smaller share than the one in the urbn area by 0,7%, respectively 6,8%, and the old female population in the rural area (21,3%) had a share bigger by 7,5% than in the urban area (13,8%).

The phenomenon of demographic ageing or rejuvenation is brought forward by the relation between the share of the people over 60 years old and those in the 0-19 years old group, having as a critical threshold of the ***ageing index*** of one population 0,42. For Romania, in 2002, this index was 0,47. For the Someşul Mic Valley, this index grew from 0,12 in 1857 to 0,42 in 1992 and 0,70 in 2002. By *living environments*, the index is higher

in the rural area, in 1992 being 0,66 and in 2002 0,87, whereas in the urban area it was 0,40 in 1992 and 0,68 in 2002, an obvious more accentuated ageing in the rural area as opposed

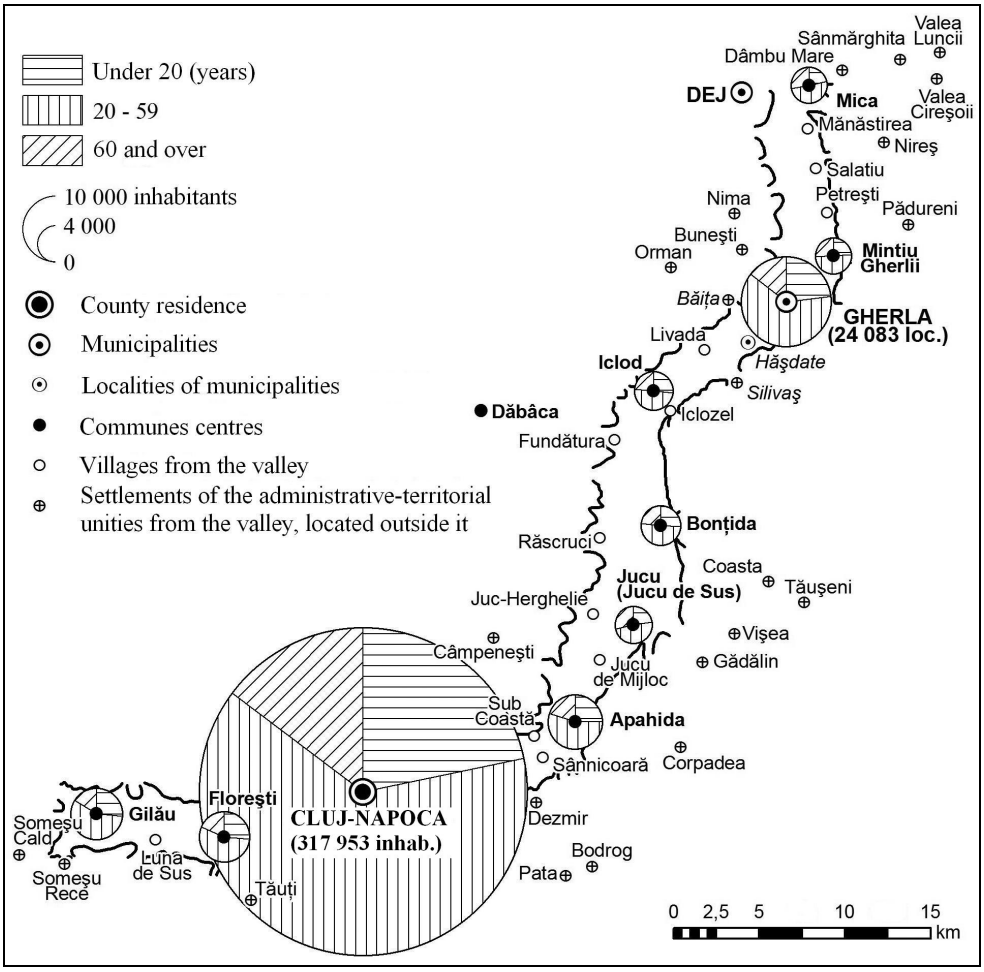


Fig. 5. The population age groups from the administrative units in the Someşul Mic Valley in 2002.

to the urban one. By *genders*, we have a higher index in what concerns women (0,82 in 2002) than men (0,58 in 2002), a normal situation, considering the life hope at birth of women compared to men, as well as women's higher share in the population total.

4. THE STRUCTURE BY LIVING ENVIRONMENTS

The share of the urban and rural population in a territory shows the economic and social development level of that area. The structure by living environments of the population in the Someşul Mic Valley between 1850-2002 shows a very peculiar state of things, compared to the situation in other geographical areas or the county. Thus, in 1850, from the total of 38916

inhabitants of the Valley, more than half (59,8%) were in the urban area and the rest of 40,2% lived in the rural area. To be more exact, to each inhabitant of the rural area there were 1,5 corresponding inhabitants in the urban area. The situation's evolution did not favour the rural area and so in 1948 the rural population was only 20,2%, and the urban population had a share four times this much (79,8%). The depopulation of the rural area continues, and so in 1992 there was the smallest percentage of the rural population (8% of the Valley's total population), the vast majority of the Valley's inhabitants being located in the urban area (92%). The reasons for this situation were socio-political and economical, reflecting the living standard differences between the two areas. The year 2002 shows a growth of the rural population compared to 1992 (from 8% to 9,1%), and the urban one reaches 90,9%, meaning that for each inhabitant of the rural area there are ten inhabitants in the urban one.

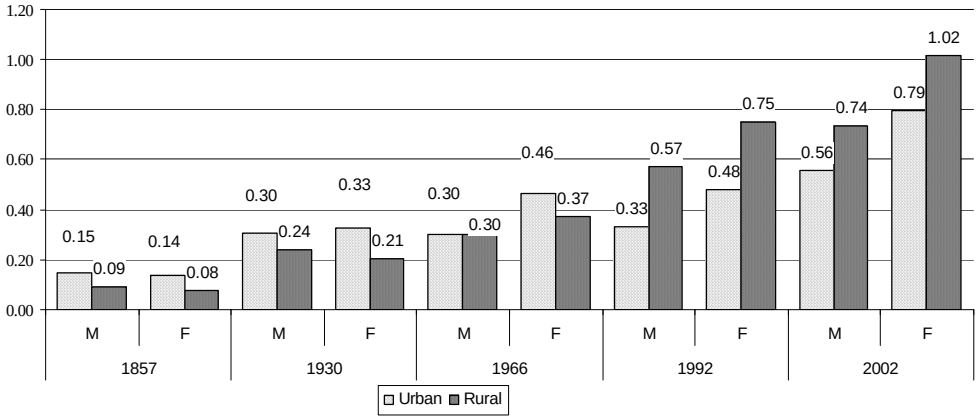


Fig. 6. The evolution by gender of the population's ageing index.

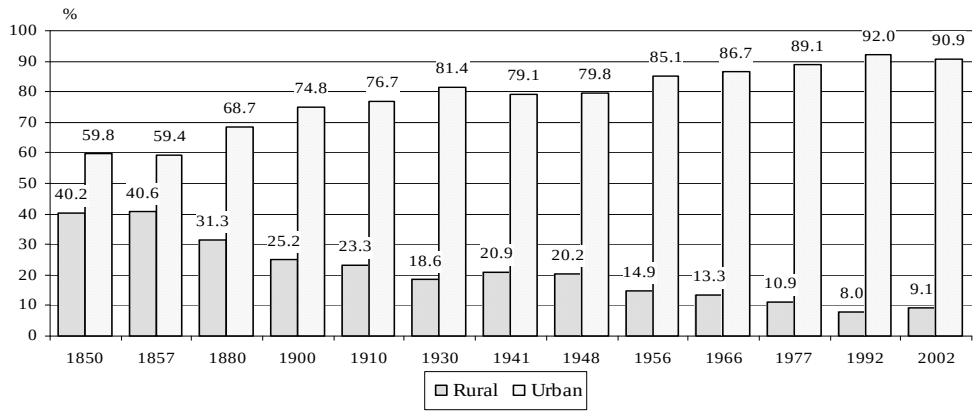


Fig. 7. The population's evolution by living environments.

Comparing the situation according the living environments of the Valley's population with the county's population, we can see that in 1966 the county's rural population was 53,06% of the total, whereas the urban one was 46,94%. At a county level, the situation turned favourable

for the urban area in 1974, leading in 1992 to a percentage of 67,4% in the county's urban area, as opposed to only 32,6% in the rural one. The situation is identical in 2002 at county level, with a very small increase of the rural population up to 32,7%.

It can be easily noticed that the population in the Valley's *rural area* grew slower but constantly. An exception was the sixth decade of the XXth century, when, at the 1966 census, there was a decrease of the rural population share as opposed to the urban one, from 203,5% in 1941 to 198,2% in 1966. The general growth between 1850-2002 was of 224,2%, from 15269 inhabitants in 1850 to 34240 inhabitants in 2002, thus a 2,2 times growth.

The urban area had a very high growth as opposed to the rural area's population. If in 1850 the urban population counted 23647 inhabitants, in 2002 it had 341061 inhabitants, thus a 1442,3 % growth. However, this percentage is not the highest growth in this period of time. The highest share of the urban compared to the rural area was in 1992, when the urban population had a 92% share, as opposed to 8% in the rural area, thus a growth of almost fifteen times over a century and a half.

The Someşul Mic Valley. The population's structure by living environments and its share

Table 2

Years	Valley		Urban			Rural		
	Abs.	*%*	**Abs.**	*%*	**Share**	**Abs.**	*%*	**Share**
1850	38916	*100,0*	23285	*100,0*	*59,8*	15631	*100*	*40,2*
1857	40272	*103,5*	23912	*102,7*	*59,4*	16360	*104,7*	*40,6*
1880	54946	*141,2*	37754	*162,1*	*68,7*	17192	*110*	*31,3*
1900	78260	*201,1*	58537	*251,4*	*74,8*	19723	*126,2*	*25,2*
1910	92062	*236,6*	70637	*303,4*	*76,7*	21425	*137,1*	*23,3*
1930	135629	*348,5*	110448	*474,3*	*81,4*	25181	*161,1*	*18,6*
1941	148329	*381,2*	117258	*503,6*	*79,1*	31071	*198,8*	*20,9*
1948	156035	*401,0*	124578	*535,0*	*79,8*	31457	*201,2*	*20,2*
1956	190661	*489,9*	162340	*697,2*	*85,1*	28321	*181,2*	*14,9*
1966	227928	*585,7*	197668	*848,9*	*86,7*	30260	*193,6*	*13,3*
1992	384671	*988,5*	353886	*1519,8*	*92,0*	30785	*196,9*	*8,0*
2002	375301	*964,4*	341061	*1464,7*	*90,9*	34240	*219,1*	*9,1*

5. CONCLUSIONS

The structure by gender, age and living environment of the population in the Someşul Mic Valley had an evolution following the general trend of our society, but also having peculiarities which individualize this geographic area.

Thus, analyzing the evolution of the structure by ***gender*** throughout the 152 years, we can see a *growth of the female population's share*, from 50,60% in 1850 to 52,14% in 2002, whereas the share of the male population dropped from 49,40% in 1850 to 47,86% in 2002.

In respect to ***age***, we can see that the Valley's population *grew older*. Thus, as opposed to 1857, the share of the *young* population in the Valley dropped (from 43,6 % in 1857 to 30,4 % in 1992 and to 22,2 % in 2002), while the *adult* population group's share grew (from 51 % in 1857 to 57 % in 1992 and 62,3 % in 2002). The same is the case for the *old* population (from 5,1 % in 1857 to 13% in 1992, respectively 15,6 % in 2002). By

gender, we can see that in 1857, in the young population group there was a dominance of the female population, whereas in the adult and old groups there was a male dominance. In 1992 and 2002 there is a male dominance in the young and adult groups, in the rural and urban area as well, and in the old population group there is a female dominance. By *living environments*, we can see that the *young* rural population had in 1857 a 46% percentage, whereas in 1992 this dropped to 29% and in 2002 reached 25% of the total. In the urban area the evolution was similar, the young population dropped from 42% in 1857 to 30% in 1992 and 22% in 2002. The *adult* population from the rural environment had a smaller growth (from 50% in 1857 to 53% in 2002) compared to the urban environment (from 52% in 1857 to 63% in 2002). The *old* population grew more in the rural area (from 4% in 1857 to 22 in 2002), compared to the urban area (from 6% in 1857 to 15% in 2002).

In respect to the structure by ***living environments*** of the Valley's population, we can see that it has a peculiar situation, given by the fact that, even since 1850, the share of the urban population was higher (59,8%) than of the rural one (40,2%). After 152 years, in 2002, there is an exaggerate growth of the urban-rural difference, leading to the fact that the majority of the population (90,9%) lives in the urban area and only a small part (9,1%) live in the rural area.

To sum up in a few words the evolution of the population's structure in the Someşul Mic Valley by gender, age and living environment in these 152 years, we can say that there was a process which led to a growing share of the *female* population, to an *ageing* of the population and to a growing share of the *urban* population.

REFERENCES

1. Maier, A. (2001), *Podişul Someşan. Populaţia şi aşezările*, Edit. Gh. Barițiu, Cluj-Napoca.

2. Pascu, Șt. (1974), *Istoria Clujului*, Consiliul Popular al Municipiului Cluj, Întreprinderea Poligrafică Cluj.

3. Pop, P. Gr. (1990), *Potențialul geodemografic al oraşului Gherla*, Studia UBB, Geographia, 1, Cluj-Napoca

4. Pop, P. Gr., Bodocan, V. (1999), *Oraşele Transilvaniei în ultimul secol şi jumătate (1850-1999)*, Studia UBB, Geographia, 2, Cluj-Napoca.

5. Pop, P. Gr. (2007), *Județele României. Județul Cluj*, Edit. Academiei Române, Bucureşti.

6. xxx *Recensămintele populației din 1850, 1957, 1880, 1900, 1910, 1930, 1941, 1948, 1956, 1966, 1977, 1992, 2002.*

STUDIA UNIVERSITATIS BABEŞ-BOLYAI, GEOGRAPHIA, LIV, 2, 2009

L'EROSION SUR LES SENTIERS DE RANDONNEE ET LEURS AMENAGEMENTS DANS LE MASSIF DU SANCY (MASSIF CENTRAL FRANÇAIS)

O. POP [1], M. GUITTON[2], V. SURDEANU[3]

ABSTRACT. – Hiking Trail Erosion and Rehabilitation in the Sancy Massif (French Central Massif). In the Sancy Massif (French Central Massif), the tourism-related activities (hiking, skiing, biking, etc.) have become a threat to the morphological stability of the slopes. On the massif's ridges, the volcanic rocks (lava flows, pyroclastic deposits, etc.) and the soil (more or less evolved andosols) present a variable resistance to erosion. Tourists are attracted by the sites of geological, geomorphological, botanical or zoological interest. Thus, their intense presence on the hiking trails causes morphological changes and therefore the question of erosion-protection planning should be considered as a priority. On the most frequented trail segments, the managing bodies (Parc Naturel Régional des Volcans d'Auvergne, Conseil Régional, Communauté des Communes) have begun rehabilitation work rather belatedly. New rehabilitation projects are being planned for the affected trails. A better taking into account of the erosion phenomena and a close collaboration of all the decision-makers in elaborating the managing plans should consider the whole trail network rehabilitation in the Sancy massif.

Keywords*: erosion, geomorphological processes, hiking trails, rehabilitation, Sancy Massif (France).*

1. INTRODUCTION

Dans de nombreuses régions montagneuses du monde où l'activité touristique se développe de plus en plus, on constate que des changements profonds sur leur morphologie s'opèrent, dans la plupart des cas ces transformations étant irréversibles. Les montagnes, par leurs caractéristiques constituent des endroits privilégiés pour la pratique de diverses activités touristiques et sportives en pleine nature. Or, une surfréquentation touristique de ces milieux fragiles conduit à des dégradations morphologiques qui, à leur tour, peuvent engendrer d'autres dérèglements environnementales, comme par exemple la destruction du couvert végétal.

L'impact géomorphologique lié à la surfréquentation touristique est depuis quelques temps entré dans l'attention des chercheurs (REYNARD et al., 2003). La dendrogéomorphologie a été utilisée dans le but de quantifier l'érosion des sentiers traversant des forêts (PELFINI et SANTILLI, 2006**)**. Mais, l'application de ces méthodes reste conditionnée par la présence des arbres de la zone tempérée. Dans le massif du Sancy (Massif Central français), VEYRET et al., (1990) et KRZEMIEN K. (1995) ont montré les conséquences des pratiques touristiques (randonnée et ski) sur la morphologie des versants du massif volcanique.

Après avoir dressé un bilan quantitatif des influences anthropiques sur la morphologie des sentiers de randonnée de crête, pour cet article nous nous proposons de porter un regard critique sur les actions effectuées ou envisagées par de divers gestionnaires dans le but de protéger ces lieux de passage des touristes.

[1] *Université „Babeş-Bolyai", Cluj-Napoca, Roumanie; Université Blaise Pascal, CERAMAC, Clermont-Ferrand, France, e-mai: olimpiu_p@yahoo.com*
[2] *Université Blaise Pascal, CERAMAC, Clermont-Ferrand, France, e-mail: mathieu.guitton@hotmail.fr*
[3] *Université „Babeş-Bolyai", Cluj-Napoca, Roumanie, e-mail: surdeanu@geografie.ubbcluj.ro*

2. LA ZONE D'ETUDE

Le massif du Sancy (fig. 1) représente un strato-volcan pliocène-quaternaire d'environ 150 km² situé au nord du Massif Central, entre le Cantal, le Cézallier et la Chaîne des Puys. Le relief actuel est constitué des formes et formations volcaniques (LAVINA, 1985), glaciaires et périglaciaires (VEYRET, 1978; VALADAS, 1984) héritées des périodes antérieures, ainsi que de celles caractérisant la morphodynamique actuelle dominé par l'activité des coulées de débris, des avalanches, des chutes de pierres, etc. (KRZEMIEN, 2004).

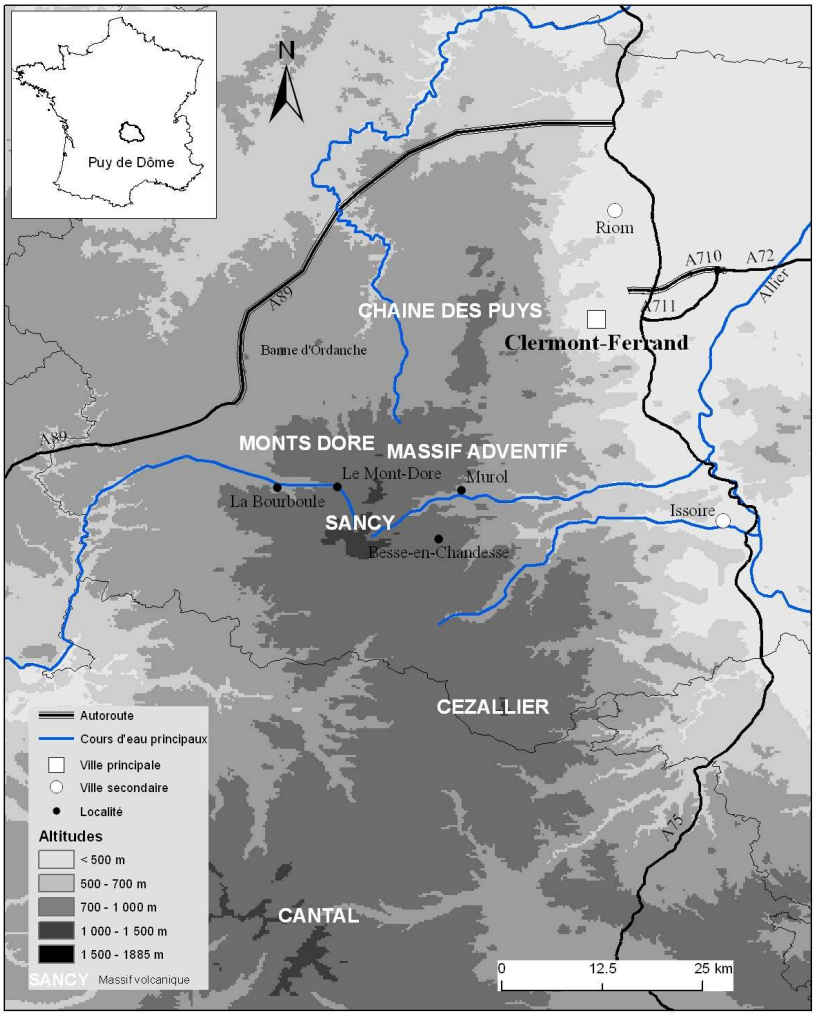


Fig. 1. Localisation du massif du Sancy dans le cadre du Massif Central français.

Trois vallées principales d'origine volcanique et glaciaire rayonnent du centre vers la périphérie du massif (fig. 2). Les crêtes qui les entourent sont ponctués principalement par des dômes (Puy de Sancy, 1885 m, point culminant du Massif Central; Puy Ferrand; Puy de la Perdrix; Puy Gros; Roc de Cuzeau, etc.) ou protrusions (Le Capucin, Puy Jumel), émoussés par les glaciers quaternaires et les processus périglaciaires. Certaines parties des crêtes sont constituées de coulées de lave mises en inversion de relief par l'érosion ou des vestiges des anciens cônes de lave et de scories (Puy de Cacadogne, Puy de Crebasses, Puy de Cliergue). Dans la partie centrale du massif, les dépôts volcaniques et volcano-sédimentaires sont traversés par de dykes (Dent de la Rancune, etc.) qui donnent une note de spectaculaire dans les paysages. Certains sentiers de randonnée relient les parties basses des fonds de vallée aux crêtes. Des ramifications des chemins d'accès se dirigent vers les crêtes surplombant les trois vallées principales, en passant soit à travers les versants, soit par les sommets.

Le Puy de Sancy qui représente le point central du massif, attire le plus grand nombre de randonneurs à cause de la facilité d'accès (téléphérique de la station du Mont Dore, télécabine de Super-Besse). De vastes panoramas et des vues remarquables sur les paysages attirent les touristes vers les crêtes, ceux-ci ayant l'impression d'être présents dans une zone de haute montagne et de «nature sauvage». Les versants raides et le dénivelé de plus de 400 m entre le fond des vallées et les sommets favorisent la pratique du ski alpin dans les trois les stations aménagées au Mont-Dore, Super-Besse et Chastreix. Les effets de cette activité sur la morphologie sont importants mais, vu la complexité du phénomène, nous n'insisterons pas dans ici sur cet aspect.

3. LES PRATIQUES TOURISTIQUES

Depuis le début du 19ème siècle le thermalisme est une activité importante dans la région. La présence de deux stations thermales importantes, le Mont-Dore et la Bourboule ont fait connaître rapidement l'existence du massif du Sancy au niveau national.

La pratique du ski a commencé au début du 20ème siècle. Vers 1912, l'activité touristique se développe dans la ville-station Mont-Dore grâce notamment aux infrastructures du thermalisme (hôtellerie, commerces) et surtout à la présence du chemin de fer. En 1937, avec l'installation du premier téléphérique (le deuxième entrera en fonction en 1962), la Mont-Dore devient alors le troisième domaine skiable de France. En 1961, la station, Super-Besse, est créée sur le versant sud du Massif, avec la construction d'une télécabine. Suivront ensuite quelques autres petites stations: Chastreix-Sancy ou Chambon des Neiges (cette dernière étant à l'heure actuelle démantelée). Le massif a vu se couvrir rapidement de remontées mécaniques ainsi que de chemins permettant l'accès aux structures et aux pistes de ski pour l'entretien.

La construction des téléphériques et d'une télécabine, qui tournent également l'été, a facilité l'accès aux crêtes contribuant à l'augmentation de la fréquentation des crêtes du massif. La clientèle du thermalisme, (la Bourboule et le Mont-Dore, entre 10 000 et 20 000 curistes par an), qui n'ont qu'une partie de la journée libre utilisent prioritairement le téléphérique afin d'atteindre rapidement et facilement le sommet Puy de Sancy.

Avec le développement de la randonnée ces dernières décennies, le nombre de touristes a augmenté en été. Les sentiers balisés se sont multipliés; différents guides (par exemple *Chamina*) ont été édités à l'intention des randonneurs. La randonnée est pratiquée principalement sur les sentiers de *Grande Randonnée* (GR 4 et GR 30) dont les parcours durent plusieurs jours, reliant d'autres massifs voisins. Il y a aussi des chemins de *Petite*

Randonnée (PR), des itinéraires de durée courte (3 à 6 heures). De plus, les communes du massif du Sancy ont également balisé 650 km de sentiers en éditant un guide des promenades comprises entre 30 minutes et 3 heures qui reprennent en partie les itinéraires des GR et des PR. Au total, il existe plus de 77 km de sentiers balisés pour la randonnée pédestre, que ce soit en fond de vallée ou sur les crêtes du massif du Sancy.

Les touristes qui fréquentent les crêtes ont des comportements très différents. Cela va du simple promeneur qui se contente de prendre le téléphérique pour monter directement au sommet du Sancy sans même s'écarter des marches, jusqu'au randonneur les plus chevronné sillonnant les GR.

Il est très difficile d'évaluer les fréquentations sur les différents tronçons des crêtes. Une part importante de la fréquentation est constituée de personnes utilisant le téléphérique ou la télécabine. Avec le téléphérique du Mont-Dore, on peut atteindre des pics de fréquentation de 5000 personnes par jour, les week-ends en période estivale (LEROY, 2007). La télécabine de Super-Besse transporte moins de touristes vers les crêtes. Des comptages ont été réalisés pendant la saison estivale de 2004 sur l'ensemble des sentiers du Sancy (BATISSE, 2004). Les secteurs les plus fréquentés sont la partie sommitale du massif entre le terminal du téléphérique et celui des télécabines: plus de 90 personnes par heure sur les secteurs de marches en bois et environ 53 sur le secteur entre le Col de la Cabane et la gare de la télécabine. Plus on s'éloigne du sommet du Sancy, plus la fréquentation des sentiers baisse. Plus de 50000 personnes par an vont dans la vallée de Chaudefour, les deux mois d'été (juillet et août) enregistrant plus de 20000 de randonneurs. Environ 10 % de ceux-ci prennent le chemin des crêtes (TENEAU, 2001), soit pour faire le tour de la vallée, soit pour atteindre le sommet du Sancy puis revenir par le même chemin. Mais faute d'observations et des comptages permanents, il est très difficile de connaître la fréquentation réelle des crêtes par les touristes.

4. CONSEQUENCES MORPHOLOGIQUES DE LA RANDONNEE

Notre méthode de quantifier l'érosion des sentiers de crêtes du Sancy est basée sur la photo-interprétation, les relevés de terrain, le traitement informatique des données et l'interprétation des résultats (POP et GUITTON, 2008). Cette méthode a été largement décrite dans un article précédent, nous n'en reprendrons ici que les éléments principaux. Des photos aériennes de plusieurs missions (2004, 1999, 1965, 1954) ont été utilisées dans certains secteurs afin de mieux se rendre compte des changements survenus pendant la période couverte (nouveaux tracés, élargissement et multiplication des cheminements). Sur le terrain nous avons mesuré des paramètres morphométriques (largeur et profondeur maximale et minimale des chemins, nombre de cheminements par tronçon) de chaque tronçon de chemin de randonnée homogène, les bouts de ces tronçons étant relevés avec le GPS Trimble. Des observations concernant le type de substrat, la présence ou absence du sol ont été systématiquement notées.

Une fois ces données intégrées dans un SIG, nous avons pu réaliser une carte de sensibilité. Celle-ci prend en compte les facteurs altitude, morphométrie des sentiers, pente, type de substrat, type de végétation présente à proximité des sentiers et fréquentation touristique.

Sur la carte de sensibilité (fig. 2), on peut repérer les tronçons les plus fragiles. Les sentiers des crêtes autour de la vallée de Chaudefour sont en plusieurs endroits très dégradés. On a constaté que les chemins les plus touchés par l'érosion correspondent aux secteurs qui réunissent le plus des facteurs favorables (pente élevée, altitude, substrat friable, absence de végétation, fréquentation, etc.).

Nous avons ensuite calculé la longueur des segments en fonction de leur indice de sensibilité (tableau 1). Ces indices sont compris entre 10 et 25. Près des deux tiers des sentiers ont des indices compris entre 13 et 19. Peu de chemins sont concernés par les valeurs les plus élevées (516 mètres), ceux-ci étant majoritairement localisés autour du Puy de Sancy et du Puy Ferrand. Les secteurs les moins fragiles sont situés surtout vers les périphéries du massif.

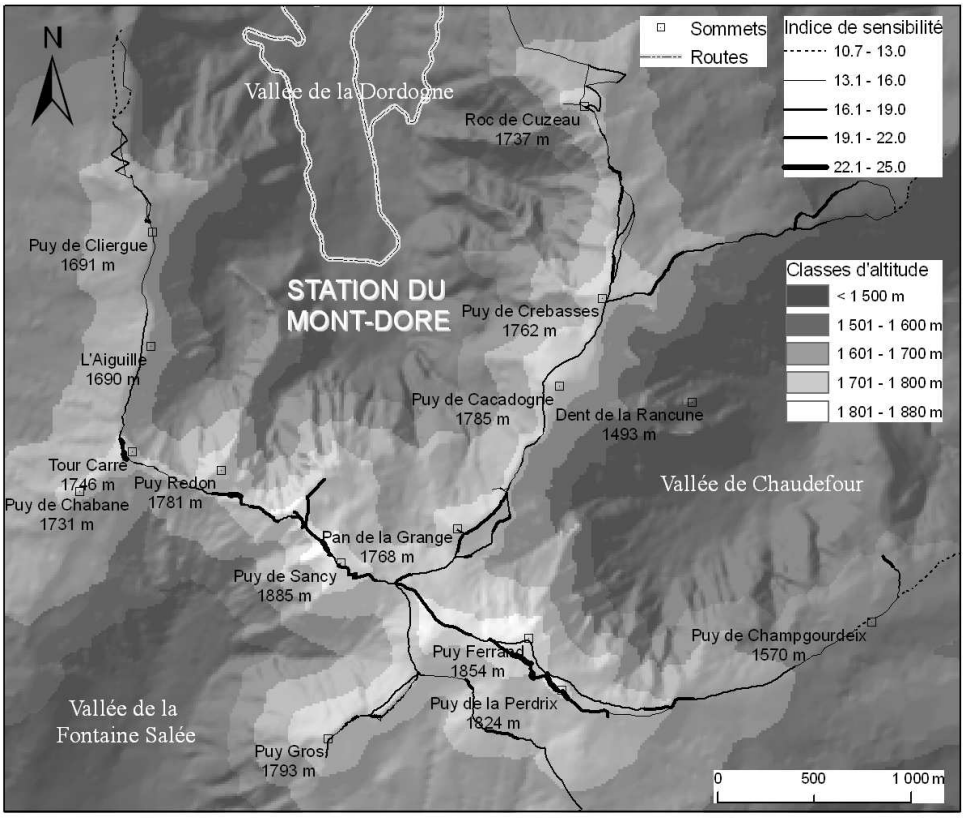


Fig. 2. Carte de sensibilité des sentiers de crêtes.

Répartition des sentiers de crêtes en fonction des indices de sensibilité

Tableau 1

Classe de sensibilité des sentiers	Longueur des sentiers par classe de sensibilité	Longueur totale
Entre 10 et 13	3653 m	26335 m
Entre 13 et 16	5792 m	
Entre 16 et 19	10696 m	
Entre 19 et 22	5678 m	
Entre 22 et 25	516 m	

Actuellement, dans le massif du Sancy les sentiers de randonnée valorisent des sites d'intérêt géologique, géomorphologique, botanique ou zoologique originaux. Les pratiques touristiques variées (randonnées, ski de piste et de fond, équitation, VTT, etc.) constituent une menace réelle pour la stabilité morphologique de certains secteurs des versants ou des crêtes qui, auparavant, n'étaient pas affectés par l'érosion. L'érosion due à la surfréquentation des chemins de randonnée pédestre sur les crêtes (compaction du sol et du substrat, arrachement des mottes de sol et de la couverture végétale, déplacement des matériaux par piétinement répété lors du passage du randonneur, etc.) est accompagnée d'une accélération de l'érosion «naturelle» liée principalement à l'écoulement de l'eau (ruissellement concentré, ravinement), à la nivation, à la succession d'un nombre important de cycles gel/dégel (cryoclastie) et à l'action du vent (déflation).

Sur les chemins qui suivent les crêtes du massif, l'érosion est plus évidente que dans le cas des autres secteurs. Les effets sont ici plus visibles du fait de la combinaison d'une l'érosion «naturelle» et d'une érosion «anthropique»: la pente et la longueur des segments de chemins rectilignes qui favorisent le ravinement (RADOANE *et. al.*, 1998); la disparition du couvert végétal protecteur à cause du piétinement combiné avec la réduction de la saison végétative avec l'altitude et en dépendance de la présence de la neige tardive en taches; présence d'un sol friable, andique, qui recouvre le plus souvent un substrat constitué de matériaux volcaniques non consolidées (dépôts pyroclastiques, cendres volcaniques, laves trachy-andésitiques acides altérées, etc.); une fréquentation touristique de masse, de plus en plus concentrée sur les crêtes. A cela s'ajoute l'effet du passage des troupeaux ovins et bovins dont les effets géomorphologiques sont difficiles à cerner faute de données.

5. AMENAGEMENTS REALISES

Les techniques pour rehabiliter un secteur dégradé se résument à faire un choix entre aménager rapidement le sentier pour qu'il soit de nouveau praticable ou tracer un nouveau sentier plus adéquat. Les principes généraux sont assez simples mais les techniques choisies peuvent varier en fonction de données géologiques, pédologiques ou climatiques: guider les touristes à l'aide des câbles montés à droite ou à gauche du sentier pour limiter les divagations; rebouchage des ornières; ré-engazonnement; canalisation les écoulements de l'eau afin d'éviter l'érosion et la dégradation d'une végétation encore mal fixée; traçage de nouveaux cheminx en prenant en compte la nature du sol ou la pente.

La sensibilisation des touristes aux problèmes d'érosion des sentiers est également l'un des aspects importants pris en compte par ceux qui s'occupent de la réhabilitation des sentiers. Ainsi, les agents *Garde Nature* qui surveillent les secteurs le plus érodés, donnent de consignes aux touristes pour qu'ils ne s'éloignent du chemin balisé Les panneaux explicatifs installés à proximité des tronçons de chemin sensibles à l'érosion, à l'extérieur des chantiers de réhabilitation des sentiers ou au départ du téléphérique et de la télécabine, informent les touristes sur les conséquences de l'érosion, diminuant ainsi les comportements inadéquats.

Pour favoriser l'accès au sommet principal (par le versant nord-ouest Puy de Sancy) qui s'était considérablement dégradé, à partir de 1987 un programme de réhabilitation a prévu de restaurer la pelouse fortement dégradée. L'installation d'un ouvrage en bois a été préférée au bétonnage du sentier parce qu'elle est perçue comme s'intégrant mieux dans le paysage. Depuis cette réhabilitation de 1987, il n'y eu pas vraiment de chantiers de grande ampleur: remodelage, ouvrage de sécurité (mise en place des échelles, des marches, des échaliers pour passer les clôtures, etc.) ou de renforcement (consolidation d'un chemin le long de la pente avec des blocs et du grillage au Pas de l'Âne).

Récemment, plusieurs aménagements ont été réalisés sur les secteurs du Roc de Cuzeau en 2000, le Puy de Cliergue en 2004 et le Puy Ferrand en 2005 (fig. 3).

La nature des aménagements, l'origine des investissements et les travaux réalisés dans ces secteurs ont connu chacun un cadre différent (tableau 2). A côté de ces chantiers ponctuels, un entretien minimum est organisé. Le Conseil Général du Puy de Dôme, par l'intermédiaire de son Plan Départemental des Itinéraires de Petites Randonnées (PDIPR), œuvre pour maintenir en bon état les sentiers: conventions de passage avec les propriétaires privés, balisages, panneaux explicatifs, etc.

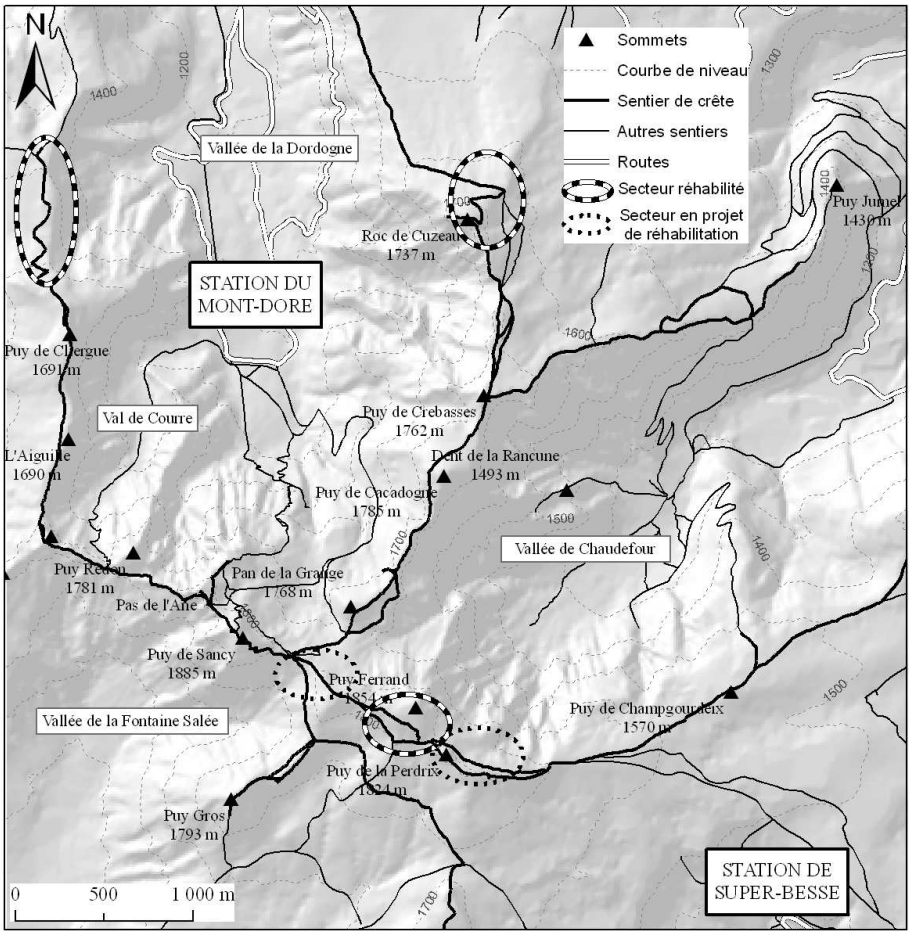


Fig. 3. Les sentiers de crêtes avec les aménagements réalisés ou prévus.

D'autres aménagements, comme celui réalisé par le Parc Naturel Régional des Volcans d'Auvergne (PNRVA) sur le versant sud-ouest du Sancy, visent à guider les randonneurs, afin d'éviter la multiplication des cheminements où de limiter les risques de chute dans ce secteur très instable et très fréquenté.

Les coûts des travaux sur les chantiers de réhabilitation des sentiers

Tableau 2

Site	Roc de Cuzeau	Puy de Cliergue	Puy Ferrand
Localisation	Sur le GR 30 fréquentation modérée	Sur le GR 30 fréquentation modérée	Entre les télécabines et le Puy de Sancy, sur un tronçon annexe forte fréquentation
Année	2000	2004	2005
Coût Origine des financements	41 000 E Natura 2000: 100 % (Fond de Gestion des Milieux Naturels: FGMN, organisme disparu depuis)	20 000 E FEOGA (40 %) Conseil Régional (20%) Conseil Général (20%) Communauté des Commune du Massif du Sancy (20%)	150 000 E Etat (50 %), Conseil Régional (30 %,) Conseil Général (10%) Parc Naturel des Volcans d'Auvergne (10 %).
Organisme (s) chargé (s) de la direction du chantier	Communauté des Commune du Massif du Sancy Parc Naturel Régional des Volcans d'Auvergne	Conseil Général Communauté des Commune du Massif du Sancy	Parc Naturel Régional des Volcans d'Auvergne Office National des Forêts.
Longueur	1040 m	1039 m	100 m
Travaux réalisés	Remodelage de l'ancien sentier et creusement de rigoles pour évacuer l'eau Nouveau chemin en lacet	Rebouchage les ornières, mise en place de la toile de jute et ré-engazonnement Nouveau chemin en lacet Guidage avec des câbles d'acier	Tranchées obliques par rapport à l'ancien chemin et la pente, comblées au fond des blocs et pouzzolanes (drainage) Mise en place de la toile de jute et ré-engazonnement Traçage d'un nouveau chemin Guidage avec des câbles d'acier

Des méthodes de réhabilitation comme celles utilisés pour le versant nord-ouest du Sancy ou à la sortie de la télécabine de Super-Besse (installation de marches en bois), sont très efficaces mais ont néanmoins plusieurs inconvénients. D'abord elles sont très coûteuses et du point de vue esthétique elles ne sont pas forcément appréciées par tous les touristes. On constate aussi que le chemin de marches en bois ne règle pas le problème ravinement latéral et ne limite non plus les divagations des touristes. Les planches en bois sont irrégulièrement fixées occasionnant un inconfort pour les randonneurs. D'autre part, les touristes perçoivent ce sentier couvert de planches en bois comme trop artificialisé ayant l'impression d'emprunter une «autoroute à touristes».

Des nouveaux aménagements touristiques envisagés risquent d'accroître la fréquentation des sentiers de crête. Ainsi, l'implantation d'un Funitel (le nouvel équipement qui remplacera l'ancienne télécabine de Super-Besse) qui entrera en fonction en automne 2008, aura certainement des conséquences sur l'affluence touristique vers les crêtes et les sommets du massif. Le projet de la construction d'un restaurant d'altitude au terminal du Funitel pourrait attirer encore plus de visiteurs. La nouvelle réserve naturelle de Sancy Chastreix, comme celle de la vallée de Chaudefour, aura aussi un programme de gestion des chemins de randonnée. Cela pourrait créer de nouveaux points d'entrée vers les crêtes mais dans ce cadre plus strict, les randonneurs seront mieux guidés.

6. CONCLUSIONS

Dans une optique de développement durable de la région, une bonne compréhension des dynamiques géomorphologiques de la part des décideurs devrait être adoptée dans leurs politiques qui visent à mettre en valeur les sites touristiques du massif du Sancy.

La prise en compte des phénomènes d'érosion par les différents décideurs dans leurs politiques d'aménagement (Communauté des Communes, Parc Naturel Régional des Volcans d'Auvergne, Réserve Naturelle de la Vallée de Chaudefour, Conseil Régional, Conseil Général) contribuerait à trouver les meilleures solutions aux actions destinées à réhabiliter les sentiers de crête et les appliquer à l'ensemble du massif. Cette réhabilitation des sentiers devient nécessaire si les décideurs souhaitent rendre la randonnée agréable et sécurisée, mais cela devrait se réaliser en réduisant au minimum les atteintes aux éléments naturels (géologie, morphologie, flore, faune, etc.).

Actuellement les retombées économiques provenant de l'activité de randonnée dans le Sancy sont plus modestes comparées à celles liées à la pratique du ski. Mais, une amélioration des conditions de pratique de la randonnée pourrait aussi attirer davantage des touristes dans la région. Dans le contexte actuel de réchauffement climatique qui met en question la pratique des sports d'hiver dans le Sancy, la randonnée pourrait constituer l'avenir pour le tourisme de cette région.

R E F E R E N C E S

1. Batisse, R. (2004), *Rapport Garde Nature Zone Natura 2000 des Monts Dore - Saison 2004*, Parc Naturel Régional des Volcans d'Auvergne, 119 p.
2. Krzemien, K. (1995), *Le rôle du tourisme dans la transformation des versants du massif des Monts Dore*, Dans «Milieu naturel et activités socio-économiques dans les montagnes Carpates – Massif Central», Krezmien K. (dir.), Prace geograficzne, zeszyt 99, Uniwersytetu Jagiellonskiego, pp. 23-34.
3. Krzemien, K. (2004), *Le rôle des processus morphogéniques contemporains dans le modelage du Massif volcanique des Monts Dore (Massif Central)*, Dans «Les transformations du milieu montagnard Carpates-Massif Central français et autres montagnes d'Europe», Krzemien K. (dir.), Institute of Geography and Spatial Management, Jagiellonian University, Cracovie, pp. 11-25.
4. Lavina, P. (1985), *Les volcans du Sancy et le Massif Adventif – Etudes volcanologiques et structurales*, Thèse de doctorat, Clermont-Ferrand, 211 p.

5. Leroy, T. (2007), *Eléments sur la fréquentation pédestre entre la télécabine de la Perdrix et la plateforme du Ferrand. Réserve naturelle nationale de la vallée de Chaudefour*, Parc Naturel Régional des Volcans d'Auvergne, Etude financée par la DIREN Auvergne, 26 p.
6. Pelfini, M., Santilli, M. (2006), *Dendrogeomorphological analyses on exposed roots along two mountain hiking trails in the Central Italian Alps*, Geografiska Annaler, vol. 88 A, n° 3, pp. 223-236.
7. Guitton, M., Pop, O., (2008) *L'érosion des sentiers de randonnée sur les crêtes du Sancy (Massif Central français)*, Actes du Colloque International «Développement durable des territoires: de la mobilisation des acteurs aux démarches participatives», 17-19 septembre, 2008 (à paraître).
8. Radoane, Maria, Radoane, N., Ichim, I., Surdeanu, V, (1999). Ravenele – forme, procese, evolutie, Presa Universitara Clujeana, Cluj-Napoca, 266 p.
9. Reynard, E., Morand, S., Ammann, T. (2003), Protection et mise en valeur touristique d'un site géomorphologique: la région du Sanetsch (Valais, Suisse). Dans «*Géomorphologie et tourisme*», Travaux et recherches n° 24, Reynard, E., Holzmann, C. Guex, D., Summermatter, N., (eds.), Institut de Géographie de l'Université de Lausanne, pp. 35-51.
10. Teneau, A. (2001), *La vallée de Chaudefour dans le cadre du Massif du Sancy, étude d'une réserve naturelle*. Mémoire de Maîtrise de Géographie, Université Blaise Pascal, Clermont-Ferrand, 149 p.
11. Valadas, B., (1984), *Les hautes terres du Massif Central français – contribution à l'étude des morphodynamiques récentes sur les versants cristallins et volcaniques*, Thèse de Doctorat, Université de Paris I, 927 p.
12. Veyret, Y., (1978), *Modelés et formations d'origine glaciaire dans le Massif Central français – problèmes de distribution et de limites dans un milieu de moyenne montagne*, Thèse de Doctorat, Université de Paris I Panthéon-Sorbonne, 783 p.
13. Veyret, Y., Hotyat, M., Bouchot, P., (1990), L'érosion d'origine anthropique dans un milieu de moyenne montagne: le massif montdorien. Dans «*La Terre et les Hommes – Mélanges offerts à Max Derruau*», Publication de la Faculté des Lettres et Sciences Humaines, Université Blaise Pascal, Clermont-Ferrand, pp. 545-556.

STUDIA UNIVERSITATIS BABEŞ-BOLYAI, GEOGRAPHIA, LIV, 2, 2009

THE ROLE OF HYDROGRAPHY IN THE GENESIS AND INDIVIDUALIZATION OF THE SYSTEM OF SETTLEMENTS AND IN THE SOCIO-ECONOMIC EVOLUTION OF LĂPUŞ LAND (II)

ŞT. DEZSI[1]

ABSTRACT. – The Role of Hydrography in the Genesis and Individualization of the System of Settlements and in the Socio-Economic Evolution of Lăpuş Land (II). The first part of the study points out several relevant aspects regarding the ground hydrographical network by briefly mentioning the most significant of their quantitative and qualitative parameters, as well as their distribution and intraregional spatial relations. The second part focuses upon the relations of interdependency and reciprocal support between parameters and the manner in which they influenced the apparition and evolution of the system of settlements, as well as the socio-economic development of Lăpuş Land.

Keywords: *hydrography, system of settlements, management, spatial distribution, qualitative and quantitative characteristics.*

1. INTRODUCTION

In the complex process of organizing and planning the geographical space, the evenly capitalization of water resources and setting optimum balances between the socio-economic activities and the hydrological resources becomes a necessity, even in the case in which – at first sight - the analysed territory is the possessor of significantly quantitative and superiorly qualitative of potability. Bearing these in mind, the first part of the present study analyses their best usage, their impact and specific manner in which their management has played a major role in the process of anthropic evolution of Lăpuş Land (locating settlements, level of accessibility, supporting life and cohesion of human communities, etc.), by adopting and adapting a variety of techniques and traditional hydraulic installations that would allow both to supply life sources, and the overall evolution of Lăpuş society up to present. In this context, we tried to accomplish a thorough analysis of the underground water quantitative and qualitative characteristics, its spatial distribution, its best usage, as well as the manner in which it influenced the apparition and development of human settlements and activities of Lăpuş Land's population.

Further, we intend to points out several relevant aspects regarding the ground hydrographical network by briefly mentioning the most significant of their quantitative and qualitative parameters, as well as their distribution and intraregional spatial relations. In the final part, the study focuses upon the relations of interdependency and reciprocal support between parameters and the manner in which they influenced the apparition and evolution of the system of settlements, as well as the socio-economic development of Lăpuş Land.

[1] *„Babeş-Bolyai" University, Faculty of Geography, 400006, Cluj-Napoca, Romania, e-mail: stefan@geografie.ubbcluj.ro*

2. QUALITATIVE AND QUANTITATIVE FEATURES OF THE GROUND WATERS, THEIR DISTRIBUTION AND THE INTERREGIONAL SPATIAL RELATIONS

As a result of the steady water fluxes determined by the contact between the mountain and the high hilly areas that surround the depression area and due to the general air circulation predominantly on a West – North-West direction, the rivers in Lăpuş Land form a dense, branched network with a high drainage and a relatively constant flow, which is formed exclusively from the rivers that have their springs within Lăpuş Land. Therefore, hydrological resources organize altogether within the system, thus allowing their unitary management and offering multiple possibilities for economic valorisation.

Gr. Posea (1962) determined that the formation of hydrographical network of Lăpuş Land was influenced by the presence of piedmonts, especially that of Şatra, more extended in the past, which imposed a semicircular flow direction, in the Central-Northern part of the depression, as compared to its form and extent, as well as its withdrawal; another factor to be considered is the presence of piedmont cones, which imposed its flow directions in relation with the slope, type and manner of twinning, as well as the contact with Ciceu-Giurgesti strata, directions usually in contradiction with tectonics of strata over which piedmonts lay.

Among other secondary factors that subsequently influenced the distribution of hydrographical network, we can mention the discordant structure found after the alienation of piedmont materials, the subsidence movements in Baia Mare Depression, the retrieval of Şatra Piedmont in a circular manner, various catchments, etc.

Crossed over by two main rivers, Lăpuş and its tributary, Suciu River, Lăpuş Land has a quite dense hydrographical network, determined and influenced by the multitude of tributaries of the two main rivers, such as: Strâmbu-Băiuţ, Libotin, Dobric, Cufoaia, on the right side of Lăpuş River, respectively Bradul, Tocila, Botizul, Ruoaia, Edera, Rohia, Valea Mare etc., on its left side.

Lăpuş River is the longest watercourse of Maramureş County. It collects waters from all the Southern slopes of Gutâi-Şatra-Ţibleş volcanic mountains and Lăpuş Mountains, as well as from the Northern slope of Breaza Hill and Preluca Massif. It springs from under Văratec Peak at 1365 m, at about 1200 m altitude, and flows into Someş River, West of Săsar locality, at only 148 m altitude. Its basin registers values of 1820 sq km and a length of 114,6 km. a real sub-mountain collector, with a high asymmetry, deviated towards right, especially if we consider Suciu River as its system's spring. In the springs area it presents rather accentuated longitudinal slopes of about 10 – 15 m/km, which tend to become moderate when it crosses Băiuţ depression, where other two small but economically very important tributaries are added: Strâmbu-Băiuţ River, covering a surface of 31 sq km, and a length of 8 km coming from the right side, and Botiz River covering a surface of 30 sq km, and a length of 12 km coming from the left side. Their flows are enough for covering the water necessities for the extraction and exploitation of sulpha, gold and silver ores within the mining exploitation area.

The industrial usage determines the precarious quality of Lăpuş River, which is polluted up to downstream Târgu Lăpuş, yet without overlapping the limits admitted by current regulations, at least in official numbers. The mining waste waters contain, alongside significant quantities of suspensions, also residuals of plumb, zinc, phenol, sulphate and cyanides, but their concentration is a lot lower due to the large quantities of waters brought by Lăpuş tributaries. Still, Lăpuş River receives left tributaries,

though of reduced lengths, among which we can mention: Ruoaia (surface = 45 sq km and length = 16 km) and Iedera, which drains the Southern slope of Lăpuş Mountains. Between localities Rogoz and Dămăcuşeni we can observe the first large hydrographical convergence sector, here Lăpuş River receiving some of its most important tributaries, such as Libotin on the right and Suciu, on the left, the latter draining the Western slope of Ţibleş Mountains. Beginning with Lăpuş and continuing until the entrance in Răzoare defile, Lăpuş River has a smooth course, with reduced longitudinal slopes.

The right tributaries drain the Northern sector of the depression, which contains significant quantities of underground water in its piedmont deposits. These tributaries flow on a West – South-West direction, have large basins, and mostly relatively large falls, fact that may become an advantage for their use hydroelectrically. They also formed extended meadows with their frequent meanders. Libotin and Dobric tributaries have their springs near Şatra Peak, at 800 m and respectively 700 m altitude, having a rich underground source. Nevertheless, their dimensions are not quite significant, as it follows: Libotin tributary – surface = 68 sq km, length = 16 km, Dobric tributary – surface = 87 sq km, length = 16 km. after they cross the central part of Târgu Lăpuş Town, where, on a length of 3 km works of embankment were made as a condition for avoiding floods, Lăpuş River receives other three tributaries upstream Răzoare village, such as: Rohia, on the left, Dobric and Cufoaia on the right.

Downstream Târgu Lăpuş locality, at kilometre 42, Lăpuş River crosses Preluca Massif creating a spectacular defile of 28 km length, here slopes reaching values of 3-4 m/km, with abrupt slopes and meanders. At its confluence with Cavnic tributary, the most important of its tributaries, with a length of 34,8 km and an average flow of 3,87 m^3/s, its course straightens. Before it enters the defile, at Răzoare locality, it has an annual average flow of 12 m^3/s, value that varies from 1,5 m^3/s during droughts, to 500 m^3/s when large floods. The other existent tributaries on the left come from Breaza Hill, the most important of them being Valea Mare (Văleni) and Valea Ponoriţii.

Suciu River (Ţibleş) represents the most important tributary of Lăpuş River before it enters the defile. It springs in Ţibleş Mountains, near Hudin Peak, at 1611 m altitude, its course having 35 km length. Like most of the rivers in Lăpuş Land, it is known under several names: Valea Ţibleşului in the mountain area, until it passes by the first village – (Groşii Ţibleşului, at the confluence with Valea Bradului) it is called Valea Mingetului, and then Valea Groşilor until it crosses Suciu de Sus locality and Valea Suciului from here up to the end. Upstream Groşii Ţibleşului locality the meadow is very well individualized, yet it receives smaller tributaries, out of them the most important ones being Periac and Lupoaia on the left side. They join together on the territory of Dămăcuşeni village.

Rohia River is the left tributary of Lăpuş and it collects waters that flow on the Northern slope of Breaza Hill, West from Breaza Peak, at 974 m altitude. After it flows on a direction East-West, when it reaches Rohia locality, it turns towards North and, it crosses the gorges sector formed on Eocene calciferous strata, such as Calcarele de Cozla, which are part of the Vartoape Area, and it drains into Lăpuş river downstream Târgu Lăpuş Town. Along the valley we can observe two sectors: the inferior one, or the so-called Rohia Valley, largely opened and constituted on the Vârtoape Area and the superior one (up to Rohia village), called Boierenilor Valley, which perpendicularly crosses the fragmented hills nearby Breaza Hill. Its main tributaries are Ursului, Părintelui and Porcului creeks.

Libotin River (Rotunda) springs in Lăpuş Mountains, its current form being determined by the join of Ungurenilor and Fundăturii creeks that spring from Sdârcea Mare Peak (1064 m altitude). The name of Libotin is given only to the sector downstream

the homonymous locality up to its draining into Lăpuş River, which is on the territory of Rogoz locality. The evolution of this valley is related to that of Şatra piedmont, its main tributary being its homonymous locality, and to that of an old piedmont cone resulted from the superior basin of Bloaja. Libotin River joins Lăpuş River at Rogoz locality.

Dobric River constitutes the main collector of the creeks that come from Şatra Massif at 1041 m altitude, where from it receives numerous tributaries, such as: Stoiceni, Dumbrava, Dobricel, and Valea Teiului (the last one creating a gorges sector in the crystalline of Magura Ineu. Close to the flowing into Lăpuş River it receives Cufoaia tributary, which forms a short epigenetic gorges sector in the North-Eastern area of Preluca Massif. Downstream Dumbrava village, its course was corrected and embanked. It joins Lăpuş River upstream Răzoare village.

Most of the *lakes* within Lăpuş Land were the result of people's actions, thus offering great perspectives for recreational activities and pisciculture. Some of the most important ones in matters of size and functions are: Dobricel lake, with a surface of 7 hectares and a volume of 145000 m^3 arranged in 1982 on its homonymous river, between Târgu Lăpuş and Dumbrava localities, aiming to provide water for the meadows within its perimeter; Lighet Lake, with a surface of 4 hectares and a volume of 75000 m^3 arranged in 1975, within its perimeter we can find all the recreational base of Târgu Lăpuş Town; Rohia Lake, with a surface of 2,5 hectares, located between Rohia and Fântânele villages; Dămăcuşeni Lake with a surface of 1,5 hectares, situated on Gardului Valley, it was constructed for the water alimentation of the former U.F.E.T. Târgu Lăpuş, as well as for fishing activities; Ruoaia Lake, with a surface of 3 hectares, arranged nearby Lăpuş commune, is used for recreational activities and pisciculture; and Băiuţ Lake, which is located in the South-West of Băiuţ commune, it being used for mining flotation. To these it can be added the natural lake of Tăul Negru, in Ţibleş Mountains, situated in the South-East of Măgura Neagră (1589 m).

3. FEATURES OF THE HYDROLOGICAL PARAMETERS OF THE GROUND HYDROGRAPHICAL NETWORK AND THEIR ROLE IN THE SOCIO-ECONOMIC DEVELOPMENT OF LĂPUŞ LAND

The values registered by all the elements of the natural water circuit are in relation with the hydrological balance, which is a synthetic method of determination of the hydrological traits, based on the elements of the water circuit. Thus, the hydrological balance expresses the equality between the total amount of precipitations (X_0) in a given period of time and the equivalent sum of superficial drainage (S_0), infiltration (U_0) and their evaporation (Z_0).

Out of the elements of the hydrological balance, the average value of precipitations (X_0) have a particular role in the formation of the drainage regimen of Lăpuş River, they oscillating from 950 to 1380 mm on the reference territory, registering higher values on the Western slopes of the mountain and hilly areas (over 1000 mm); in depression areas the values decrease to 800-1000 mm. The global average drain ($Y_0 = S_0 + U_0$) is of about 500 mm, the same like evapotranspiration (Z_0), therefore the values of drain increasing with the altitude.

The river flow within Lăpuş Land is mainly provided (more than 95%) by the mountainous and high hilly area around the depression; here the average value of 12 m^3/s flow comes to the main collector of the reference space (Lăpuş River) between 1972 and 2005. The values were registered at Răzoare hydrometrical station, located at the beginning of Lăpuş defile. These values increase to 18 m^3/s downstream, at the end of the defile, at Remetea Chioarului, and reach numbers of 25m3/s when it drains into Someş River.

The most significant quantities of water come from Lăpuş Mountains, especially given by Lăpuş River and its tributaries, mainly Libotin, Izvorul Poienii and Ruoaia; from Ţibleş Mountains, given by Suciu River and its tributary, Valea Bradului River; from Şatra Massif, given by Dobric, Libotin, and Valea Teilor rivers; and from Breaza Hill given by Boiereni, Rohia and Valeni valleys. It is a hydrographical network drained to the main level overlapped to the hydrographical convergence area in the centre of the depression, within the perimeter of Răzoare-Rogoz.

Thus, only a small part of the total flow of Lăpuş River is within the limits of depression area, it being drained by the creeks formed at the foot of glacises or piedmont structures that surround the depression (Breaza Glacis and Şatra piedmont). By summing up the total flows within the reference space, the available water resources reach a volume of about 30,63 m^3/inhabitant/day, that seems to satisfy the current household and industrial necessities of the region.

The waters of Lăpuş Land are included in the *Western Carpathian and Western Pericarpathian hydrological regimens*, characterised by the relatively early beginning of the highest flows in the springtime, period that lasts one or two months (March-April), followed by floodwaters at the beginning of summertime (June), so that in the period of July-November the hydrological drought would begin, with some periodical interruptions, and during wintertime being possible the apparition of floodwaters due to high rainfall and snow.

The analysis of the territorial distribution of multi-annual average flow reflects a series of differentiation induced by altitude and, strongly connected to this, by the volume of precipitations in various areas within the region. Therefore, if within the Lăpuş land specific flow register values between 10 and 13,6 l/s/sq km , specific flow within the mountainous area increases up to values between 12-14 l/s/sq km, while in the areas of hills, volcanic and crystalline isolated massifs, such as Şatra and Preluca, as well as in Breaza Hill area there are registered values between 8 and 10 l/s/sq km^2, because at the contact area between the depression and the marginal units, the values decrease under 7 l/s/sq km.

Thus, the degree of water supply for the population highly varies according to the local traits of physical and geographical factors (which subscribe to a distinguishable differentiation according to the location of localities' precinct (central area) in Lăpuş Land). The most favoured ones, in this respect, appear to be the ones in the North-Eastern and Eastern compartments of the territorial system under consideration (overlapping the superior basins of Lăpuş and Suciu rivers, covering the mountainous area and thus providing a rich and rather constant supply). The localities in the Western and South-Western compartments can be placed at the antipode (especially the villages of Jugăstreni and Sălniţa), they showing a deficit of water availability due to particular hydro-geological and morpho-lithologic conditions (determined by their location on the Purcăreţ-Boiu Mare limestone plateau).

The average flows registered at the hydrometrical stations of Lăpuş Land (the multi-annual average between 1972 and 2002)

Table 1

River	Hydro-metrical station	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Average
Suciu	Suciu de Jos	2,82	3,76	6,97	7,44	4,78	4,49	3,48	1,83	2,35	2,56	3,13	3,89	**3,96**
Lăpuş	Răzoare	9,79	13,11	23,21	21,26	12,70	11,93	9,12	4,47	6,02	7,20	10,62	13,45	**11,91**

The average liquid flow also reveals seasonal variations of ultimate importance, as consequences of mutations in the ratio between the rainfall regimen and the factors that influence the seasonal distribution of the flow regimen. As a consequence for the region on an overall, the highest water flows are registered (at all hydrometrical posts on the Lăpuş River and its tributaries) during springtime (40-42%), followed by those during wintertime (registering volumes of 26-30%), due to an increase of the Western circulation, although a high quantity of rainfall is stocked on the surface. This phenomenon occurs as a consequence of the predominance of negative temperatures, which lead to freezing and favour the preservation of the snow layers and generating low winter waters.

The ingress of warmer air masses determines partial meltdowns of the solid precipitations in the soil and leading towards floodwaters in the cold season, as well.

As a consequence of evapotranspiration and the reduction of specific precipitation quantities in summertime, the seasonal flow barely represents half of the percentage value registered in springtime. This leads to the creation of low summer waters (without leaving out the emergence of high water flows during summertime, as a consequence of heavy rainfall), so that during the autumn period, the lowest flow values are registered. These values occur despite the reduction of evapotranspiration and the emergence of autumn rainfall (they do not manage to make up for the deficit of underground reserves, which were exhausted during summertime).

If, for the entire territorial system, the seasonal distribution of the average liquid flow demonstrates maximum flow during springtime (as a consequence of positive air temperatures and gradual meltdown of snows, in accordance with the meltdown rate, duration and intensity of spring rainfall, thus floodwaters appearing due to snow meltdown, rainfall or due to the overlapping of the two phenomena), the values registered for the hydrographical basins reveal a series of differentiations. These differentiations appear to be important in certain cases, according to the local physical and geographical traits. Therefore, the river with hydrographical basins covering mostly a mountainous sector reveal higher flows during the spring-summer period, as a consequence of a thicker snow layer in the cold period, immobilized for a longer time (until the half of May) and its gradual meltdown. These conditions - alongside consistent rainfall specific to the beginning of the warm season - provide more significant water flows in the summer period for river mountain sectors (more distinguishable in the case of the Lăpuş and Suciu rivers and their mountain tributaries).

In exchange, however, due to the same causes, the winter season displays the lowest flows for mountain rivers. This is due to the fact that rivers and their hydrographical basin covering the depression area (where snow melts and refreshes successively during wintertime) show the lowest flows during the autumn period, as the water supply for this season is provided exclusively by liquid precipitations, lower during the beginning of the season.

High rainfalls at the beginning of summertime lead to an increased river flow for rivers in the depression area, and at its contact with the mountain or with the high hills, yet without exceeding springtime flow (the high supply of the season is due to snow meltdown in high mountain areas and to the increase of liquid precipitation volume against solid ones).

Knowing *maximum flow values* is of paramount practical interest, due to the impact that the floodwaters - as a major risk factor - might have on the components of the human habitat and socio-economic activities. The elements that lay at the basis of their production are climatic (liquid precipitations, thickness of the snow layer and air temperature) and hydrological (duration of high water flows and the floodwaters that generate them). The values of absolute maximum flow- determined according to the hydrological data for the 1972-1995

interval from the two hydrometrical stations in the territory of reference (Suciu de Sus and Răzoare)- reveal the fact that the majority of floodwaters produced in the depression area have a *mixed pluvial and snow origin* (rainfall and snow meltdown).

The pluvial ones in the warm season are predominant, namely at the beginning of winter. A rather lower frequency is assigned to the situation where these precipitations were produced at the beginning of springtime (March-April) as a consequence of a sudden meltdown of the snow layer, alongside heavy rainfall.

Absolute maximum flows registered at the hydrometrical stations in Lăpuș Land (1972-1995)

Table 2

River	Hydrometrical station	Year	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
Suciu	Suciu de Jos	m^3/s	50	26,4	208	98	48,5	27,5	135	54,2	149	115	39,4	47,7
		data	15.11	07.06	12.06	04.04	03.04	14.06	30.12	01.01	29.07	12.03	01.07	31.01
Lăpuș	Răzoare	m^3/s	191	207	410	141	132	121	358	228	136	290	118	150
		data	15.11	27.12	12.06	03.04	2,3. 04	11.02	30.12	01.01	01.06	12.03	01.07	31.01

River	Hydrometrical station	Year	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Suciu	Suciu de Jos	m^3/s	45,3	44,6	93,8	35,1	58	52,4	31,8	51,6	x	85,8	33	93.6
		data	05.07	04.05	20.04	01.04	24.03	18.12	04.07	20.05	x	21.12	31.12	24.12
Lăpuș	Răzoare	m^3/s	126	144	204	96	118	192	114	170	x	352	166	372
		data	05.07	04.05	20.04	01.04	24.03	18.12	01.11	20.05	x	21.12	31.12	24.12

Note: x = no data.

As a consequence, Răzoare hydrometrical station (measuring the water collected by the main drainer of the region, the Lăpuș River) for almost the entire middle and superior basins of the river, the absolute maximum flow is exclusively pluvial (410 m^3/s, on 12 June 1974), followed by the maximums of December (1995 and 1978 with 372 m^3/s, respectively 358 m^3/s, due to heavy rainfall together with the meltdown of the pre-existent snow layer, yet with a smaller contribution).

This situation does not suffer significant „disturbances" either in the case of rivers with narrow basin surface (at the hydrometrical station of Suciu de Jos), where absolute maximum flows „copy" with few exceptions, all the high water intervals for the entire regions (e.g. 208 m^3/s on 12 June 1974, 149 m^3/s on 29 July 1980, 135 m^3/s on 30 December 1978, 93, 6 m^3/s in December 1995 etc. – Table 2). The difference is that high waters in the

winter - spring period - due to the sudden meltdown of the snow layer - are produced more frequently as compared to the rest of the Lăpuş area due to the rather wide basin surface overlapping the mountain area of Ţibleş (e.g. 115 m^3/s in March 1981 and 93,8 in April 1986).

Absolute minimum flow registered at hydrometrical stations in Lăpuş Land (1973-1995)

Table 3

River	Hydrometrical station	Year	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Suciu	Suciu de Jos	m^3/s	0,406	0,635	0,573	0,62	0,48	0,564	0,871	0,574	0,7	0,247	0,268	0,15
		data	14.01	30.01	05.02	07.03	29.10	19.01	09.1	29.02	30.09; 01.10	06.12	15.12	20.03
Lăpuş	Răzoare	m^3/s	0,73	0,856	1,62	1,49	1,61	1,85	1,4	2,08	2,48	0,808	0,54	0,687
		data	28,30. 09, 08.10	26.01	13.12	21.07	16.09	30, 31.08	7,8.1	11.01	30.09	05.12	05.12	15.01

River	Hydrometrical station	Year	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Suciu	Suciu de Jos	m^3/s	0,449	0,232	0,358	0,421	0,47	0,462	0,5	x	0,455	0,441	0,538
		data	17.01	10.11	10.12	05.11 (2)	04.01	1,2.09	16,17.09	x	1,2.12	10.09	27.07
Lăpuş	Răzoare	m^3/s	1,32	0,52	1,04	1,04	2,45	0,838	1,31	x	1,36	0,849	0,944
		data	08.10	11.12	16-18.09	12.11 (5)	28.07	29-31.08; 09 (2)	12.09 (5)	x	15.06 (5)	14.09	31.07

Note: x = no data.

After 1970, there were more strong floodwaters that generated floods in Lăpuş Land, especially downstream Lăpuş River. Only 4 years after 1970, in 1974 the maximum was as strong, while in the following years it showed the repeated production of strong floodwaters (in 1978, 1979, 1980, in March 1981 – the same as the one in 1978 and almost as strong as the one in 1974 etc.).

At their turn, *minimum flow values* are highly important in order to establish the water volume in rivers during small water flows in the summer-autumn period and the second part of the cold season (the months of January and February), as water resources drawn from the hydrographical network are the ones that provide the highest part of the water necessary for household consumers, industrial units, as well as various social and urban facilities across Lăpuş Country. The analysis of these values relied on the same database as in the case of maximum flow.

The analysis performed on available data (see table 3) reveals a deviation of data for small flows at the two stations, emphasizing the fact that the period for minimum

production occurs mostly during the cold year period (December-January) on the rivers displaying a high extension over a mountain area (for Suciu, in this case, at Suciu de Jos hydrometrical station). This phenomenon appears as a consequence of water stocks in the water and ice layers. Meanwhile, for the overall period under study, the share of minimum flow for the first autumn months (September) is lower.

In exchange, the rivers having their basins over a depression area, at lower altitudes, the predominant period for minimum flow production is higher in the summer-autumn periods (July-September at Răzoare hydrometrical station on the Lăpuş River), as a consequence of the reduction of rainfall supply, of intensified evapotranspiration and reduction of underground water stocks (phreatic and depth waters).

In certain cases, there is a several day time deviation of the minimum flow production period registered at the two hydrometrical posts, which can be explained through a longer period of liquid flow drainage towards downstream for low water flows and reduced speeds, especially when compared to the data of maximum flow, where data coincide in most cases, due to the high water flow speed and reduced distance between the two measurement points mentioned.

We mention however, that the situation revealed by the data registered at the two Lăpuş hydrometrical posts (both in its depression area, Suciu de Jos nearby the contact of the depression hearth with Ţibleş mountain area, and Răzoare, before Lăpuş enters Preluca defile) and concisely presented above, only partly reflects the natural hydrological regimen of the rivers, as the hydrographical network suffered a series of anthropogenic interventions leading to the creation of several artificial lakes (which stock a certain quantity of the water volume in the hydrographical network), as well as the usage of certain quantities of water from the rivers for industry and animal breeding.

Very high oscillations occur in river flows (a differentiation between a maximum of 410 m^3/s and a minimum of 0,52 m^3/s for the main collector) residing – besides natural causes - in disturbances of the natural systems caused by human contradicting activities. First, it is a matter of massive successive deforestation, starting with the end of the 19th century and the beginning of the 20th and continuing for the after-First World War period and the 1975-1985 decade. The application of Laws 18/1991, 169/1997 and 1/2000 for restoring property rights on agricultural lands and forests further led to the process of diminishing the forest fund.

Water temperature for Lăpuş Land rivers oscillations are directly related to thermic air variations with average values increasing from the source onto downstream, namely from 8^{o}C…10^{o}C to 10^{o}C…12^{o}C. Maximum temperatures (32…34^{o}C) correspond to the July-August interval. Minimum temperatures occur in the December-March interval, fitting between 0…-2^{o}C, with few exceptions.

Freezing phenomena may occur at the end of November and maintain until the second decade of March, as the ice bridge forms in the third decade of December and the first decade of January and lasts for 30-40 days on an average and have a maximum duration of up to 60 days. The ice bridge is more stable on the Lăpuş River, especially in the sector of the town of Târgu Lăpuş, due to small slopes and the low water flow speed.

Average solid flow on Lăpuş River (1965-1995)

Table 4

Hydrometrical post	F km^2	H m	Q m^3/s	R kg/s	r t/ha/year	f gr/m^3	Forestation percentage
Răzoare	744	628	11,2	4,94	2,00	440	40%

Q = multi-annual average liquid flow; R = solid flow, actual transported quantity; r = specific solid flow/ surface unit of basin /an entire year; f = water turbidity (silt charge), quantity of suspensions for water volume unit (gr/m3).

Solid flow reaches higher values in the Lăpuş River basin as compared to the nearby hydrographical basins due to the influence exerted by waste rock discharges from mine flotations and installations in the Băiuţ and Răzoare mine ground. According to alluvial land (suspension) measurements, the average calculations of solid flow were calculated for the intervals under measurement for the last 4 decades (table 4). For example, the values measured at Răzoare hydrometrical station indicates the fact that Lăpuş River transports an average of 150,000 tons annually solely in suspension, but during high floodwaters, the annual transportation average is surpassed ten times.

The analysis of hydro-chemical water traits (conducted during low water periods, when underground flow and highly-mineralized waters predominate) reveal major differences between water quantity in the mountain area and the depression area. As such, in the mountain sector, there is a predominance of carbonated waters in the calcium group, with mineralization between 100-200 mg/l and hardness of water under 8^oG, while depression waters are chemically varied, as they suffer mineralization alterations due to the influence of sources and tributaries (HCO_3, SO_4 and Cl).

REFERENCES

1. Dezsi, Şt. (2004), *Evoluţia reţelei de aşezări din Ţara Lăpuşului în secolele XIII-XVI*, Studia UBB, Geographia, XLIX, 1, Cluj-Napoca.
2. Dezsi, Şt. (2005*), Evoluţia sistemului habitual şi a ierarhiei funcţionale a aşezărilor din Ţara Lăpuşului în perioada cuprinsă între secolul XVII şi prima jumătate a secolului XIX*, Studia UBB, Geographia, L, 1, Cluj-Napoca.
3. Dezsi, Şt. (2005), *Evoluţia sistemului de aşezări din Ţara Lăpuşului în a doua jumătate a secolului XIX şi secolul XX*, Studia UBB, Geographia, L, 2, Cluj-Napoca.
4. Dezsi, Şt. (2006), *Ţara Lăpuşului. Studiu de Geografie regională*, Edit. Presa Universitară Clujeană, Cluj-Napoca.
5. Popa, N. (1999), *Ţara Haţegului – potenţialul de dezvoltare al aşezărilor omeneşti*, Edit. Brumar, Timişoara.
6. Popa, N. (2000), *Tipuri de aşezări din Ţara Haţegului*, Edit. Brumar, Timişoara.
7. Posea, Gr. 1962), *Ţara Lăpuşului. Studiu de geomorfologie*, Edit. Ştiinţifică, Bucureşti
8. Ujvari, J. (1972), *Geografia apelor României*, Edit. Ştiinţifică, Bucureşti.
9. *** (1964), *Atlasul cadastrului apelor din R.P.R.*, C.S.A. (D.G.G.A.), vol. 1 Bucureşti.
10. *** (1971), *Râurile României. Monografie hidrologică*, I.M.H., Bucureşti.
11. *** (1971), Râurile României. Monografie hidrologică, I.M.H., Bucureşti.
12. *** (1972-1979), *Atlasul Republicii Socialiste România*, Institutul de Geografie, Edit. Acad. Române, Bucureşti.
13. *** (1983), Geografia României, I, Geografia fizică, Edit. Acad. Române, Bucureşti.
14. *** (1984), Geografia României, II, Geografia umană şi economică, Edit. Acad. Române, Bucureşti.
15. *** (1987), Geografia României, III, Carpaţii româneşti şi Depresiunea Transilvaniei, Edit. Acad. Române, Bucureşti.
16. *** (1987), *Geografia României, IV, Regiunile pericarpatice: Dealurile şi Câmpia Banatuui şi Crişanei, Podişul Mehedinţi, Subcarpaţii, Podişul Moldovei*, Edit. Acad. Române, Bucureşti.

STUDIA UNIVERSITATIS BABEŞ-BOLYAI, GEOGRAPHIA, LIV, 2, 2009

SPECIFIC HUMAN-GEOGRAPHICAL FEATURES AND THE TOURISM ALTERNATIVE OF DEVELOPMENT OF SOME RURAL SETTLEMENTS WITH MONOINDUSTRIAL FUNCTION IN THE PERIOD OF TRANSITION. CASE STUDY: SĂRMĂŞAG COMMUNE, SĂLAJ COUNTY

N. CIANGĂ[1]

ABSTRACT. – Specific Human-Geographical Features and the Tourism Alternative of Development of Some Rural Settlements with Monoindustrial Function in the Period of Transition. Case Study: Sărmăşag Commune, Sălaj County. One of the most affected category of predominantly monofunctional-industrial settlements is analyzed. During the period of transition, they were affected both from the viewpoint of the decrease of jobs and incomes, and from that of the population decline. The quality of the public utilities was also affected, as well as the physiognomy and the aesthetics of the settlement. As a result, the projects launched as an alternative had in view the revitalization of the mining activities, the modernization of agriculture and its management towards the development of the wine-growing landscape and of the wine-related tourism. The tourism resources of the analyzed geographical space (the forestry landscape, the reservoir areas of fishing interest, the very small rural settlements in process of disappearance) also constituted opportunities for the planning of tourism areas fit for leisure, rural tourism and secondary holiday homes.

Keywords: *demographical features, the structure of the population, tourism potential, leisure, secondary holiday homes, rural tourism.*

1. INTRODUCTION

The transition to the market economy has affected mostly the small settlements with monoindustrial functions, especially those involved in the mining industry. An example in this respect is Sărmăşag commune from Sălaj County, in which the industry of coal mining has contributed to the social-economic development of the commune itself and of the surroundings. The decline of this activity had a complex impact on the number of inhabitants, on employment and income, and on settlement structures.

2. HUMAN RESOURCES

2. 1. Demographical features

The geographical and administrative-territorial area of Sărmăşag commune comprises the villages of Sărmăşag – the commune seat, Moiad, Lompirt, Ilişua and two hamlets on the verge of disappearance (Ţărmure and Poiana Măgurii).

[1] *"Babeş-Bolyai" University, Faculty of Geography, 400006 Cluj-Napoca, Romania, e-mail: cianga@geografie.ubbcluj.ro*

This territory was inhabited even since the Dacian antiquity, and a Dacian treasure has been discovered. The villages have different ages, as they were attested at the beginning of the 13th century – Moiad, in the first part of the 14th century – Lompirt, while Sărmăşag appeared in the documents in the second half of the same century.

The origin of the population of Sărmăşag, Moiad and Lompirt villages is related to the Hungarian colonization that began in the 13th century.

The administrative territory of Sărmăşag commune extends in the Western part of Sălaj County and it is tentacularily developed within the Crasna and Lompirt Hills, reaching an altitude of 375 m, in its northern part. It is crossed by Crasna and Zalău rivers which meet within the built-up area of Sărmăşag village. These rivers developed an extended sector of plain and terraces, favourable for the setting and development of villages, as well as for the development of complex agriculture.

The existence of important reserves of lower coal, brown coal and lignite, found at a small depth, stimulated for many decades the development of the mining activities and the accentuation of the urban characters and traits of Sărmăşag village (residential blocks-of-flats, running water and sewerage, B sector industrial units, mining industrial high school, commercial units). It also contributed to the stability of the local population and even the attraction of segments of population found at distances of several tens of kilometers, the diversification of the professional structure of the active population, especially during the last decades of the 20th century.

The numerical evolution of population

Table 1

Year	Number of inhabitants	Year	Number of inhabitants
1880	1200	1941	2500
1890	1400	1956	3900
1900	1600	1966	4600
1910	1750	1977	4500
1930	2250	1992	5000
		2007	6521

All these contributed to the fact that, between 1880 and 1992, and especially after 1956, Sărmăşag commune became one of the few examples of a rural space which registered a constant numerical increase, in the general context of a decline of the number of inhabitants, especially after 1962, as a result of the socialization of agriculture and the powerful industrialization of the urban areas. These factors determined a phenomenon with major implications and with profound long term effects, the *"exodus of the rural population"*, especially of the young population under 20 years and of the young-adult population segment, comprised between 20-35 years. The consequences were: the ageing of population, the catastrophic reduction of the young population segment, the feminization of the labour force in agriculture. Sărmăşag commune was relatively protected from this tendency, having developed its own industrial-mining sector of activity.

This aspect is proved by the numerical evolution of the population for a period longer than 120 years between 1880 and 2007 (table 1).

Within this period, the population of the commune grew 5.4 times, with an annual average rate of increase of 42 persons at the level of the whole period. Between 1910 and 1930 and between 1941 and 1956, lower annual rates of increase are to be noticed, due to the human losses caused by the two world wars.

The demographic positive tendencies were attenuated after 1998, up to 2007, when the number of inhabitants had slight fluctuations, in the sense of insignificant increase or decrease, 6553 inhabitants in 1998, compared to 6521 inhabitants in 2007. This happened in the conditions in which the mining activity was reduced to maximum, maintaining only the quarry mining at a low rate. In Sărmăşag commune, the demographic decline has not yet started.

2. 2. The demographic size

As far as *the demographic size* is concerned, the villages belonging to Sărmăşag commune are to be found in the following categories: very large villages over 4000 inhabitants – Sărmăşag, with 4071 persons, middle-sized villages, with 500-1500 inhabitants – Lompirt with 912 persons, Ilişua with 722 persons, small villages with a population between 100-500 inhabitants – Moiad with 223 persons, very small villages, with less that 100 inhabitants – Poiana Măgurii with 8 persons.

As a result of this demographic evolution, a constant increase of the population density was registered, from 45 inhabitants / km^2 in 1880 to 57 inhabitants / km^2 in 1930, 90 inhabitants / km^2 in 1977, 80 inhabitants / km^2 in 1992 and 95.5 inhabitants / km^2 in 2007.

The agricultural density is very high, due to the relative large number of population employed exclusively in agriculture, in relation to the agricultural area, while the subsistence density resulting from the relation between the total population and the arable area reaches 217 persons per 100 hectares, therefore less than 0,5 hectares of arable land / person.

The actual demographic situation is mostly due to the *natural growth of population (movement or natural increase)*, characterized by balanced values of the incoming population, as a result of the birth rate and of the outgoings from the system owed to mortality.

The natural increase of population

Table 2

The interval/years	Birth rate (‰)	Mortality (‰)	Natural increase (‰)
1900-1910	40-45	25-27	15
1966	17-20	Below 8	Over 10
1975-1980	18-20	Below 10	10
1981-1990	Over 16	Below 12	4
1991-1995	12-14	Below 14	0.5
2007	11	10,5	0.5

Although there has been a constant declining tendency, the natural growth of the settlements belonging to Sărmăşag commune, has always maintained pozitive values, as the birth rate has been higer than the mortality.

2. 3. The territorial mobility of population

After 1966, the migration rate has registered negative values, because the number of the departed persons was higher than the number of newcomers in the commune, with losses of 10-15 ‰. After 1980, this tendency was reduced, and negative values below 10 ‰ were registered. After 1990, the domestic migration almost ceased to exist. In exchange, the external migration for work increased after this year, and this phenomenon intensified after 2000 and especially after 2007, when Romania was included among the countries of the European Union. The targets for temporary migration for work are especially Hungary and Germany, where more than 250 persons working mostly in agriculture depart annually.

2. 4. Population structures

The sex structure of the population indicates a slight prevalence of the male population since 1910 – 50.7 %, with an increase of this weight in 1930 – 52.3 %, but the situation would reverse from 1966 to 51,3 %. This situation is maintained nowadays, too. There was a higher weight of males before 1966, and a higher rate of females after 1966.

As for the age structure, according to the conformation of the age pyramid, one may notice a balanced pyramid, in which the young schooling population exceeding 1200 pupils represents 18,4 % from the total population, while the aged population, over 60 years, is slightly above 15 %, and the other 65 % are part of the category of active and employed adult population.

2. 4. 1. The national structure of the population. The population of Sărmăşag commune is remarkable due the predominance of the Hungarian national community, to which one should add the presence of the Romanian population and of the Gypsies (table 3) in significant weights.

The national structure of the population

Table 3

No.	Villages	Total population	National group							
			Hungarians		Romanians		Gypsies		Others	
			T	%	T	%	T	%	T	%
1	Sărmăşag	4696	3813	81.2	809	17.2	72	1.5	2	0.1
2	Lompirt	877	651	74.2	112	12.8	114	13.0	-	
3	Ilişua + P. Măguri	740	708	95.6	13	1.8	19	2.6	-	
4	Moiad	224	7	3.1	217	96.9	-		-	
5	**Total commune**	**6537**	**5179**	**79.1**	**1151**	**17.6**	**205**	**3.1**	**2**	**0.1**

T = Total population.

If at the level of the commune, the weight of the Hungarian population reaches almost 80 %, the situation is much more nuanced in the component villages, with a much more numerous Hungarian population at Ilişua (95.6 %) and Sărmăşag (81.2 %) or below the commune average in Lompirt (74.2 %).

Comparatively, the Romanian population represents only 17.6 % at the level of the commune and only Moiad village is inhabited almost exclusively by Romanians (96.9 %).

The weight of the population of *Gypsy origin* represents only 3.1 % and it is lower than the county and country average. A higher concentration is to be noticed in Lompirt village (13.0 %).

2. 4. 2. The denominational structure is related to the dominant weight of these two national communities, the Hungarians and the Gypsies, the latter belonging, largely, to the Orthodox denomination (table 4).

Nevertheless, this structure is also reflected by the presence of the churches belonging to the Protestant, Orthodox, Roman-Catholic denominations, but also to the Neo-Protestant denominations (Pentecostals, Baptists, Unitarians), 4.6 at the commune level (table 4).

Confessional structure of the population

Table 4

No.	Villages	No. inh.	Denomination									
			Protestant		Roman-Catholic		Orthodox		Greek-Catholic		Neo-protestant Sects	
			T	%	T	%	T	%	T	%	T	%
1	Sărmăşag	4696	3510	74.7	201	43	809	17.2	13	0.3	166	3.5
2	Lompirt	740	371	50.1	211	23.5	3	0.1	-	0.1	42	5.7
3	Ilişua	8770	650	74.1	9	1.0	128	14.6	-	-	90	10.3
4	Moiad	224	-	-	4	1.8	213	95.1	2	0.9	5	2.2
5	**Total commune**	6537	4531	69.2	425	6.5	1153	17.6	15	0.1	303	4.6

One may see the differences at the village level: the clear predominance of the Protestant population in Sărmăşag and Lompirt (over 74 %) and of the Orthodox population in Moiad (97,1 %). The Neo-Protestant denominations are best represented at Lompirt (10.3 %).

2 .4. 3. The population structure according to the level of instruction reflects the status and the position of Sărmăşag commune as a former mining industrial centre with a pronounced urban character.

- Number of persons without Comprehensive School studies	2432	37.2 %
- Number of persons with High School studies	3755	57.4 %
- Number of persons with university studies	320	4.9 %
- Number of persons with master or PhD studies	30	0.5 %
Total population	**6537**	**100 %**

3. TOURISM AS AN ALTERNATIVE OF DEVELOPMENT IN THE PERIOD OF TRANSITION

Sărmăşag commune disposes of a varied tourism potential, as it is located in Crasna-Lompirt hilly region, where the highest altitude reaches 375 m, and the landforms are more fragmented at its northern and southern ends, a geographical area inhabited since ancient times. However, it does not have exceptional components which would grant a peculiar position, and which would determine massive investments in tourism arrangements.

3. 1. The natural tourism potential

3. 1. 1. The landscape potential of the landforms is specific for the low hills under 400 m altitude, with maximum landform energies of only 200 m. These stand out in the Northern part of Sărmăşag village and in the Southern part, in the area of Ilişua and Poiana Măgurii villages.

3. 1. 2. The tourism climatic and bioclimatic potential is framed within the limits of the plain and low hills moderate temperate climate, with soft summers and moderate winters, with average annual temperatures of 9-10^0 C and temperature values in the extreme months of 20^0 C in July and – 1.5… - 2.0^0 C in January.

A high length of the sunshine, exceeding 2000 hours / year, an average nebulosity of 5.5 and an annual precipitation average of 700 mm, are to be taken into consideration as well.

These have led to bioclimatic specific features, represented by an average thermal comfort of 8 days in July, a small number of days with thermal discomfort, because of the hot temperatures, of 9-10 days during the same month. The general index of bioclimatic stress (as a result of cumulating the cutaneous and pulmonary stress) increases to an average value of 40 units.

Because of these climatic and bioclimatic specific features, the months of March and October are relaxing, April and November are balanced – as far as the cutaneous stress is concerned, while the December - March interval is moderately dehydrating. The May – September summer season is slightly hydrating.

These parameters are specific to the sedative, indifferent bioclimate, with less aggressive climatic factors during the extreme seasons. On this background, the human body does not have to make special efforts for adaptation-acclimatization.

The bioclimate of plain and low hills is without contraindications and it is recommended for rest and climatic cure, stimulating leisure and rest, during the May – September interval.

3. 1. 3. The tourism potential of water resources. The bedrock of Sărmășag commune is lacking hydro mineral and thermal resources. Among the attractive components of this category, one should notice the springs of some tributaries of Crasna river (in the area of Ilișua and Poiana Măgura villages) and especially of Zalău valley, in the Northern part, where a dam lake of 15 hectares was arranged, favoured also by the wooden landscape.

The quarry located in the western part of the village is also of potential tourism interest, as it may become a destination for rest and pleasure in weekends or for the practicing of angling, if cleaning and arrangement of a green space around it takes place.

3. 1. 4. The biogeographic tourism resources are noticeable due to the presence of forest areas made up by a mixture of deciduous trees (pedunculate oak tree, hornbeam, beech). One should notice especially the tourism attractivity of the forest area located in the Northern part, which include very old specimens, and the forest around Poiana Măgura village, which has a tourism potential for rest and pleasure.

The specific fauna of these forests is made up by cynegetic stocks, and some species of real interests are to be noticed here: the wild boar, roebuck or small game.

One should remark the setting of the reservoir aimed for tourism, with special surroundings, in the northern part of the commune. Here, a unique fauna of lake birds is present (mostly ducks and herons) and one should remark the fish fauna with valuable species for angling tourism: carp, pike perch, pike, and even a very valuable species of sturgeon, brought from the fishing station of Nucet.

3. 2. The anthropogenic tourism potential

It is represented by the ***religious objectives***, among which the Protestant churches of Lompirt and Ilișua are remarkable due to their style, age and ecclesiastical objects.

Nevertheless, the elements related to ***rural civilization and culture*** are the most important.

From this point of view, *viticulture* stands out, as it has a long tradition in this region. The whole southerly-exposed slope of Sărmășag village stands out because of the remarkable viticultural and original landscape, made of wine-growing areas, but especially due to the presence of several hundreds of wine cellars (more than 1000 according to some statistics) integrated in the wine-growing area. There is even a gallery more than 1 km long, where the primary processing and the storage of the wine is performed, before it is transferred to Șimleu Silvaniei for champagne processing.

Among the traditional activities, the following ones are to be noticed: the feast dedicated to the month of May, the Sărmășag festive day, the festival of grapes in August (and in the last part of October), the religious celebration of evangelization during one week in January-February, as well as the feasts dedicated to the great Christian moments (Easter, Christmas).

Wood carving, pottery, hemp manufacture and vine culture are practiced in this region as traditional activities and they have an impact on tourism.

Another tourism component that can be put in good use is the gastronomical tourism related to a varied cuisine, using products based on pork, the traditional way of processing and preserving it, and some other specific products (onion sour soup).

3. 3. The tourism planning

The tourism planning and the valorization of the tourism potential is still in an early stage. We consider that the wine-growing stock extended over many hectares, adding the existence of specific *wine cellars*, may become one of the main tourism attractions of Sărmășag commune. A number of wine cellars may be designed as tourism units that would accommodate tourists whom should be offered the whole succession: the vintage (the wringing), grapes juice tasting and wine tasting and organized suppers in the setting of the viticultural landscape.

We propose the materialization of a „wine road", which should cross Sărmășag village, together with a chain of villages with a wine-growing potential: Pir – Sărmășag – Borla – Șimleu Silvaniei.

The water and biogeographic tourism potential presents a remarkable component for tourism planning and capitalization, the *dam lake in the northern part* covering over 1.5 hectares, populated with valuable species of fish and where waterfowl species are present.

The existing tourism capacity of accommodation (the tourism board and lodgings of eight places) may be increased by building some other similar units on the right shore of the lake, finally totalizing 100 places.

The arrangements for fishing and leisure integrated in the landscape (in a lake setting with reed and forest) are very interesting. The 5 km long road must be repaired, to make this special tourism destination accessible for fishing, hunting and leisure.

In the southern part, in the area of *Poiana Măgura* village, that only has 15 households, partly deserted, and in a state of precarious preservation, there is an opportunity for the development of complex arrangements as holiday homes and rural guest houses (there are already 10 secondary homes). This would be stimulated by the building upstream of a small dam lake for rest and leisure and by the rehabilitation of the local road. It is a favorable destination for leisure and sightseeing, for rural tourism, for short stays or transit tourism.

4. CONCLUSIONS

The alternatives to the tendencies existing before the transition have in view the application for projects regarding the reconversion and the revival of some components of the primary economic sector, of some specific agricultural branches and especially the development of several types and forms of tourism, capitalizing the tourism resources that are to be found in the area belonging to Sărmăşag commune.

R E F E R E N C E S

1. Ciangă, N., coordonator (1984), *Economia turismului în Depresiunea Transilvaniei*, Studia UBB, Geologia - Geographia, Cluj-Napoca.
2. Ciangă, N. (2007), *România. Geografia turismului*, Presa Universitară Clujeană, Cluj-Napoca.
3. Morariu, T., Sorocovschi V. (1972), *Judeţul Sălaj*, Edit. Academiei R.S. România, Bucureşti.
4. Pop, P. Gr. (2005), *România: Dealurile de Vest şi Câmpia de Vest*, Edit. Univ. Oradea.
5. Surd, V. (2001), *Geodemografie*, Presa Universitară Clujeană, Cluj-Napoca.
6. xxx, (1992), *Geografia României. IV. Regiunile pericarpatice*, Edit. Academiei Române, Bucureşti.

STUDIA UNIVERSITATIS BABEŞ-BOLYAI, GEOGRAPHIA, LIV, 2, 2009

PROVINCIA CORVINIA CONURBATIO

D. RUS [1]

ABSTRACT. – **Provincia Corvinia Conurbatio.** Conurbatio represents an urban structure resulted from the territorial union of two or more nearby towns, which keep their identity even though they are gathered in a single administrative unit. Within the conurbatio, due to the territorial extension and the socio-economic development, the component towns, which up to a given moment developed independently, must solve common problems (transportation, water and energy supply, environment planning and protection, etc.). After Romania has become a member of the European Union, the lack of a large city in Hunedoara County raised problems concerning the attraction of European funds necessary to the development of the infrastructure and the development of public interest projects. Moreover, situated in the neighbourhood of large cities such as Timişoara, Arad and Sibiu, the municipality of Deva had no chance to become an economic centre of regional importance. In 2007 a solution was found for this disadvantage to disappear, by elaborating a project to unite the towns of Deva, Hunedoara, Simeria and Călan (the distances between these towns are less than 15 km), within a territorial administrative entity, named Provincia Corvinia Conurbatio. The population of the conurbatio would reach the number of 170 000 inhabitants, taking into account the communes/ villages that are included in the perimeter of the four towns. At the end of the year 2000, UE and the Romanian government put forward a normative allotting the sum of 1.4 billion Euros for 13 'poles of urban development': Arad, Baia-Mare, Bacău, Brăila, Galaţi, Deva, Oradea, Piteşti, Râmnicu-Vâlcea, Satu-Mare, Sibiu, Suceava and Târgu-Mureş. These towns will have the role of a 'binder' between 'the poles of growth', respectively the towns of Braşov, Cluj- Napoca, Constanţa, Craiova, Iaşi, Ploieşti and Timişoara. As a future pole of development, Deva (subsequently Provincia Corvinia Conurbatio) is among the few areas in the country where there exists a coherent plan of socio-economic development, agreed by the local councils of the component towns. Also, by 2010 the problem of the administration of the conurbatio will be solved from a judicial point of view.

Keywords: *Conurbatio, poles of urban development, urban agglomeration, Provincia Corvinia Conurbatio Project, Hunedoara County.*

1. INTRODUCTION

As a territorial administrative organization the county of Hunedoara comprises 14 towns, among which 7 municipalities, 55 communes and 457 villages. According to the number of towns, the county of Hunedoara occupies the second place (after the county of Suceava), and according to the number of municipalities, the first place.

In 2008 more than three quarters of the population of Hunedoara County lived in towns.

Although it occupies the second place in the country according to the number of towns, there is no a really large towns in Hunedoara County. The capital town of the county, Deva, counts less than 70 000 inhabitants, while Hunedoara, the largest municipality in the county, counts barely more than 70 000 inhabitants.

[1] *Pedagogical High School "Sabin Drăgoi", Deva, Roumanie, e-mail: dumitrurus@yahoo.com*

Since 1996, successive waves of unemployment in mining and siderurgy left aside tens of thousands of people. Some went to work abroad; others went to larger cities, where they could find easier a work place.

At the level of the county, the active population represented 43.1% in April 2008 (205 700 persons). In the county, the unemployment rate was of 5.53% in April 2008. This is 1% higher the unemployment rate in April 2007, but it is smaller than in May 2006, when it was of 8.3%.

There is no certainty that all the persons who are not registered as working are included in the data base. There are persons who work abroad or citizens who live in the countryside and who are not registered at the County Agency for Work Force.

Within the urban area Deva-Hunedoara-Simeria-Călan, that knew a very strong industrialization in the communist period, the most important number of unemployed, in 2007, were registered in Hunedoara (1,372 persons – 1.9% of the population), followed by Deva (997 persons – 2% of the population), Călan (684 persons – 5.26% of the population) and Simeria (220 persons – 1.6% of the population).

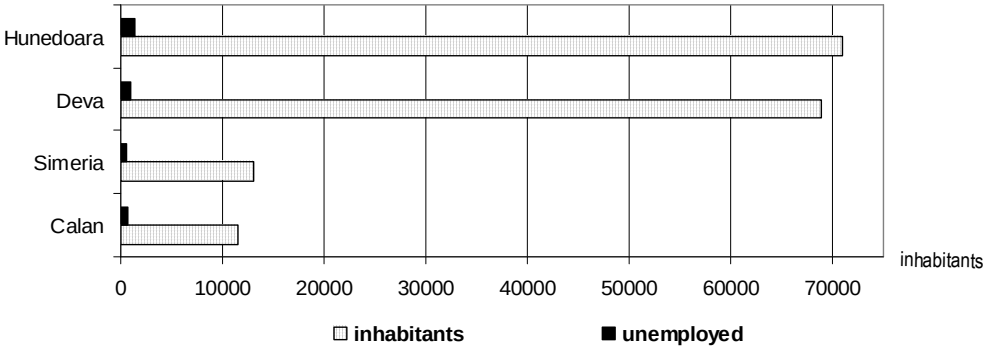


Fig 1. Unemployment rate.

In a classification of the first 50 towns in the country made by the professionals at the Statistics National Institute only three towns in the County of Hunedoara can be found: Deva, Hunedoara and Petroşani.

According to the classification "The most inhabitable 50 towns in Romania", compared to Timişoara, which occupies the first place with 7.25 points, the municipality of Hunedoara occupies the 33rd place, with 4.48 points, and Deva, the 36th place with 4.45 points. If the town councilors in Hunedoara are satisfied with this place, the ones in Deva are deeply dissatisfied by the 36th place, which offends their self-pride, taking into account the massive investments made in recent years.

These aspects have led to the elaboration, by the local authorities, of projects meant to draw the area out of the economic isolation, to ensure a unitary development and an easier access to European funds.

2. PROVINCIA CORVINIA CONURBATIO PROJECT

After the integration in the European Union in 2007, European funds referring to infrastructure or projects of public interest are difficult to receive, because there in not enough population to benefit them.

Besides, the vicinity of some large cities, such as Arad, Sibiu or Timişoara do not offer the towns of Deva or Hunedoara the chance of becoming economic centres of national or regional importance.

In 2007 the local councillors launched a project that hints at uniting the towns of Deva, Hunedoara and Simeria, which are less than 20 km of each other, and forming another city, for which the names Provincia Corvina, Corvinia Magna or Hunedava were suggested.

The three localities are situated relatively close each other, 12 kilometres between Deva and Simeria, 15 between Deva and Hunedoara and 15 between Simeria and Hunedoara.

Among the three towns some villages developed (Sântuhalm, Sântandrei, Bârcea, Cristur, Peştiş), today they are suburbs of the three urban settlements.

During the last 10 years, within the triangle Deva-Simeria-Hunedoara there have appeared commercial service and industrial buildings, which are considered the "binder" of the future urban agglomeration.

In order to put this project into practice, a work team has been constituted, under the leadership of the former chief-architect of the city of Timişoara, Radu Radoslav.

While the project was advancing, the conclusion was reached that a fourth town should enter the conurbatio – Călan, a quadrilateral thus closing, with Deva, Hunedoara, Simeria and Călan in the four corners.

The population would thus reach about 170 000 inhabitants, if we consider the communes that would enter within the perimeter of the conurbatio.

Analysing the evolution of the three localities since 1912, year when Deva had a population of about 15 000 inhabitants, the conclusion was reached that the three localities would unite anyway, around he year 2025.

The idea of uniting Deva and Hunedoara in a single urban locality is not new, as it goes back in the communist period. Thus, at the beginning of the eighth decade of the last century a plan was made to build a tramway railway between the two localities, of 17 kilometres long.

But the idea of the conurbatio was brought back into discussion only in 2005 by the county authorities. The General Urban Plan (PUG) of the future area Deva-Hunedoara-Simeria (DHS) was presented during a public meeting in 2007.

Also, there are projects to build an airport (under Italian licence) at Săuleşti, on the site of the present airfield and an emergency hospital in the area Sântuhalm-Cristur, which will be at equal distance between Deva-Hunedoara-Simeria.

A first step in putting into practice this project is represented by easing the more and more intense traffic between Deva and Hunedoara, where a four-lane road has been built, the construction is ready in a proportion of 80 percent (area Sântuhalm - Peştiş).

The mayors of the three towns generally agree with the idea of this unity, some considering that the towns will unify anyway, and as all large cities manage to solve their problems, the future urban agglomeration will manage, too.

Provincia Corvinia Conurbatio – SWOT Analysis

Table 1

Strong points	**Weak points**
• The location of the conurbatio an important transit axis The existence of the project to build the highway Arad-Deva-Simeria-Sibiu. • The modern road Sântuhalm-Hunedoara (4 lanes). • Short distances between the four towns Support for development projects from some economic agents. • The existence of projects to green the former iron works at Hunedoara and Călan. • The foundation of the industrial park in Hunedoara. • The existence of a General Urban Plan • The presence of the terraces and of the waterside of the river Cerna at Hunedoara, that is not easily flooded, favourable to extend constructions. • Quick access of high technology • The existence of some protected areas.	• The local economic context does not allow an optimal distribution of the financial and material resources necessary for a rapid and equal development of the settlements that make up the conurbatio. • Lack of some economic objectives and significant investments in Călan. • Significant urbanistic discrepancies among the four urban localities. • Existence of unemployment. • The conurbatio is located in an area with ecological problems (Călan, Hunedoara, Chişcădaga-Mintia). • Lack of an airport.
Opportunities	**Threats**
• The elaboration of a strategy for institutional development meant to strengthen partnership with local authorities. • The promotion of actions of ecological reconstruction in the industrial areas Hunedoara-Călan and Mintia-Chişcădaga. • Reduction of discrepancies of economic and urban development among the four towns. • The arrangement of industrial parks at Simeria and Călan. • The arrangement of an airport at Săuleşti.	• Animosities and antipathies between the inhabitants of the municipalities of Deva and Hunedoara. • Local rivalries and political interests. • Unequal allocation of the development funds by the County Council. • A territorial-administrative reorganisation of Romania. • Explosive raise of land prices. • Destruction of the natural habitats and reduction of biodiversity.

It is here that the most of industry would concentrate, while Hunedoara would contribute with the most important part of the population and the largest territory. In the perspective of building the highway Arad - Sibiu, along the river Mureş, it is thought to include the commune Hărău in the conurbatio, by building a bridge over the Mureş, that will link Corvinia with the future highway.

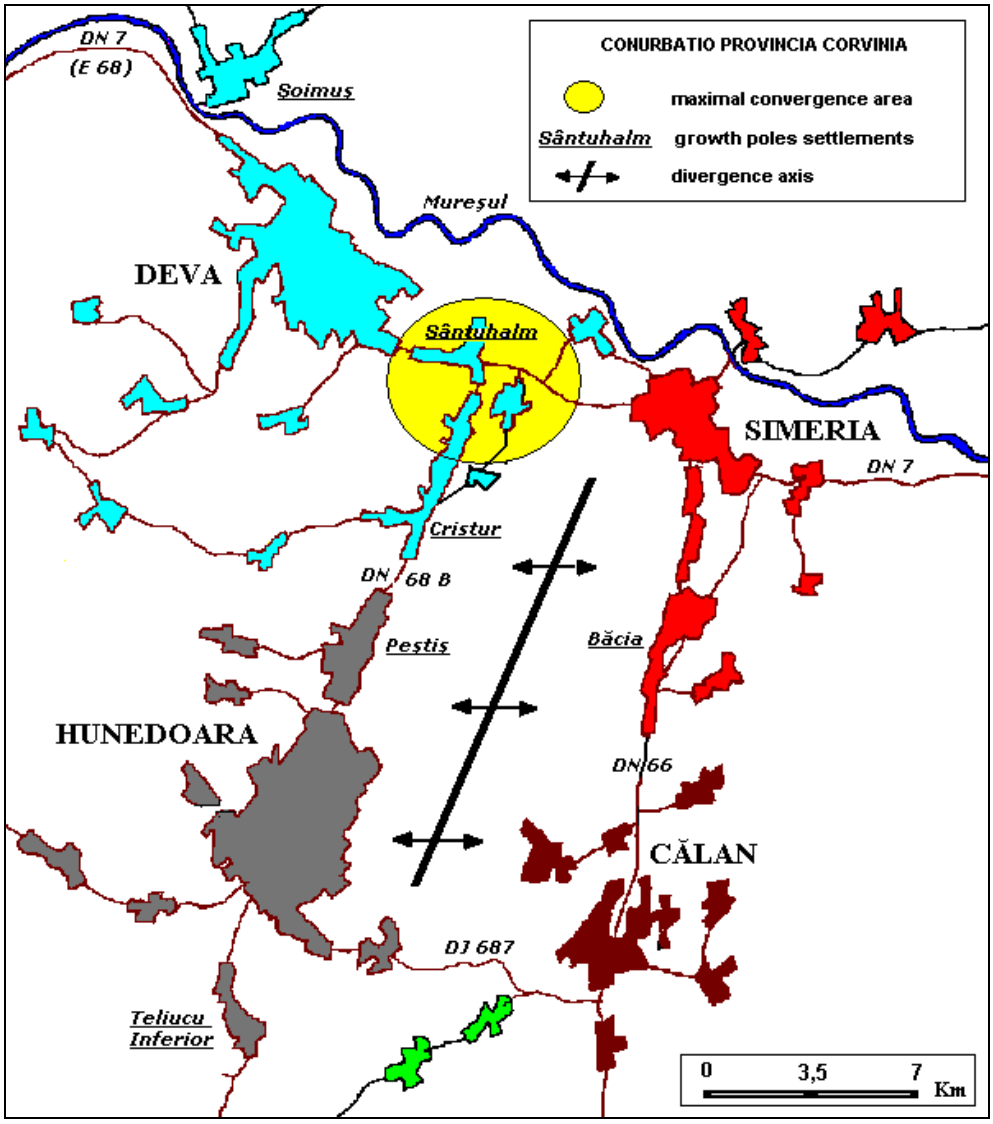


Fig. 2. Corvinia Conurbatio choreme.

The conurbatio Provincia Corvinia will be ruled by an administration council, made up of representatives of the component localities, designed by the local councils and the County Council. The Administration Council will be led by a chosen president.

If in the next decades the conurbatio will materialize administratively, too, Transylvania will have a new large city, called “Provincia Corvinia”, or “Corvinia”.

3. CONCLUSIONS

The main objective of the realisation of Province Corvinia Conurbatio the support of the unitary development, based on partnership, of the towns Deva, Hunedoara, Simeria, and Călan, taking into account the particular stress laid on integrated regional development in the EU, and on the real possibilities to put into common practice of the far-reaching projects that serve the common interests of the inhabitants of the four towns.

The main purpose of the conurbatio, formed more as an associative structure between communities, would be to attract funds for common infrastructure projects (roads, railways, an international airport at Săuleşti, economic objectives, etc.), utilities to encourage the private domain, to attract important investments meant to generate higher income and better life conditions.

Although there are enemies, the conurbatio is about to become an administrative reality. The Local Council Deva is the first of the founding members of the conurbatio that approved the Statute of the Association of Intercommunity Development (Conurbatio) "Corvinia", and which, on September 12, 2008, approved the Arrangement Plan of the Intercity Zone Territory Deva-Hunedoara-Simeria (called TZI DHS).

In the report added to the decision project, the main reason for which the union of the three localities is proposed is to balance the East Euroregion of the European Union. According to the decision of the councillors of Deva, TZI DHS would include the municipality of Deva, with the localities Sântuhalm, Cristur, Bârcea Mică and Archia, the municipality of Hunedoara with the localities Răcăştie, Peştişu Mare, Boş, Groş and Hăşdat, and the town Simeria, with the villages Bârcea Mare, Cărpiniş, Simeria Veche, Sântandrei, Şăuleşti and Uroi.

Even if the judicial problem of the administration of the conurbatio is, for the time being, only theoretically solved, definitely today's young generation will live in a conurbation named Provincia Corvinia (Corvinia Province).

REFERENCES

1. Gruiescu, S. I., Grumăzescu, Cornelia (1970), *Judeţul Hunedoara,* Edit. Academiei, Bucureşti.
2. Rus, D**.** (1998), *Judeţul Hunedoara. Ghid Turistic,* Edit. Sigma Plus, Deva.
3. Rus, D. (2002), *Deva, oraşul de la poalele cetăţii,* Edit. Sigma Plus, Deva.
4. Rus, D. (2008), *Judeţul Hunedoara. Elemente de geografie şi istorie,* Edit. Corvin, Deva.
5. *** *** (1992), *Atlasul României,* Edit. Academiei Române, Bucureşti, 1992.
6. *** *** (2008), *Top 50 – Oraşele României, 2008*, Institutul Naţional de Statistică, Bucureşti.
7. *** *** (2008), *Planul de Amenajare a Teritoriului Zonal Interorăşenesc Deva-Hunedoara-Simeria,* Consilul Local, Deva.

STUDIA UNIVERSITATIS BABEŞ-BOLYAI, GEOGRAPHIA, LIV, 2, 2009

CRITICAL ASPECTS CONCERNING THE RURAL TOURISM DEVELOPMENT IN TÂRNAVA BASIN

H. V. CONȚIU[1]

ABSTRACT. – Critical Aspects Concerning the Rural Tourism Development in Târnava Basin. When it comes to sustainable development, the rural tourism becomes an important factor in conserving the rural identity, keeping and valuing specific traditions and habits, pointing out a different way of life and advertising an original culture for all tourism lovers. The study shows two potential tourism axes along the two Tarnave (Tarnava Mica and Tarnava Mare) that lack any major pollution sources (except Copsa Mica and Tarnaveni) that take over and guide tourists either to the eastern end, towards Sovata-Praid or Odorheiu Secuiesc- Cristuru Secuiesc tourism zones (with the opportunity for rural tourism development), or the western end, for cultural tourism in Sangeorgiu de Padure-Tarnaveni and Sighisoara-Blaj zones; to this, one may add the support brought by the regional union that deals with guiding tourists along the major traveling axis having a transversal position (E 60). We consider that the eastern end of Tarnava Mica axis, the Sovata-Praid zone, hasn't reached by far its full polarizing range because of an obvious discrepancy between the tourism potential and its capitalization and between demand and supply. Also, as a way to rise the tourism demand (and the amount of receipts) we suggest using the narrow rail road between Sovata and Targu Mures again, the latter being an important tourists source.

Keywords*: rural tourism, development, SWOT analysis, sustainable tourism, tourism potential, Tarnava basin.*

1. INTRODUCTION. THE RURAL TOURISM

The rural tourism represents a special kind of tourism, with a complex nature, that stands out thanks to a number of specific features: it offers varied services to relatively low prices, it manages to handle easily all kind of demands, it's based on a large variety and it's very scattered. The rural tourism groups first of all the actual tourism activity (including the accommodation, pensions, the tourism circulation, and the main and auxiliary services), the agricultural activities, and secondly taking part or just assisting to a number of traditional activities that take place in the household (J. Benedek, Șt. Dezsi, 2006, p.40). From all that's said above we can conclude that the rural tourism is becoming an important factor in conserving the rural identity, keeping and valuing the specific traditions and habits, showing a different way of living and promoting an original culture available to all tourism lovers.

This approach suggests that the rural tourism is becoming a *tourism of local initiative*, the major role of promoting this type of tourism is the local community's which has to be actively involved in developing some strategies in the process of easily blending

[1] *"Alexandru Papiu Ilarian" National College, 540072, Targu Mures; „Petru Maior" University, Faculty of Economics, Law and Administrative Sciences, 540560, Targu Mureş, Romania, e-mail: hcontiu@yahoo.com*

with the tourism demands. Still, the term "*local colour tourism*" is used to determine the nature of each village, objective, centre or tourism region. The rural tourism has to be a *rentable tourism* for all the communities that support and promote it, all the investments being doubled by extra incomes (H. Grolleau, apud Cornelia Ureche, Gabriela Rotar, 1999).

2. POSITIVE (ADVANTAGES) AND NEGATIVE (DISADVANTAGES) ASPECTS CONCERNING THE DEVELOPMENT OF THE RURAL TOURISM

Among the ***advantages of the rural tourism***, that are positive premises in the lasting development of the studied region are:

- *the actual and potential trends of extending the rural tourism and so, the premises of bettering the rural life are obvious although, at the moment, this type of tourism isn't very popular.* So, the rural tourism may have some consequences in using labor through encouraging and financing some types of activities that can offer more to different economical states
- *new jobs*, since in the past few years the young population tends to emigrate from the rural zones. And so, by building new pensions and extending the special tourism offers new jobs appear that give an alternative for the population with a nice and attractive income;
- *pluriactivity* is another positive aspect justified by the fact that many owners deal with agriculture, managing households of different sizes and fields (crops, pastures etc). Also, getting involved in the rural tourism gives these owners the chance to have a complex activity, different from the household needs and the obligations towards the tourism services;
- *promoting and supporting services*, taking account of the fact that more and more pensions have a website or use the media (press, television, radio) to promote pensions/ tourism services; the extra incomes are invested, developing the business;
- *promoting and supporting folk art, customs and traditions*; many of the pension owners try to maintain the folk art, to built/(re)arranging memorial houses (using the same type of elements as in the past: furniture, pottery or wooden dishes, old newspapers etc.), reintroducing in the tourism circuit forgotten traditions, customs or trades (for example, the museum of "hats" near Bezid, bringing up to date the rural dances, asserting old works such as shepherding or viticulture and so on);
- *lowering female labor*; women's part in the rural community is usually reduced, men being the ones that deal with productive activities. Still, many pensions have a female as an owner (their activity usually is complex, having to deal with the tourists, accommodations, maintaining the house and promoting the pension).;
- the rural tourism is, without a doubt, a profitable business for the regions that deal with it. But it can also generate a series of problems because, usually, limiting the working activity in places with a fragile balance implies a risk that may develop. So, among the negative aspects or ***disadvantages of the rural tourism***, we mention;
- *pressure on the environment*; the rural tourism takes place in natural environments that are most of the times in a fragile balance, the tourism circulation might be damaging it and the crops. For example, tourists leave wastes near streams affecting the ecosystems (especially the piscicultural fund, which has a lot to suffer from these careless tourists);
- *the socio-cultural pressure*; the tourists that visit the rural zones in the Tarnava area may disturb the intimate socio-cultural atmosphere of the rural communities because of their large number (the population of the communities may feel suffocated by the large mass of people and disturbed in their daily routine). The tourists may influence this calm, relaxed milieu by

introducing new ideas, clothing styles and culture. Not very community is ready for such changes especially since the socio-cultural differences between tourists that come from more modern and larger places and the people from the local community can be enormous.;

- *the limited accommodation places*; in many cases the accommodation places are very small (pensions, summer houses, rentable rooms). That's why these areas confront themselves with a big problem when the number of tourists is very large and they can't all stay in the same house; it might be needed to accommodate the tourists in more pensions (divided in groups) which leads to a certain discomfort and changes in the tourism programs;

- *the problem of partnership and cooperation*; the competition that occurs from the development of the accommodations, especially in case of lack of experience (rural tourism in the Tarnava basin is just in its beginning) may lead to communication problems between those who are "partners" in development of the local communities based on rural tourism;

- *the farmer's reticence*; these represent the main element of the rural economical functioning and the landscape that the rural tourism depends of; in many cases the farmers understand very hard and in many cases very slow all the possibilities tourism offers them. Usually certain problems appear on both sides: the tourist is disappointed of the service quality and the farmer sees the tourist as an intruder that threatens the calmness of the place.

3. THE SWOT ANALYSIS OF THE TOURISM PHENOMENON IN TARNAVA BASIN

According to the principles of SWOT analysis, we will synthesize next the main ideas, opportunities, weak and strong points and risks which define the present conditions of popularizing the tourism in the studied region.

Strongest:

- the presence of some tourism, natural and artificial resources of great value as much in the national plan as in the international one;
- the diversity of the tourism resources induces the possibility of emphasize some variate types of tourism;
- the singleness of Sovata resort in regional and national plan (heliothermic phenomenon);
- the favorable geographic position of the region regarding the major axes of intern and international circulation (railway and road axes along Tarnava Mica and Tarnava Mare intersect some important axes: E60, Bucarest-Sighisoara-Blaj thoroughfare; near international airport from Tg. Mures).

Opportunities:

- the application of tourism services growing on the intern and extern market;
- the need of preserve and protect through organized tourism of some resources under the influence of natural or artificial degradation;
- the recent standing out of rural tourism on a worldwide plan;
- the ecological reconstruction through tourism of some affected zones of other forms of economical improvement;
- the possibility to turn to good account the tourism climate mountainous resources through winter sports, pleasure and road-trips and hikes in Gurghiu and Harghita Mountains;
- the existence in the Tarnava Mica corridor or in its near surroundings (Targu Mureş, Sovata, Gheorgheni) of some university institutions involved in the evolving of specialist in the tourism domain (Faculty of Economics, Law and Administrative Science of „Petru Maior" University from Targu Mureş, Faculty of Geography of „Dimitrie Cantemir" University from

Targu Mureş, Faculty of Geography of „Babeş-Bolyai" University from Cluj-Napoca, as like other schools with a tourism profile);

- the standing out of curative and cultural tourism, in terms of some special resources existent in the region;
- the activation of the narrow railway from Sovata to Targu Mureş, through Săcădat Defile and Nirajului Valley.

Weakness:

- the existence of some districts of the access ways to the tourism purposes still old-fashioned;
- the blockage of the possibilities of tourism arrangement for consecrated objects and other ones new either through the lack of some elementary facilities – lack of modern ways of access – or through ignoring the existence of this potential of the responsible organisms;
- the existence of some present tourism offers with big deficiencies in the matter of the quality of services;
- the rapport between the populations incomes drawn by curative and cultural opportunities of the region and prices involved in the re-launching of the accommodation base, in general of the infrastructure, which causes a tourism demand with diminished values reported to the colossal tourism potential;
- the tourism product is stereotypical (see P. Cocean and al., 2004, p.125) and promotional materials are missing;
- the degree of tourism information is bounded in the case of many promoters of tourism (in the rural environment as in the urban one).

Threats:

- affecting the tourism resources through an inadequate exploitation or the growth especially in the interior half of the corridors, of some forms of economic competitive increment (industry, agriculture);
- the multiplying of ad-hoc habitats;
- the multiplying of disloyal competition;
- the framing of a negative image above the tourism phenomenon and improving it in the studied region due to an existence of an unsatisfied tourism application;
- the tourism isolation of the tourism objects from the corridor space through the sizeable diminution of the tourism application.

4. DURABLE TOURISM DEVELOPMENT STRATEGIES

Finally, we suggest as a possible component of *a durable tourism development strategy* in the whole region, besides the advancement of Sovata, the curative tourism and the full promovation of the potential in the Sovata-Praid area, promoting the rural tourism especially in the superior half of the passage to value the tourism resources and the possibility of consolidation of the intercultural dialog, even encouraging intercultural cooperation, at a local level but also a regional one; in the inferior half of the passages, the existence of certain historical and cultural sights imposes the development of the cultural tourism but also of the tourism in the areas near cities or neighboring areas (Tarnaveni, Sangeorgiu de Pădure, Sovata, Sighisoara, Medias, Blaj, Odorheiu Secuiesc; currently in the socio-economic conditions, when most of the population is under the lowest level of a decent tourism practice – 500 Euro, the net amount a month per person – short time tourism in the areas near cities offers facilities to an important number of people); the existence of grape-vine

crops, especially in the Sangeorgiu de Padure-Tarnaveni area, suggests the development of a special type of tourism: *the viticulture tourism*; the promoting of *transit tourism* opportunities is required by building motels and campings long the main railways; to all of these, the making of an *original tourism offer* is added, based on the local or regional specific characters (folklore, gastronomy), that includes bases with local rustic features (architecture, clothing, music, menu) and promoting the local and regional mythology, of customs and traditions in making tourism programs. Finally, we must notice the lack of tourism informations and the difficulty of accessing them; therefore we suggest spreading the tourism informational centers in the region and building a base of data that actual and perspective tourism promoters can use, but also for interested tourists; thanks to the low level of public information on the tourism potential of the studied region, the promovation of the area and its sights is needed, through a campaign of making and publishing specific materials (guides, fliers, maps, video cassettes, DVD's etc.).

5. CONCLUSION

Therefore it foreshadows two potential tourism axes in those two Tarnave (Tarnava Mica and Tarnava Mare), devoid of major source of pollution (except for the towns Copşa Mica and Tarnaveni) which drain and take over tourism fluxes either to east or to tourism zone Sovata-Praid or Odorheiul Secuiesc-Cristuru Secuiesc zone (with evolving possibilities of the rural tourism) or to the west, through the development of a cultural tourism in Sangeorgiu de Padure-Tarnaveni and Sighisoara-Blaj zone; at these is added the support brought by the regional unity in the sewerage of the tourism fluxes along the major axe of circulation, with a transverse position (E60). It is considered that the east extremity of the axe Tarnava Mica, Sovata-Praid zone, didn't achieve the whole blade of polarizing valency being a discrepancy between the tourism potential and its capitalization, as like between demand and offer. Also, it is suggested as a way to rise the tourism demand (and the amount of receipts), the using of the narrow rail road between Sovata and Targu Mures, the last one being an important tourists source.

R E F E R E N C E S

1. Benedek, J. (2004), *Amenajarea teritoriului şi dezvoltarea regională*, Edit. Presa Universitară Clujeană, Cluj Napoca.
2. Benedek, J., Dezsi, Şt. (2006), *Analiza socio-teritorială a turismului rural din România din perspectiva dezvoltării regionale şi locale*, Edit. Presa Universitară Clujeană, Cluj-Napoca.
3. Bugnar, Nicoleta (2004), *Agroturismul în context global*, Edit. Dacia, Cluj-Napoca.
4. Cocean, P. coord. (2004), *Planul de amenajare a teritoriului regiunii de nord-vest (PATR) – coordonate majore*, Edit. Presa Universitară Clujeană, Cluj-Napoca.
5. Cocean, P. coord. (2007), *Amenajarea teritoriilor periurbane*, Edit. Presa Universitară Clujeană, Cluj-Napoca.
6. Cocean, P. şi colab. (2005), *Geografia generală a turismului*, Edit. MeteorPress, Bucureşti.
7. Ianoş, I. (2000), *Sisteme teritoriale. O abordare geografică*, Edit. Tehnică, Bucureşti

8. Petrea, Rodica, Petrea, D. (2000), *Turism rural*, Edit. Presa Univ. Clujeană, Cluj-Napoca.
9. Pop, Gr. P. (2001), *Depresiunea Transilvaniei*, Edit. Presa Univ. Clujeană, Cluj-Napoca.
10. Sorocovschi, V. (1996), *Podişul Târnavelor, Studiu hidrografic*, Edit. CETIB, Cluj-Napoca.
11. Ştef, T., Tripon, A., Runcan, P. Șt., Conțiu, H.-V., Iorgulescu Polimeni, Raluca (2007), *Animare rurală şi turism rural durabil*, Edit. University Press, Târgu Mureş.
12. Ureche, Cornelia, Moldovan, Fl., Mahalnischi, A. (2001), *Turismul rural – etapele dezvoltării şi impactul asupra spațiului rural*, în „ Geography within the context of contemporary development", 3-5 June 1999, Edit. Napoca Star, Cluj-Napoca.
13. Ureche, Cornelia, Rotar, Gabriela (1999), *Turism rural şi dezvoltare locală*, Analele Universității din Oradea, Seria Geografie, tom IX, Edit. Universității din Oradea, Oradea.
14. Velescu, O., Bondoc, D. (1978), *Itinerar pe Târnave*, Edit. Sport-Turism, Bucuresti.

STUDIA UNIVERSITATIS BABEŞ-BOLYAI, GEOGRAPHIA, LIV, 2, 2009

SYNCHRONISM AND DEPHASING IN THE SPATIAL AND QUALITATIVE DEVELOPMENT OF TOURISM IN TIMIŞOARA AND BANAT

N. POPA[1]

ABSTRACT. – Synchronism and Dephasing in the Spatial and Qualitative Development of Tourism in Timişoara and Banat. Timişoara, the main polarization center from the western part of Romania, is also the biggest supplier of tourist requests from this part of the country. The increase in the income of a significant part of its inhabitants lead to the development of the tourist request and, in particular, to the evolution of its expectations regarding the quality of tourist services. The city and its pool of influence answered, in a certain measure, to such changes. However, a shift seems to have occurred between the city tourist request and the offer proposed by the Banat area. A shift which is about to cancel the former representations of Banat, as an area with famous tourist infrastructures of high performance. Is there being outlined, during the last years, a new tourist model typical for Banat? Which would be the options to consider in order to stimulate the implementation of a long term profitable model for the city of Timişoara and for the region of Banat ? This article intends to find some clarifications for these questions.

Key words*: tourism, synchronism, dephasing, development, Timişoara, Banat.*

1. INTRODUCTION

In order to accomplish this objetive, we started from the premise that the reactions of Timişoara city and of its reference area, Banat region, respectively the Western Development Region, are characterized both by synchronism, and by phase displacement compared to the evolution tendencies of the tourist phenomenon, both in terms of the tourist request and offer.

We will begin the presentation of this article by defining the key concepts advanced as hypothesis even from the title, more exactly the concepts of *synchronism and*, respectively, *dephasing (phase displacement)*.

More complex, the concept of ***synchronism*** is defined as „the particularity of two or several evolving phenomenon to occur at the same time, having a parallel, eventually a congruent performance". Also, synchronism is a phylosophical principle, derived from the „imitation" theory of Gabriel Tarde (1843-1904), French phylospher and sociologist, principle sustained in the Romanian culture by Eugen Lovinescu (Dicționar enciclopedic – Encyclopedic Dictionnaire, IV, 2006).

According to this, in the modern era, due to the multiple means of connection among nations, the culture and all the institutions of a nation develop through imitation and adaptation, in a close relation with the other cultures. This would determine a unitary set of material and spiritual features, a so called „spirit of the century", which would provide more or less unitary features to social life, according to the simultaneity or phase displacement that the models are imitated and assimilated by each group (nation).

In our opinion, *the tourist practice*, being a modern reality, with such an obvious territorial and vertical mobility, answers very well to the recently mentioned concept of Lovinescu.

[1] *West University of Timişoara, Department of Geography; 4, Vasile Pârvan Blv., 300223 Timişoara, e-mail: npopa61@yahoo.com*

The other concept, of ***dephasing*** *(phase displacement)*, is specific to physics (shifting), where it represents the difference between the phases of two sinusoidal values of the same frequency (Dicționar enciclopedic, II, 1996). But it can also derive, through extrapolation, from the previous concept, *of synchronism*, as representing the particularity of two or several similar, identical or potentially congruent evolving phenomenon, to occur with a certain delay one from the other.

These conceptual premises also lead to the issue of the present study, which intends to reflect on several basic questions.

At what structural levels could we speak about synchronism and phase displacement in the evolution of the tourism of Timişoara ?

Which would be the reference scales to notice the synchronous and/or shifted spacial dynamics of the tourist phenomenon?

What concrete social, economical and cultural implications can involve such evolutions in the reference area (Timişoara, Banat) and over neighbouring areas?

These are three problematic questions, for which we try some developments and answers, based on the study of representations and perceptions, on the general knowledge of the analyzed space, and also on the interpretation of the statistics available at a national and regional level. Structuring some scientific conclusions remains a task to be performed after the completion of this work, which is intended, for the time being, to identify a certain type of problem. The following phase will be to refer to the empirical check of the advanced hypothesis and to the formulation of some pertinent conclusions.

2. SYNCHRONISM AND DEPHASING IN THE FIELD OF THE DOMINANT TYPES OF TOURIST PRACTICE

The types of tourist practice in the reference area are generally the same as the ones in any other complex tourist area from the development category that they are included into, from the European cultural complex, in general. Starting from the tourism valuating the natural potential, under its various forms, especially present in the mountainous area, to the rural tourism or to the complex forms of the cultural and business tourism, particularly specific for the urban area, all the tourism types fiind a certain expression potential in the Western part of Romania, polarized by Timişoara.

Evolution of the tourist number in the country, in the tourist accomodation units from Romania (1970-1980)

Table 1

	1970	1975	1978	1980	1985	1989	1970-1989 (%)
Total (mil.)	4,80*	8,03*	8,37*	9,04*	10,36**	11,59**	241,4

Sources: *Anuarul statistic al R.S. România – Statistical Year Book of the S.R. Romania, 1981, **Anuarul statistic al României – Statistical Year Book of Romania, 1991.

A certain specificity only came up in terms of the relation between the interna land external tourism, generated by the social and political regime under which Romania evolved during 1947-1989, period in which, almost all the countries from the Northern hemisphere, passed from tourism of choice, to mass tourism. In this context, Romania experienced, at its turn, a strong development of the tourist phenomenon. More and more Romanians launched in mass tourism, especially in the seaside and balnear tourism, which stimulated the provision of tourist infrastructures in the regions with high potential: the Black Sea coast, Prahova-Braşov Valley, Banat mountains etc. (table 1).

The improvement of accomodation and tourist service infrastructures, together with the international opening of the country in the 70's and the need for foreign currencies – felt by the regime in order to fund industrial development projects, then the external debt – made Romania to become one of the European tourist destinations in great demand, during the entire period of the eighties from the 20th century. A great number of tourists from European socialist countries, but also from the West (Germany, the Northern countries, Italy etc.) used to come each year in Romanian resorts, especially in seaside resorts. In compensation, the number of Romanian tourists left for holidays abroad was maintained at much lower rates, drastically reduced after 1982, at the same time with the increase of the comunist regime autarchy. The progressive self-isolation imposed by the regime, as a result of the fact that Romania's economical problems became more serious after 1980, will also gradually reduce the number of foreign visitors, in a period when, in other parts of the world, international tourism was in full progress. Thus, a kind of „low levels' balance" will be established, only compensated by the preservation of Romanians' habit to spend their time at seaside (preservation of internal tourism, gradually drained, in higher proportions, by the seaside).

Reflection of the national situation and of the mentioned external conditions, Timişoara and its reference area experienced similar evolutions: accomplishment of important accomodation infrastructures (hotels, motels, camps for children, chalets etc.), flows of tourists towards and from different regions of the country, especially in balnear facilities (Băile Herculane, Buziaş, Lipova a.o.) and in the climatic ones from Banat Mountains and Muntele Mic. During the last two decades of the comunist regie, the city of Timişoara also represented a special attraction, famous for its liberalism and for its opening towards the West, through Yugoslavia. Its attraction was doubled in the second half of the 80's, both internally and externally (through the small border traffic), by the relative local agricultural and food abundance (due to the agricultural and food factory „Comtim"), in opposition with the food crisis which was present in most of the socialist countries of that time, especially Romania.

Right within the relation internal tourism / external tourism occurred the most *vast mutations after 1989*, facilitated by the change of the political regime and by opening the borders. Conjugated with the borderly position of the city, a gate to easy relations with Central and Mediteranean Europe (Popa, 2006, p.222), this political mutation involved the increase of external tourism, to the detriment of the internal tourism. Contrary to the situation of previous decades, Timişoara and Banat region thus became areas of tourist prevalent supply, both at a national level and in the field of international tourism.

Couldn't it be possible to also occur a reverse process, of international re-valuation of the local tourist potential, considering the remarkable tourist tradition of Banat region? In order to state such a hypothesis, first we must analyze the factors which contributed to the deep change of the tourist profile of Timişoara and Banat. In the present article, we will try to only clarify a part of them, antithetically focussing on the binomial proposed even from the title, that is *synchronism* and *dephasing (phase displacement)*. We consider that such approach will allow us to better understand what and why has been happening with Romanian tourism in general and with the one from Banat region in particular, during the last two decades.

Evolution of tourist arrivals and night accomodations in the Western Region of Romania

Table 2

	1990	2001	2002	2003	2004	2005	2006	2007	1990/ 2007 (%)
Total no. of tourists (thousands)	1375,2	541,3	493,1	520,4	535,9	535,2	613,8	674,5	49,05
- Romanians	1267,7	428,7	387,5	395,6	397,8	395,5	469,4	514,1	40,6
- foreigners	107,5	112,6	105,5	124,8	138,1	139,7	144,4	160,4	149,2
Total no. of night accomod. (thousands)	4089,2	1933,2	1908,7	2034,4	1938,8	1835,3	2006,2	2006,9	49,1
- Romanians	3906,2	1709,2	1689,1	1769,8	1648,5	1532,3	1676,2	1673,8	42,8
- foreigners	183,0	224,1	219,6	264,5	290,4	303,0	330,0	333,1	182,0

Source: Turismul României. Breviar statistic [Romanian Tourism. Statistical Vademecum], INS, Bucureşti, 2003- 2008.

3. DEPHASING IN THE DEVELOPMENT OF ACCESS INFRASTRUCTURES

Normally, opening the state borders and facilitating free traffic in the European area should have worked not only in the benefit of tourist flows from Romania outwards, but also in the opposite direction. For the time being, though, the reciprocal one is not available, due to a series of causes, factors and conditions which tended to turn Timişoara and Banat into a rather leaving space (providing tourists), even if there existed good local traditions regarding holiday fittings and services: Băile Herculane, Semenic, Muntele Mic, Buziaş, Lipova being only some of the traditional destinations, among the most important in the country. In addition to those comes Timișoara, „open city" and „horn of abundance", in a Romanian reality of the 80's which would become even more gloomy.

One of the strongest discouraging factors was represented by the *dephasing (phase displacement)* experienced while building acces (transport) and comunication infrastructures of high performance in comparison with neighbouring areas, especially with the Hungarian territory. However, due to the close position to the Western border, such delay did not discourage the external tourism practiced by the inhabitants of Timisoara and Banat region. In 1-2 hours, they can reach the modern transport infrastructures of Western neighbouring countries, where they are provided with the possibility to continue their travel to the big tourist centers and regions of Central, Mediteranean and Western Europe. In exchange, the permanent degradation of trans-carpatian routes, neglected for a long time by national authorities, represented and still represents a real impediment in re-consolidating a coherent national tourist market.

On the other side, the very low quality of traffic infrastructures from Banat region discouraged the arrivals from distant or close neighbouring countries, but also from the other regions of Romania. Banat region still is one of the Romanian provinces with the worst roads. From a total of 1481 km of national roads, only the sectors Arad-Timişoara

and Nădlac-Arad-Săvârşin, in amount of around 170 km, have been enlarged and improved during 1992-2005 (Popa, 1998, pg.109). Other road sectors only benefited from new coatings, and not from recalibration works[2] too. It is easy to see that recently improved roards serve with priority the connections with the exterior (Hungary and Serbia), less with the interior of the country, entirely neglecting access to the traditional tourist objectives of Banat region. Even under such conditions, the quality of the already fitted infrastructures and the traffic capacity still fail to meet normal European standards.

The only exception is the international airport „Traian Vuia" of Timişoara. Its enlargement and development, the increase of the number of destinations and the improvement of ground services, together with the fact that the city of Timişoara became the second Romanian target for foreign investments, made that airport traffic exceed 755 thousands of passengers in 2006, reaching 1 million in 2008 (http://aerotim.ro). Among them, approx. 20% (also) perform tourist activities in Timişoara and Banat region. Thus, the local airport facility represents one of the few examples of *synchronism* with the tendencies experienced in the field of international tourism.

4. SPATIAL AND TEMPORAL CONTRASTS IN THE DEVELOPMENT OF TOURIST INFRASTRUCTURES

From the perspective that we intend to discuss in the present article, the evolution of accomodation infrastructures is among the most contrasting ones. On one side, a strong renewal and development is experienced by accomodation facilities from the two big cities, Timişoara (table 3, fig. 1) and Arad, and also from other locations with potential for tranzit tourism. It is a specific symptom of the more general tendency of spatial polarization of social and economical activities, characterized by the vital force emptying of some large rural or semi-urban areas and, respectively, by its concentration in the main regional and local control poles.

Structure of accomodation places in Timişoara, according to their age (2005)

Table 3

Period	Before 1989	1990-1995	1996-2000	2001-2005	Total
No. of places	1215	277	558	981	3031
Percentages	*40*	*9*	*18,5*	*32,5*	*100*

Source: field research performed by the author, April-May 2006.

On the other side, the sudden decline of big resorts from Banat was imposed, and also the slow evolution of the facilities dispersed in the rural area and in small cities. Many of the former accomodation and service facilities from Semenic, Muntele Mic, Poiana Mărului, Băile Herculane, Buziaş, Lipova etc. still exist on papers. In reality, a part of them is not operational. Big hotels, formerly emblematic for Banat resorts, franchised or sold after 1990 to certain entrepreneurs unexperienced in tourism or to prisoners of collectivist – centralized mentalities and in lack of financial resources, are standing today unused or unsufficiently used and keep degrading. The competition among the aspirants to property granting over such facilities, seldom perfomed outside the limits of market economy mechanisms, the ball of local rivalries mixed with national political interests, they all delay the tourist restart of the famous resorts from Banat.

[2] We can mention the re-asphalting works performed after 2005 on the sectors Timişoara-Cenad (NR6) and Timişoara-Jimbolia (NR 59A), in amount of approx. 120 km.

In compensation, considering the difficulties of the old tourist centers, it would have been expected for new locations, centers and tourism types to be developed, able to take over a part of the increasing demand, which comes in particular from the urban area of Banat. Any marketing study would have underlined the demand evolution to the tourism types currently in fashion in Europe and for which Banat region does have resources: active tourism, ludic tourism, rural tourism, SPA, sport tourism, cultural tourism etc. Or, it is being found that the suitable environments for such types of tourism, for which there is potential in Banat area, are most seldom located in the rural area. A rural environment which proves to be rather lethargic, both as a result of its increased ageing, and due to a relation which is still defective with the urban area and, probably, to some tendential cultural features, characterized by self-sufficiency.

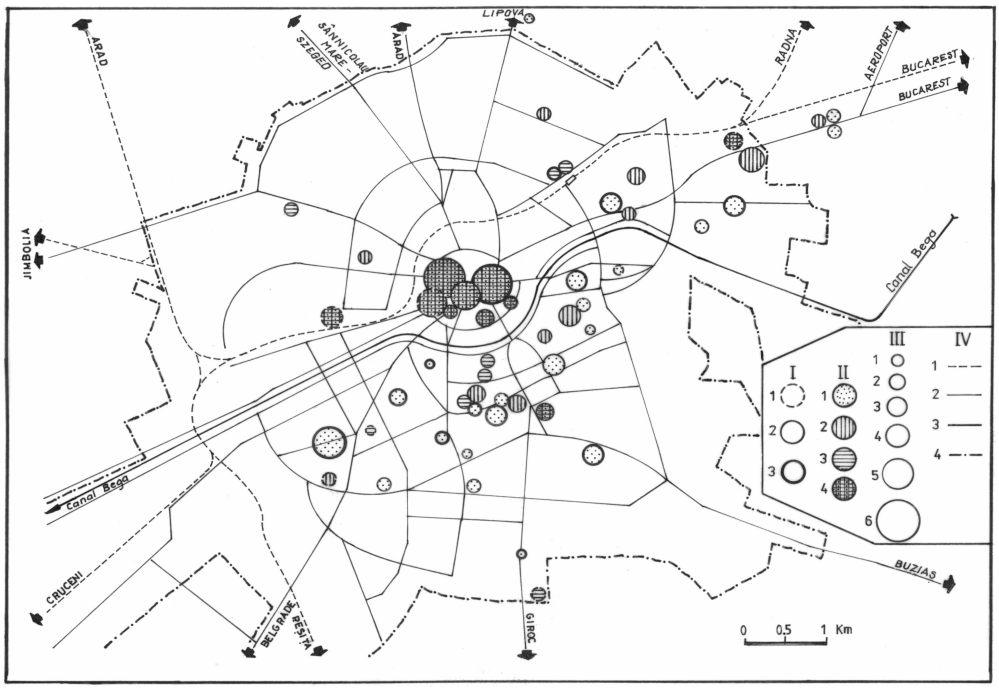


Fig. 1. Distribution and structure of accomodation facilities in Timişoara, according to their age.

I – Category: two stars (1), three stars (2), four stars (3). *II – Age*: 2000-2005 (1); 1996-2000 (2); 1990-1995 (3); before 1990 (4). *III – Accomodation facility*: less than 30 places (1), 31-60 places (2), 61-90 places (3), 91-125 places (4), 126-200 places (5), 275-325 places (6). *IV* – railroads (1); major street network (2); Bega canal (3); town boundaries (4).

Consequently, for example, Banat region actually has no well defined area for *rural tourism*. Except for the commune of Gărâna, no other locality launched as a promoter of such a tourism type, which experienced a remarkable development in other regions of the country. At the same time, the demand for rural tourism is well defined in the cities of Timişoara, Arad, partially in Reşiţa, Lugoj, Caransebeş, but it cannot be released into the regional rural environment, but in other areas, including abroad.

5. SYNCHRONISM AND DEPHASING IN THE QUALITY OF THE PROVIDED TOURIST SERVICES

Border opening and world contact, after 1989, underlined a major displacement between the complexity and quality of tourist services in the countries which had evolved in terms of market economy, and those from Romania. In spite of the permanent preservation of (filtered) connections with the exterior, Timişoara and Banat, at their turn, made no exception. The synchronism of the 70's had already made way, in the 80's, to a displacement that today is still being recovered from. The regularity of the centralized and mass provision of tourist flows discouraged the interest to acknowledge and meet the tourists' requests.

The care towards the client and his needs, the preoccupation to offer him something else in addition to accomodation and eventually meals, to work on a complex and varied tourist product, adapted to the features more and more specialized of the demand, still are unfulfilled wishes. Some entrepreneurs from tourism and their employees automatically continue to cultivate sufficient attitudes, giving the clients the feeling that they are being favoured. While, actually, the tourists are the ones favouring them, calling for their services; in fact, proportionally less, considering the fact that, after having contact with the offer from other geographical regions, every year a higher percentage of Romanian tourists choose to go on holiday abroad[3].

We believe that one of the important displacement elements is the incapacity of workers from tourism to adapt to new demand expectancies. On one side, the fault belongs to the offer which seldom is unilateral and lacking flexibility. On the other side, professionalism is also of big importance: the feeling of improvisation transmitted to the tourists is extremely impairing. Last but not least, the small interest for details regarding hospitality, civilization and comfort can estrange tourists. Together with the perceptions induced by the implementation environment of the local tourist phenomenon – from clothing and personal hygiene to landscape design and the social and political „atmosphere" – they all contribute to the development or, on the cotrary, to the inhibition of tourist activity.

6. THE ROLE OF INDIVIDUAL, INSTITUTIONAL AND COLLECTIVE BEHAVIOR

The still modest quality of tourist services also derive from the degree of civilization, education and training. Or, seldom, the tourist activity in Banat is the result of inertia, more that of training, of formation. It is an (almost) natural inertia if we consider the lack of professional formation institutions in the field of tourism before 1989[4] (in Banat there were no highschools nor universities specialized in tourism). The tourist activity was a „party task" which had to be fulfilled with abnegation, without too many interrogations, without marketing studies, even without economic efficiency calculations.

[3] As there are no such statistic information at the regional or local level, our statement is based on national data. Thus, while in 2002 the displacement between the number of passengers registered at Romanian borders, at entry (4,8 mil.), respectivelt at exit (5,8 mil.) remained at reasonable levels, in 2006 the number of exits (8,9 mil.) already was 48% higher that the number of entries (6,0 mil.) *(Anuarul statistic al României, 2007 – The Romanian Statistical Year Book, 2007).*

[4] At a national level there were only three highschools with education in the field of restoration and one faculty with a defective profile, within the University of Galați, focused more on food chemistry.

Under the given conditions, a role in the increase of tourist product quality is held, after 1990, by the imitation of the good practices identified abroad. At least for Timişoara and Arad, it is especially this imitation that contributed to the offer renewal, together with the entreprenorial initiatives of foreign investors, especially Italian ones. However for the moment, a certain insufficiency still persists, despite of the increase of work force formation channels in tourism. This is related to the negative cumulation of individual, collective and institutional behavior from the past, in addition marked by the wish to accomplish immediate profit and less by the ambition to thoroughly fulfill the assumed activity.

7. SYNCHRONISM AND DEPHASING IN LANDSCAPE CULTURE

Such behavior deficiencies have the most various and unexpected consequences. For example, they are reflected in the landscape culture. A tourist area is in the first place a *tourist landscape*, which should be harmoniuos, exciting, attractive. The natural landscapes of Banat are remarkable especially in mountainous areas (valley chutes, cloughs and gullets, underground carst forms, englacial relief, botanical and fauna reservations a.o.). They are also present in plain areas, where humid spaces are dominant, the meadows of the main rivers with their specific vegetation etc. However, access to such locations is restricted by precarious infrastructures and by the insufficient preoccupation to turn them into viable tourist products.

As for anthropical or anthropized landscapes, they are very much deffective: depopulated and neglected villages, with few landscape design islands; abandoned fields, invaded by brambles; areas „biten" by chaotic traffic, deforested flanks, facilitating errosion etc. The urban landscape – even if provided with an enormous potential – is affected by the slow rhythm of urban renewal, by the slow reconstruction of traffic infrastructures, by the difficulties encountered during the rehabilitation of buildings from historical centers etc.

The contrast is obvious and increased a lot during the last years, between Timişoara and Arad on one side, Szeged and Novi Sad on the other side. While since 2000, the four cities had been relatively similar in terms of the landscape perception induced to the visitor, after 2004 the urban remodelling strategies used by the authorities from Szeged and Novi Sad proved to be more efficient. Urban renovation operations are generally difficult, consisting in solving some complicated patrimony and legal problems, financial costs, and also increased social costs. In order to surpass them, Novi Sad intriduced a special local tax and drew private sources, and Szeged called, base don locally co-financed projects, for the national fund granted for such purpose (according to the personal research performed at the Szeged City Hall, in 2007). Both cities were favored by the preservation in public property of a significant part of the rea estate patrimony. The result? The historical centers of the two cities almost entirely rehabilitated, providing not only an attractive and interesting urban landscape for tourists, but also a pleasant environment for the local inhabitants to live their lives.

Through contrast, the allocation of properties to inhabitants without financial resources (1990-1991) and the massive recoveyance of buildings in Romanian cities, therefore in Timişoara and Arad too, a process doubled by the unclear legal situation of many buildings and land disputed in court, made it impossible to operate the potential urban restoration strategies elaborated by the two City Halls. Or example, the wide protected architectural environment from the central districts of Timişoara (Cetate, Josefin, Fabric) is punctually restored, while many valuable buildings are degrading, the old city center loosing its vitality. As the peripherical supermarkets draw more and more buyers, ordinary and luxury trade from the central districts is in difficulty. The unitary rehabilitation of the main front walls from Cetate district and the

transformation of the local streets into pedestrian areas, like in all the significant cities of Europe, would contribute to the increase of the urban landscape quality, to the revival of the city center and to the increase of its tourist interest. This is the tendency. However, for the time being, Timişoara, Arad, like other smaller cities in Banat, cumulated delays in this field, being stuck into a *phase displacement* compared to the other local cities with polarizing role.

8. CONCEPTION AND PROMOTION OF TOURIST PRODUCTS

Today, more than ever, the successful tourist product must be an *emblematic product* for a certain location. In addition to individual initiatives, i tis necessary to make an intelligent effort for the creation and promotion of the collective image, of the city image. The competition of offers is much too strong for uncustomized tourist products to have any chances to be successful. The brand – the local brand mainly – is essential in tourism. Or, Timişoara, like other places from Banat and from the country, has difficulties in providing specific tourist products, with potential to become famous, which would bear the impressive image of that place.

What exactly can Timişoara offer from this point of view? A group of *parks* located around the city center, generous in surface and location, but insufficiently taken care of in terms of landscape design. *The historical center* with its baroque design, split into three compact areas (Cetate, Josefin, Fabric), but, like we said before, which is in an advanced degraded condition. *Commercial areas* (mall, supermarkets, luxury shops), field in which competition is difficult to sustain, when not very far are located three capitals famous for their commercial functions (Vienna, Budapest, Belgrade) and when luxury shopping in Milan or Vienna became an ordinary habit for the wealthy inhabitants of Timisoara. *The Memorial of the Revolution from December 1989*, really emblematic for Timişoara, however diminuated by the critical retrospective on those events, by the disappointment of transition years too much extended and by the lack of will to promote in an intelligent manner the places and the events of the revolution which started in Timişoara.

For the moment, the only really remarkable objective, and which started to be considered as emblematic for the city, is the *Art Museum*, opened in December 2006 in the Union Square, in a high class architectural environment. A certain cultural discrepancy of the city is risking to also turn, in perspective, this objective, into one lost in the ordinary landscape of the town. In general, cultural life in Timişoarei is weak, despite of the existence of some remarkable and unique multicultural institutions[5]. The resources intended for culture, thus marked, tend to be wasted in many less important events, which do not contribute too much to the creation of a memorable city image. No cultural event organized in Timişoara during the last years enjoyed the national and international notoriety of some events regularly organized in other Romanian cities, like Cluj-Napoca (film festival), Sibiu (theatre festival), Constanţa (music festival), Brăila (opera festival) etc.

Consequently, Timişoara's tourist attraction is weakly diversified. It is mainly focused on business tourism and it cannot increase, includingly because of the relative isolation of the city, which is dynamic, but located in a rather slowly declining area.

[5] Timişoara has 3 state theatres (Romanian, Hungarian and German), the local radio station presents radio shows in Romanian and in another 8 languages of the national minorities from Banat, there are many minority cultural associations, cultural centers of important states (French, German, Italian, English, American) etc.

9. CONTRASTING DYNAMICS BETWEEN THE URBAN AND THE RURAL ENVIRONMENT

More and more significant displacements accumulated in Banat, like in the entire country, between the urban and the rural environment, underlined by the differences of economic performance and by the distribution of life standard indicators. From the mainly agricultural economic profile, to the defective infrastructural equipment, up to the problems related to the provision of health and education services, the Banat village is obviously in decay, at least compared to the big cities. This delay also affect tourism. Few are the rural communes from Banat which can provide – as they normally should – decent accomodation and restoration conditions for tourists or travellers.

From this point of view, the relation urban-rural is precarious in Banat in general and in Timiş county in particular. Here, considering Timişoara's economical and cultural force, we would have expected active connections with its surrounding rural environment, with which the city would develop a complementary and symbiosis process, as a balance for both communities. One of the impairing factors was represented by the city exclusive orientation towards itself, during the entire comunist period, orientation which is also reflected in the city landscape. Until the mid-90's, the city boundaries had been strictly defined. The passage from peripherical districts with blocks of flats to the rural area was very sudden, without intermediary areas, after the last line of blocks following the cultivated field. In a few cases only, the city enlargement also consisted in the inclusion of neighbouring villages (Mehala, Ronaţ, Ciarda Roşie, Plopi), which still had a rural appearance until recently.

The allocation of private property after 1990 and the creation of a capitalist land market brought deep changes in the relation urban-rural. They are visible in all county capital towns, but increased especially around big cities. Timişoara is a good example for this. In the last 15 years, but mainly in the last 5 years, the city has tended to overflow over the surrounding rural area, that, at the same time, it colonizes in a selective manner, through the thousands of houses newly built in the villages situated no further than 15-20 away. Along the main transport lines or in the places with a known tourist potential, such buildings go long beyond this limit, inclining to be completed by secondary residences: old houses bought and restored in easy accessible villages, respectively new buildings, seldom villas, which became more and more numerous near the mountains, at more than 100 kilometers away (Poiana Mărului, Surduc etc.). This is a process that in the Western and Central part of Europe occured 3-4 decades ago and which is still in progress of consolidation. In our country, we now recover, in an alert rhythm, the accumulated delays, Banat being included in the natural tendency of spatial organization of the contemporary human habitats.

Unfortunately for the analyzed phenomenon, too few of these buildings are intended for public tourist circuit. They have an important role in the renewal of the rural landscape, even in activating the social and economical life of rural communities, because the newly arrived inhabitants perform other activities than agricultural ones, even if, in general, they commute to the city for work. However there are few boarding houses or hotels built in the areas of recent anchorage of urban citizens, either in the surrounding villages, where the people from Timisoara move, or in the more distant ones, where they have their secondary residences. The new buildings are used, for the time being, especially for family private needs.

10. CONSEQUENCE: MUTATIONS IN THE TYPES OF RELATIONS WITH NEIGHBOURING AREAS

The social and economical development of Timişoara and of several surrounding localities (likewise for Arad) lead to the increase of the population incomes, thus to the increase of the need for relaxation, diversity and amusement. This evolution is already *synchronous* with European tendencies. Timişoara and Banat not only provide facilities and services to entirely meet the espective demand. The former facilities, partially blocked from a legal and patrimony point of view or non-adapted to the new types of tourism, are either repulsive, or insufficient, meanwhile the new facilities are very rare, unknown and do not provide complex, integrated tourist services.

In the current conditions for example, *week-end tourism* around Timişoara is practically impossible at a mass leve land at acceptable standards. On a radius of 75 km, there are no significant facilities which should enable tourist holiday, recreation in nature and relaxation, even if there are numerous interesting sites and objectives with valuable potential (water courses, lakes, forests, thermal waters, castles, monasteries etc.).

In order to arrive in interesting places minimally fitted, the tourist must travel over 120 kilometers, which become impossible when access ways are degraded or unarranged. Consequently, even week-end tourism begins to go abroad, especially in Hungaria, in the cities near the border – where boundaries are transparent –, but also in Budapest, Vienna or Milan, in case of wealthy ones. For example, a real phenomenon became the week-end tourism performed by the inhabitants of Timisoara and Arad in the resorts with thermal waters from Hungaria. The most frequented ones are Gyula and Oroshaza, fitted with modern aqualands, with various modalities to valuate the curing, sportive and amusing qualities of water. Inaugurated after 2002, on wide areas and with quality services, they shortly after experienced an unexpected success, having a great power of attraction on the population from the West of Romania, a continental space for which water represents an attractive primary factor. As a consequene, at least during summer, on every week-end, the number of Romanian tourists frequenting the two resorts (arrived especially from Arad and Timişoara) equals the one of Hungarian tourists. Given the permanent presence of Romanian tourists, in their relations, Romanian language tends to be regularly used by the staff from the two locations. The resorts even became victims of their own success, as they tend to be overcrowded.

That is why, it is more easy to understand the reasons for which Romanian authorities and tourism entrepreneurs were not the first ones to valuate, or at least to valuate at the same time, the enormous potential of this type available in the Western Plain, marked by numerous rich thermal springs, situated in the close neighbourhood of the big cities.

11. CONCLUSIONS

The analysis of synchronism and phase displacement phenomenon characteristic for tourism from the Western region of the country meets some difficulties related to the lack of comparative statistic data, at a regional and county level, for the segment of international tourists which leave from Banat counties to other regions of the country and abroad. Only at a national level are there official data regarding the trips abroad of Romanian citizens, which significantly reduces the possibilities to analyze the tourist phenomenon. In fact, the present work mainly intended to launch some work hypothesis, which should be argued base don the available data, and their empirical check being based on the elaboration of some future field researches, which will confirm or not the sequences insufficiently argued from a statistical point of view.

It is certain that, under the current development state of tourism in Timişoara and in the Western region of Romania, compared to the European tendencies, we can speak about a certain tendency towards *synchronism in the field of tourism demand*, respectively of *dephasing (phase displacement) in the field of tourism offer*.

In association with this general finding, that we tried to argue above, we also notice the *tendency to synchronization* regarding the aspirations, intents, even tourism projects, so far as they do not enter the organizational and financial involvement phase. As soon as we proceed to the analysis of facts, of organizational structures, of the entreprenorial initiative, of the practical application of projects, the necessary finding is, still, that of *phase displacement.* Not of stagnation, because Western Romania (as the entire country) also makes progress in the field of tourism offers, progress visible in the rhythm with which new hotel and service facilities are inaugurated in the big urban centers like Timişoara and Arad. If such facilities are unable to retain a more and more significant part of the national tourism demand, attracted by the offer of other geographical areas, it mobilizes in exchange more and more foreign tourists (see above, table 2), many arrived from significant distances (Italy, Germany, France, Great Britain, Spain etc.).

However for the moment, the tourism balance is rather defective, thus leading to the flight of important financial resources to the exterior. Considering the trans-sectorial role of tourism, such resources could contribute to the increase of the local population prosperity, of tourist infrastructures, of the provided services quality and to the activation of the social and economical life of the entire region.

R E F E R E N C E S

1. Popa, Nicolae, (1998), *Căile de comunicaţie şi transporturile în Banatul românesc (I) [The Ways of Communication and Transport in the Romanian Banat Region-I],* in „Analele Universităţii de Vest din Timişoara" [Annals of the Western University of Timişoara], series Geography, vol. VIII (pg. 107-112).
2. Popa, Nicolae, (2006), *Frontiere, regiuni transfrontaliere şi dezvoltare regională în Europa Mediană [Borders, Cross-Border Regions and Regional Development in Central Europe],* Western University Editions, Timişoara (286 pg.).
3. * * * , (1981), *Anuarul statistic al R. S. România [The Statistical Year Book of S.R. Romania],* The Central Direction for Statistics, Bucharest.
4. * * * , (1991), *Anuarul statistic al României [The Statistical Year Book of Romania],* The National Board for Statistics, Bucharest.
5. * * * , (1996, 2006), *Dicţionar enciclopedic (II, IV) [Encyclopedic Dictionary],* Encyclopedic Edition, Bucharest.
6. * * * , (2006), *Strategy for the development of the DKMT Euroregion,* Marineasa Edition, Timişoara (112 pg.).
7. * * * , (2003 – 2008), *Turismul României. Breviar statistic [Romanian Tourism. Statistical Vademecum],* The National Institute for Statistics, Bucharest.

STRUCTURAL TRANSFORMATION OF THE GEODEMOGRAPHIC LOAD IN RESIDENTIAL AREAS WITH APARTMENT BUILDINGS DURING THE TRANSITION PERIOD. CASE STUDY:TÂRGU JIU

SIMONA MĂLĂESCU[1]

ABSTRACT. – Structural Transformation of the Geodemographic Load in Residential Areas with Apartment Buildings during the Transition Period. Case Study: Târgu Jiu. During the transition period, residential areas with apartment buildings have undergone major transformations even if they were more discreet under the camouflage of the egalitarian and uniform stock of buildings in the communist period. This paper presents the results of a detailed investigation conducted in the residential areas with apartment buildings in the case of Târgu Jiu, aiming at surprising the structural transformation suffered by the demographic load of these buildings. On a representative sample of apartment block buildings, the structural attributes (household structure, age, education level, occupation) have been reconstructed at the level of each household belonging to a randomly chosen staircase, both in 1990 and in 2007, analyzing the initial origin of the residents in the building, the mobility of apartments during the transition period and the directions of subsequent mobility in the building. Results showed, in addition to a series of transformations amending the central structural trends and the mobility, at a general level, the homogenization trend of social status on high levels with the elimination of the lower hierarchy through a mobility from the apartment building, in the case of central and ultra-central zones, homogenization on a lower level than in the Communist period, in the case of the apartment buildings situated in semi-central area and of the ones with average value on the real estate market, and the heterogeneity of the status, respectively, predominantly with the spreading towards higher levels of the status, in the case of demographic load of the apartment buildings situated in the residential areas of the working class with low socio-economic status.

Keyword: *transition, residential mobility, Târgu Jiu, social status, residential area*

1. INTRODUCTION

Ultra-central zones of the county seats established during the communist regime are predominantly represented by block buildings. Since these were the strongest remodeled during the respective period, they are characterized by the impairment of the building fund built before 1945 generated by the construction of civic centers, symbol of the communist period (architectural-symbolic-ideological remodeling of centers which have become symbol of "the victory of socialism") because they presented all the assets of the target group[2] towns regarding the systematization phenomenon.

[1] *„Babeş-Bolyai" University, Faculty of Geography, 400006 Cluj-Napoca, Romania, e-mail: smalaescu@geografie.ubbcluj.ro*.

[2] Part of the national town-planning programme ("the civic centres of all the county-seat cities were renewed" (*Geografia României*, 1984, p. 503) and "the reorientation (n.n.: of the urban planning) towards the category of medium-sized towns (20 000 -100 000 inhabitants), which, due to their equilibrated size confer more harmonious dimensions to towns (e.g. Deva, Suceava, Târgovişte, Târgu Jiu etc.)" (*Geografia României*, 1984, p. 504).

This study has started from the finding that certain public utility and structural transformations, as well as transformations of the demographic load of urban residential areas during the transition period, are less obvious (both through surveys and observations) and accessible to being made evident, in the case of block buildings than in the case of individual houses.

In the case of the town of Târgu Jiu, *the transformation of these ultra-central and central zones under the transition period fingerprint, from the most highly valorized zones of the urban area during the communist period to* ***high valorized zones****, especially as regards the* ***social prestige maintained as a reflex of the previous regime*** *on the one hand, and of the present fund investment and public utility attention* on the other hand – attention very plastically surprised by the local press: the central area – "*daily swept and weekly painted*" (***Gorjeanu***, January 23, 2005) – could not be pursued through residential macro-survey related to social prestige, developed at the scale of the entire town but only through a detailed analysis. This paper presents the results of this investigation carried out exclusively on the representative block-building zones, highlighted by previous investigations (fig. 1).

2. METHODOLOGICAL STATEMENTS

With a view to *studying thoroughly the transformation of some block-type neighbourhoods*, the profound investigation of the transformations undergone by certain zones with compact block buildings has been resorted to, zones considered representative-on the basis of information obtained through a social geography research, previously carried out – namely ultra-central and central, semi-central, medium first-class comfort and the one represented by the second-class comfort in working class district category, no separate rooms or with duty lodging, *by randomly selecting five collective housing units, and afterwards, also randomly, a staircase for each collective housing unit apart*. In each case, the information about the ***socio-demographic structure*** of the staircase for each apartment was restored (data on household structure, age, occupation, education, the locality of origin in the building and the mobility destinations of the residents etc.) at the level of 1990 and 2007, respectively, collecting the same data, and tracking ***the mobility historic*** of each apartment in part (successively – the inputs and outputs, input origin, output destination) during the transition period.

A systematization of the analysis results is summarized in figures 2-3. The sources of information were represented, beyond the current residents and especially the stable ones (living in the block building during the entire transition period), by association administrators, the staircase committee responsible etc. Considering the recorded data, it is understandable the lack from the sample of the low quality collective housing (III, IV), characterizing the peripheral working class district, which would have represented both the building (in terms of housing characteristics) and the demographic load with the most disadvantaged status, whereas the restoration of the mobility historic and especially of the initial composition of the building, at the level of 1990, was impossible, due to the increased mobility of the residents living in the building.

Such collective housing units are just an "intermediate and temporary station" towards a new residential destination in case of status improvement or of modifying the residents' life-cycle or, as the case stands, of eliminating from the respective urban those residents caught on the negative dynamic spiral of pauperization. Mobility in such buildings is so high that beyond two stages of mobility, the mobility historic can not be mapped out anymore.

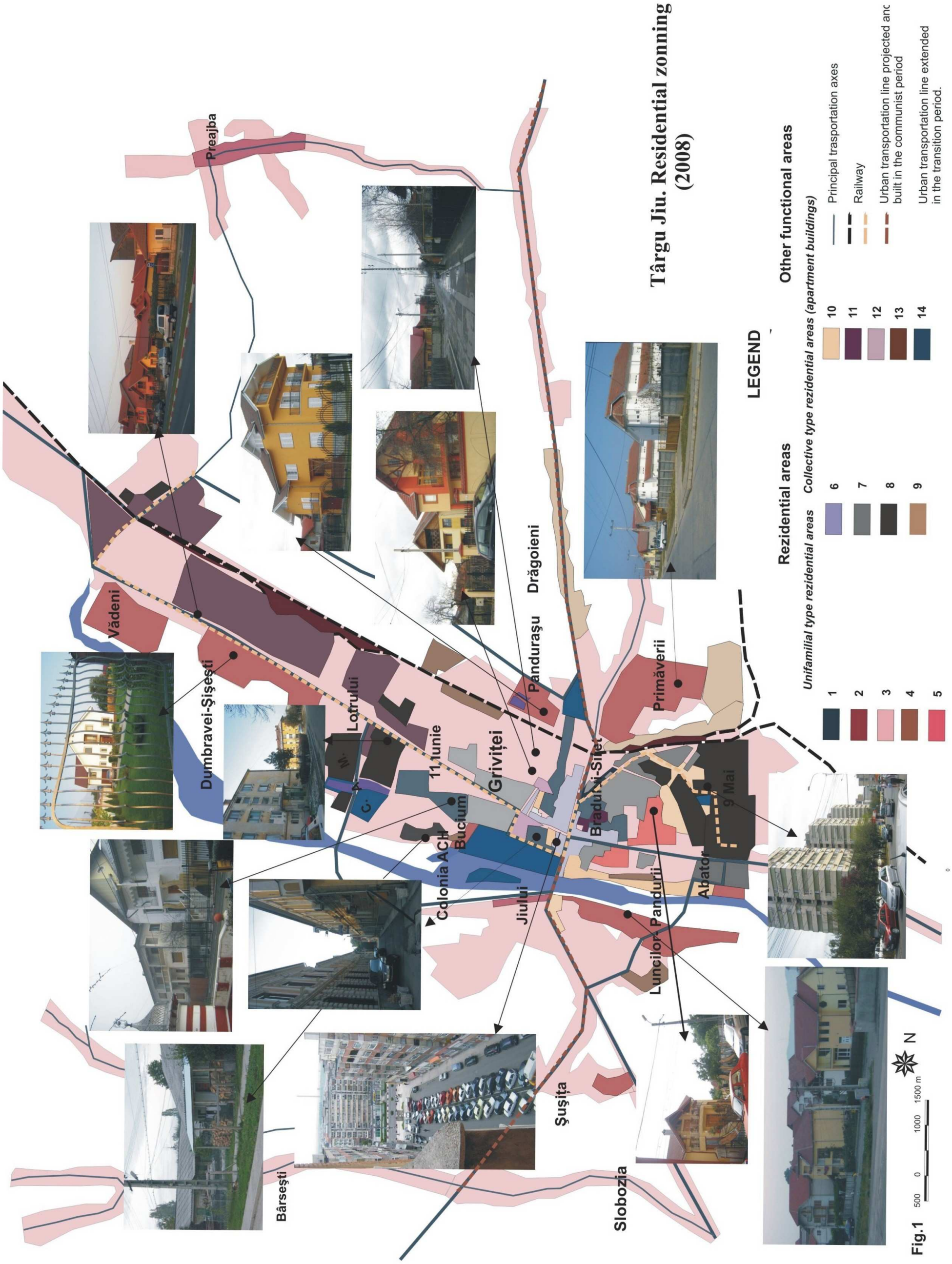

Târgu Jiu. Residential zonning
(2008)
LEGEND
Rezidential areas
Unifamilial type rezidential areas
Collective type rezidential areas (apartment buildings)
Other functional areas
Principal trasportation axes
Railway
Urban transportation line projected anc built in the communist period
Urban transportation line extended in the transition period.
1
2
3
4
5
6
7
8
9
10
11
12
13
14
Preajba
Vădeni
Dumbravei-Şişeşti
Lotrului
11 Iunie
Griviţei
Panduraşu
Drăgoieni
Primăverii
Bradului-Siret
9 Mai
Bucium
Colonia ACH
Jiului
Abator
Luncilor-Pandurii
Şuşiţa
Bârseşti
Slobozia
500
0
1000
1500 m
N

Fig.1

Fig. 1. Târgu Jiu. Residential zonning (2008): 1. Individual type with high social-professional reputation preexistent from the communist period and being in an advanced stage of urban renewal; 2. New built individual type with high social-professional reputation built predominantly after 1989; 3. Individual type, with small dimensions, preexistent to the transition period, in variable stages of urban renewal; 4. Individual-type residential semi-central area completly renewed and with upgrading residential status (derived from 3); 5. Low confort or improper dwellings (working class colony type or hut type dwellings improvised or ameliorated etc.); 6. Central, flats building type with more than 4 levels high, the highest confort, built between 1980-1989; 7. Semi-central, flats buildings, „I-II type" classification of confort, built between 1975-1985; 8. Flat buildings, low confort (II-IV), frequently "tower" type, built predominantly in the 1960-1970's, designated for the industrial workers; 9. Mixed area: dominated by warehouses or services building mixed with residential ones; 10. Predominantly commercial functional area; 11. Industrial functional area; 12. High density of public institution area; 13. Railway transportation and railway warehouses dedicated area; 14. Parks and leisure area.

The building in Sub-lieutenant Gh. Bărboi Street represented the closest insight to this category which could be obtained.

Generally, in the Western model of structuring urban area, a spatial settling from centre to periphery can be observed, not only of some special socio-professional categories, such as the disfavored in the center and the upper categories towards periphery, but also of a certain gradient of increasing the habitable area - from centre, with small housing, high densities of inhabited and rented housing - especially not personal property, towards persons with a medium to low socio-economic status. In Romania, not only that the idea of centre is still valorized, but also the housing is spacious, being not necessarily designed for "labour people", such as those in working class districts.

3. FEATURES

The block building located at the intersection of *Braduuil* and *Siret* streets illustrates the category characteristic of *the central area* with block-type buildings, (re)presenting some of the highest urban comfort degrees, having in view the apartments' area, the presence of garages, interior gardens, storage boxes, apartments' structure etc. The floor of such a building – put into service in 1989 – is divided into two apartments with three bedrooms, two bathrooms and a terrace, with areas of 75-80 square metres, and a four bedroom one, with two bathrooms and a 100 square-metre terrace. It is situated in a green, low traffic area, in the continuation of a prestigious individual housing residential zone, remained intact during the communist period and concentrating a segment of population with a high social and economic status (doctors, teachers, lawyers). The area in question – *Bradului* – might represent the highest social prestige, if a subjective correction is applied to the results obtained by means of a previous survey, according to which, the intellectual and professional elitism characteristic of this discrete zone in the Communist period, was less familiar to the residents of the sampled working-class districts in comparison with the prestigious *Victoria – Centre.*

The social reputation of the *Victoria – Centre* zone and especially the selective access to housing in this area, according to social status, is also applied to the Bradului – Siret zone, the form underlined in local press being relevant: *"It is true that in the VICTORIA-Centre, simple, modest people, with decent income, did not have the honor of buying housing, but those who had a certain social status, certain functions and material possibilities". (Mărginimea Târgu Jiului in winter,* "Raid-Inquiry" heading, ***Gorjeneanu***, January 23, 2005).

The value of an apartment in this building it is quoted at 85 000 - 110 000 € on the real estate market, but currently, there are no available apartments for sale as they have already been sold out.

According to the developed analysis, between 1990 and 2007, residential mobility in the building was low, in both cases outputs showed a medium to low socio-economic status, another religion and another model of household composition (4 – 7 persons). Inputs (one case[3]) were represented by the category known in Anglo-American literature under the acronym of *DINK*[4].

The average number of persons/apartment during this period decreased from 3.75 to 2.5 in 2007, in two cases out of 15, apartments remained in the possession and the habitation of the same family nucleus, in 5 cases to their inheritors, the rest being represented by uninhabited properties (investment), rentable, offices, in the entire building approximately 70-80% of owners possessing and/or living in single-family houses built in urban area (Panduraşu, Primăverii, Vădeni districts) or in peri-urban area (Drăgoieni etc.).

This dual ownership – the house inhabited by the main family nucleus in urban/ suburban area and the apartment in the central area – a form both to maintain a productive financial capital (the most "profitable and financially secure storage" during the transition period) - and the temporary housing of young singles or dynamic young families (*empty-nesters*) with jobs in the ultra-central administrative zone and opportunities for recreation in the pubs, clubs and terraces area situated in the central and semi-central zone - *explains the absence of definitive outputs from the building towards the new residential zones with single-family houses as one should have expected as a result of status increase.* The dynamics of the other elements peculiar to the demographic load of the building is shown in fig. 2 - 3.

The building analyzed for the *Victoria-Centre* zone was put into service in 1989 and, at that time, the apartments were purchased by owners. As in the case of the previous building, it offers some of the most exclusivist comfort conditions, possible in a collective housing building, designed with only two apartments per floor, two levels being provided with three-bedroom apartments (two bathrooms and a 5-6 square-metre terrace), having a total area of 85 square metres and two levels with four-room apartments, having an area of 115 square metres, their structure consisting of four rooms, two terraces (9 square metres or more) and two bathrooms.

The price of an apartment in the building ranges between 80 and 90 000 € for three-bedroom apartments and between 100 000 and 140 000 € for four - bedroom apartments, taking into consideration the hypothetical character of the price, as apartments are not available for sale, being made vacant in extremely rare situations, such as in the case of the previous building (where the only "liquidations", determined by status, have already been sold out).

Until 2002, residential mobility in this building was absent[5], but, after an apartment was made vacant, the input was represented by the same *DINKS* - type profile (architect, accountant, respectively, 30 and 31 years old, high income).

[3] The second apartment made vacant was acquired, as second property, and arranged as company headquarters by other owners from the building.

[4] *DINK – Double Income No Kids.*

[5] The apartment was made vacant in the conditions of purchasing and arranging a mansion-type residence in the countryside, also a touristic area.

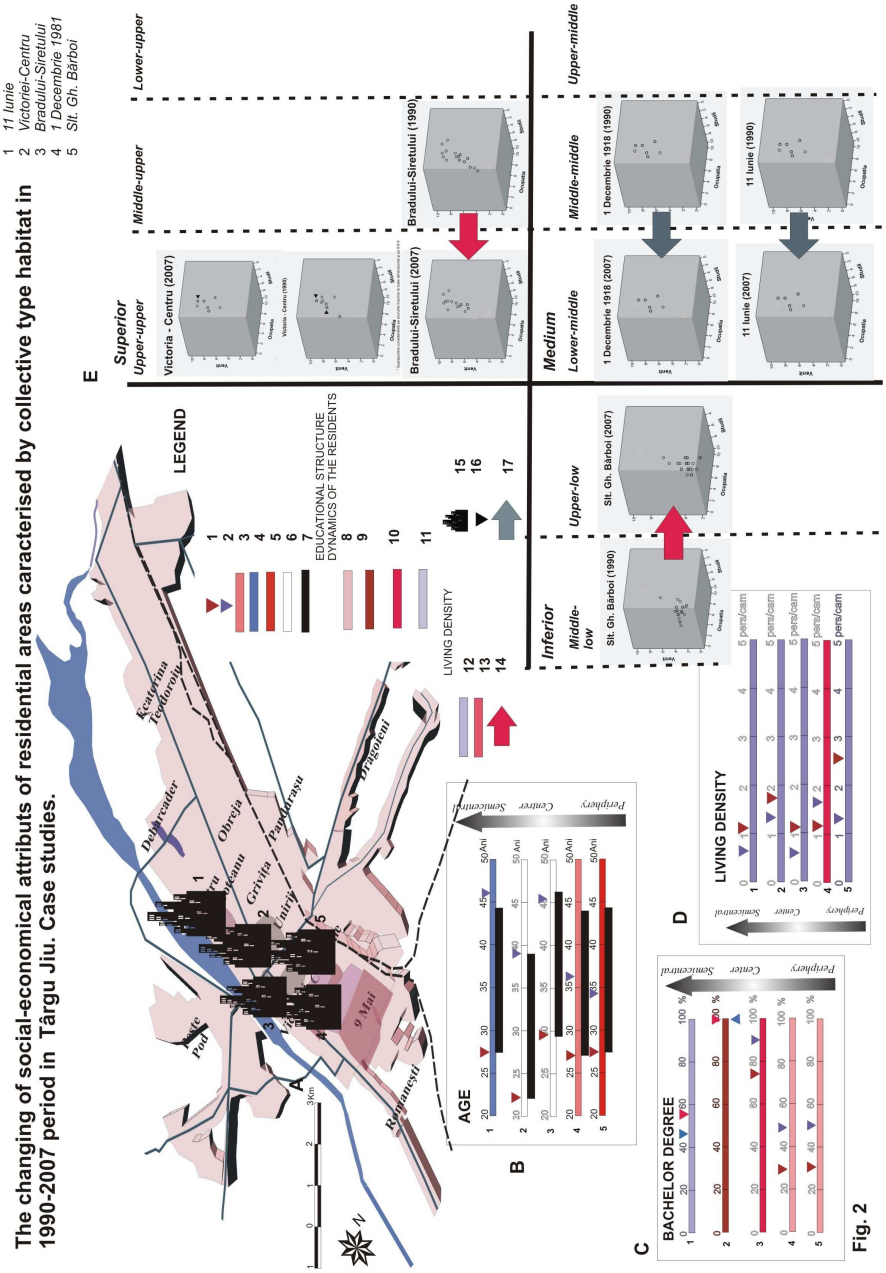


Fig. 2

The changing of social-economical attributs of residential areas caracterised by collective type habitat in 1990-2007 period in Târgu Jiu. Case studies.

Fig. 2. The changing of social-economical attributs of residential areas caracterised by collective type: 1. Medium value in 1990; 2. Medium value in 2007; 3. Demographical renewal trend; 4. Demographical aging trend; 5. Accentuated demographical renewal of the building; 6. Normal demographical dynamics; 7. The transition period interval; 8. Increasing rate of bachelor degree among residents; 9. Highly encreased educational rate of among residents; 10. Accentuated growth of residents having a bachelor degree; 11. Decreasing rate of residents having a bachelor degree in the building; 12. Decreasing living density in the building; 13. Increasing living density in the building; 14. Hypothetical transgression of social-economical status towards improvement; 15. Block type building in study; 16. Accentuated superposition value point; 17. Hypothetical transgression of social-economical status towards decreasing values.

In four out of seven cases, there is a second property – an individual house in the city, in the peri-urban area or in the capital-city, representing the withdrawal directions of the original nucleus (fig. 3), which explains once again the absence of definitive outputs in the favour of newly formed, high-status residential zones.

This type of building, situated in the central zone, presented at the beginning of the transition period only a few life - stage/cycle typologies (fig. 3 B 2 and 3), two of them being defining: 1-2 or no-child families, in the case of Bradului the component with more than two children (and medium to low socio-economic status) also added. During the transition period, the latter has migrated out of the building, contributing to its movement in another status area, the *single* component being also emphasized in both cases (fig. 3B).

The dwellings in the building situated in *11 Iunie Street* - *Sâmboteanu* (representing the semi-central zone; building 1 in fig. 2 - 3) were granted by allocation, the building being generally inhabited by qualified personnel (higher education - teachers, doctors, economists etc.), but also by medium-educated people, with many children, since the structure of the building is suitable to this mixture of status. The building structure includes two apartments per floor, with two rooms, having an area of 64 square meters, and two three-room apartments, having an area of approx. 75 square metres, the ground floor including studio apartments (54 square meters). In 1990, over 50% of the residents (8 ½ families) were higher education graduates (Picture 2C and E), the access in the building being generally made by means of house allocation.

The building records, in terms of spread intensity of housing mobility in the building, a share of 20.44% dwellings involved in real estate transactions, the maximum number of transactions/dwelling being 4 and the average of 2.5, unlike the building situated in Bărboi Street, where the maximum number of transactions/dwelling was 5, out a total of 15, but 37.5% of dwellings were involved in real estate transactions[6].

The residential outputs from the building were represented by two general categories: one consisting of medium to higher-status persons – at the time of leaving the building – and of those with very high economic status or who have improved very much their economic status during the transition period. They settled either in the capital-city, or oriented themselves towards an individual house in the city (less frequently in suburban area or in the rural area of origin).

[6] In all cases, residential mobility was considered only that mobility which had as result the involvement of dwelling in real estate transactions, excluding therefore the situations of dwelling inheritance and those of initial family nucleus withdrawal to rural environment or to another dwelling. These withdrawals to rural areas have been quantified separately.

Rezidential mobility and demographical structural turnovers during 1990-2007 in some urban residential areas of Târgu Jiu with apartment buldings. Case studies.

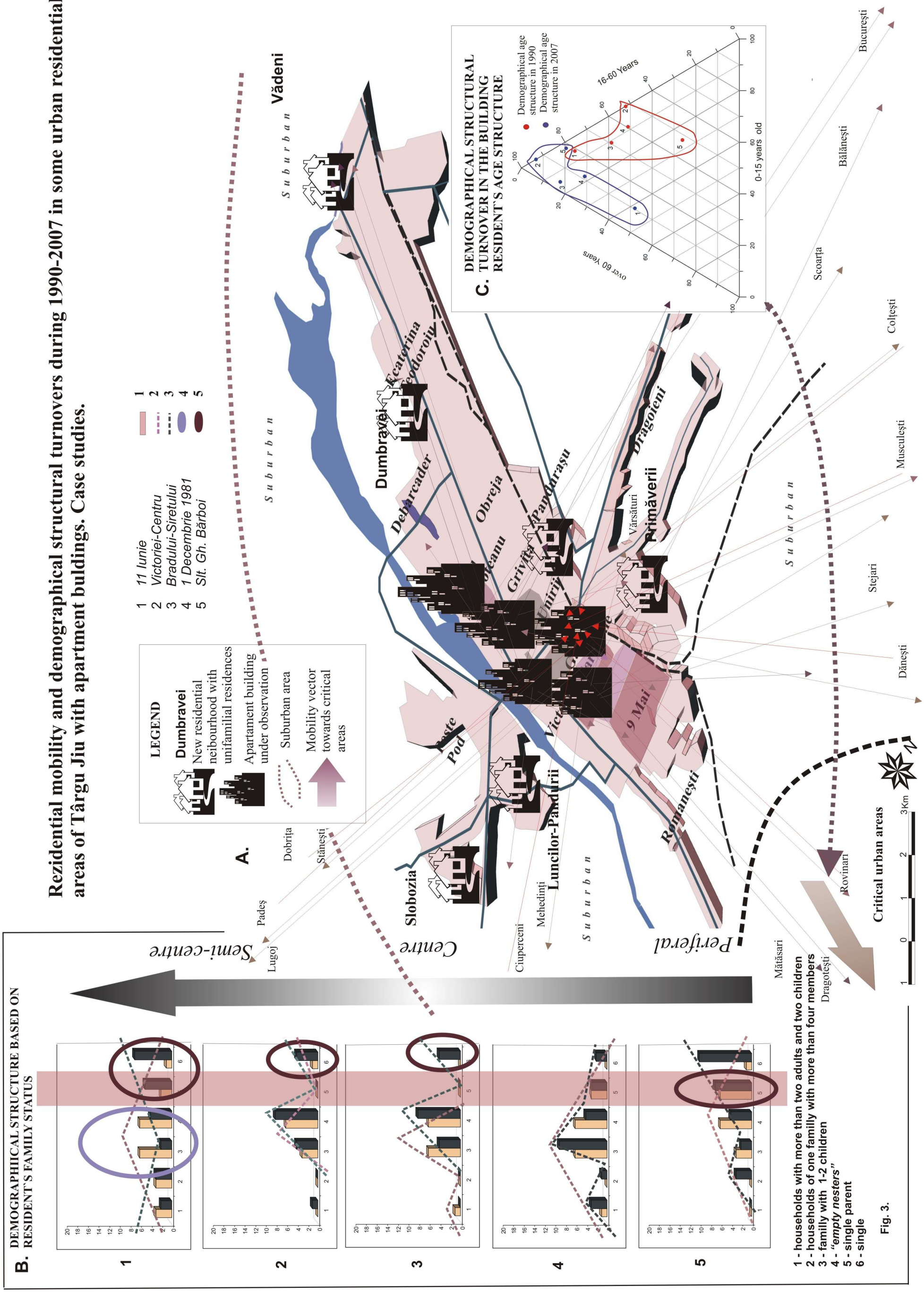


Fig. 3.

Fig. 3. Residential mobility and demographical structural turnovers during 1990-2007 in some urban residential areas of Târgu Jiu with apartment buildings. Case studies: 1. *Single parent* dimension; 2. The dominant type of familial structure in the building in 1990; 3. The dominant type of familial structure in the building in 2007; 4. Radical turnover in the resident`s familial structure in the building; 5. Critical changing dimension.

The second category is represented by those with medium to lower socio-economic status, who were also allocated dwellings in the respective building during the communist period, especially those with a large number of children, and who had their economic status decreased during the transition period («they sold because of poverty and moved to Motru» *lodger, 63 years old*), as a result migrating either to the forced-industrialized towns, where the real estate market was very cheap, or to rural areas. In 8 out of 12 cases, the residents were higher-educated families. Nowadays, residents without higher education represent exceptions.

The average state of the number of persons/dwelling[7] was nuanced in 1990 both by the presence of families with more than three children and by the predominance of the young life cycle, explaining the average of 3.15 persons/dwelling, with an average of 1.13 persons/room. In 2007, the average of persons per dwelling decreased to 2.3, with an average number of persons/room of 0.74. In 2007, the model of the typical building's resident became the couple of different ages, without children or without living with their children (mostly elderly), *single* (or divorced) and/or single parent, living in a rented or an owned dwelling, the exception being represented this time by young families with children under 15. The occurrence and the frequency of separation and the condition of *single parent* is notable, condition acquired either prior to purchasing the dwelling from the building, or during the resident status. The two categories (single person, single parent) present the highest frequencies among the situations analyzed in the case of the transition period, after the building situated in the Bărboi Street. If the considerable proportion of people over 60 who live alone, children usually being settled in the big cities of the country, is added, ***the proportion of these persons situated in the exception area of the classic family nucleus, not to mention the marginalization, exceeds 70% of the residential load of the building, which explains the present low density residence values***.

The building in the Sub-lieutenant Gh Bărboi Street (building no. 5 in fig. 2-3) is a typical example of habitat designed during the "construction of socialism" for the "working class", including the so-called *duty lodging*, allocated to those who worked at the construction and later on at maintaining the thermoelectric plant in Rovinari or in other type of constructions. This group of buildings, somehow dissimilar from those of the same class of comfort and target group of population as those in the Nicolae Titulescu Blvd. and *9 Mai* Square (2^{nd} - 4^{th} class comfort) or Minerilor (all three areas located on the north side of *9 Mai* working class district – fig. 1, 2 and 3A), was built in the immediate proximity of the railway station and of the motor coach station, in order to facilitate the rapid access to the workplace. The second-class comfort apartments, with no separate rooms, are approaching the critical lower threshold of the space necessary for a room (bathrooms and kitchens between 1.6 square metres and 2.5 square metres), lacking terraces, with two-room apartments, having unequal inhabitable areas (between 26.5 square metres and 34 square metres). These inhabitable areas, overlapping the average number of persons/dwelling of 3.73 and 2.06 persons/room (7.3 square metres area/person), respectively, at the level of 1990, give a quite pronounced snapshot of congestion in this type of building.

[7] In the conditions in which some of them are studio apartments.

Taking into consideration the year when it was given into service (1968), even though at the beginning it was inhabited by single persons (the distribution rule supposed that, in the initial stage, such an apartment had to be inhabited by one-three young workers, the first who got married would take over the entire apartment) or by young families who received the apartment as a duty lodging, until the beginning of the transition period the building developed a complete and balanced structure of inhabitants' life stages (fig. 2B), with a special mention ***for the large number, which also increased during the transition period, of persons put in the situation of single parents.*** In 1990, 37.5% apartments belonged to single parents, while in 2007 the share increased to 43.75%. Both the building located in Bărboi Street and the one in 1 Decembrie Street lined up an almost balanced structure, in which all life cycles were represented according to population shares. In general, in the latter case, ***during the transition period, the share of marginal categories has increased: single parents and single persons, and overcrowded households,*** consisting of families with two or more children as well as other members living together (Fig. 3. – categ. 1).

In 2007, the maximum number of people per dwelling was 7 (two cases, 6 people - a case) with the following family structure: the original nucleus, the family of one of the children, composed of two adults and two children and the second child, adult and single. Another type of numerous household structure was formed of an initial nucleus, with five children. As a result, this building is the only one recording an *agglomeration tendency* during the transition period compared to the initial period, and this is not as a result of the new life stage, ***but as a result of the impossibility of this category of residents to separate from the original family nucleus due to the prices of real estate market.*** In the other two buildings, with a proximal socio-economic status, this phenomenon ***is hidden by the high mobility of the initial family nucleus towards the rural area*** (towards the rural of origin, as a reverse of the initial phenomenon during the 1960's – 1980's), leaving their inheritors in the apartment – unlike the 1 Decembrie street, where, in most cases, there is no *rural of origin to withdraw to, the building having not been populated by persons of rural origin (the professionals* came from other urban areas of the country, experiencing several residential movements during the communist period.

The building situated in *1 Decembrie Street* (No. 4 in fig. 2-3) represents an illustrative building for the areas with decent living conditions (first-class comfort), without enjoying a social prestige, or as part of a respectable residential area, but also without being affected by the proximity of the working class low-comfort buildings in *9 Mai* district situated at the borders.

Beyond the issues highlighted in fig. 2 - 3 and the previously-outlined ones on the non-rural composition of the residents and the absence of the rural re-migration, in terms of the status of the demographic component, it has regressed. The phenomenon is less obvious on the status diagrams (fig. 2E), mostly due to the occurrence of an obvious overcrowding (more obvious than in situations in which there is a possibility of re-migrating to rural areas) and, secondly, by a decrease in economic status, also unobvious on diagrams, as the *studies* scale remains high (moreover, the education level increases during the transition period) fading the economic side in three-dimensional version of the chosen status.

Maybe this type of building, circumscribing *a medium level of the communist and post-communist status – manages to point out in the best manner* ***the housing crisis in the medium-sized city,*** *such as the analyzed one, during the transition period:* that increase from 4 persons/apartment (with 1.2 persons/room) in 1990 to 5.9 persons/apartment (1.7 persons/room) in 2007 – *the only statistically-emphasized increase in the analyzed areas.* This is due to the circumstances according to which, ***the medium segment of status found***

neither the option of re-migrating to rural or to small urban areas, nor did it manage positive movements on the three-assessed dimensions to allow the accumulation of capital, necessary for the newly-formed families to detach from the initial nucleus.

4. TRANSFORMATIONS

In the case of the building in Bărboi Street, the average housing density in 2007 (3.73 persons/apartment and 1.02 persons/room, respectively), lower than at the beginning of the transition period (when it recorded the highest values among the buildings considered for this study - 4.1 persons/dwelling and 2.06 persons/room) *is not due to the "aeration" of the household structure, but to the fact that, in 2007, there were uninhabited apartments (approx. 30%), their owners living in rural areas* (in the absence of an urban workplace) and *keeping the dwelling both as a form of profitable investment and for the period in which children will attend high school and will live there.*

In the case of the building in 11 Iunie Street, the housing density decreased as a result of children's separation from the initial nucleus, being many situations of elderly couples living alone, and a large number of single parents, and especially single persons (divorced or unmarried). This building shows the most visible trend (fig. 3A-2) *of the typical resident's movement from the initial family structure* (similar to the other buildings) *to marginal groups* (single, single elderly couples, single parent, families with more than four members), *the share distribution being practically reversed: from maximum in the areas with two-child families and minimum towards the marginal groups, to minimum in the central zone* (figure 3B) *and maximum towards extremities. These trends are very visible in this building's case because, the initial socio-economic status was consistent enough – these categories are not "removed" from the structure as in the other cases (to rural), pointing out the typical disorganization of the classical concept of family in the nowadays urban areas, exterior to the main cities of the country (which fix or attract the young population – the service-class or professionals).*

From this point of view, *in the case of the buildings in central zone, the increase in share of single persons, with high socio-economic status and who postpone the time of establishing a family, can be remarked.*

Overall, the socio-economic status and social prestige of the residential zone in *11Iunie – Sâmboteanu*, has decreased if compared to the communist period, recording, as residential zone, a more modest increase in real estate prices (in the context in which prices have increased in all towns' zones). This zone has registered a decrease in social prestige, especially because of its collective way of living, *plus the effect of the appearance of new peripheral residential zones, with individual dwellings, which determined the withdrawal of the high socio-economic status segment towards them, determining, at the same time, the restricting of the area of residential appreciation area to the surrounding the center, leaving a gap of social prestige conferred by the quality of the demographic load, compared with the situation at the beginning of the transition period, in semi-central zones. Thus, **in terms of social prestige,** taking into consideration the subjective role of centrality in determining it, we witness a **subjective adjustment, a reduction of the "centrality around the center" area,** which is still inhabited by dynamic, young persons (DINKS or Empty Nesters) belonging to the high status and by the very young, unmarried persons, belonging to the very high status (upper - upper class).*

The inputs in the semi-central zones are represented by young specialists *(professionals)*, married, without children, single persons or single parents, but with medium and medium to high socio-economic status *(*upper-middle class*).*

Why do not we witness overcrowding in the modest-status areas after the transition period, in the conditions in which real estate prices are increasing and the status remains the same or is decreasing? The answer is represented by the *model of living in the countryside and of keeping the property as a way of preserving the household's capital, as well as of providing accommodation for children during high school studies.*

We assist at the aging issue in none of the situations (increase in age average in the building, beyond the translation of the values corresponding to the transition interval), since, as the demographic pyramid model also demonstrated, the town is a favorite area of the active population, those with low status cannot afford it after a certain threshold, the only ones that can afford it are those with at least a medium status, while those with high status prefer the suburban area and the life in individual houses.

5. PREFERENTIAL DIRECTIONS OF RESIDENTIAL MOBILITY

Residential mobility in buildings, very low in ultra-central and central zones was more intense starting with the peripheral areas and ending with the semi-central ones. As far as the urban-rural migration is concerned, 14% of those who lived in the building in Bărboi Street at the beginning of the transition period have left the building to migrate to the rural areas situated more than 30 km away from the town (fig. 3A), to suburban areas (not as a welfare migration) and to disfavoured areas (Mătăsari, Dragoteşti). This completes the explanation of not finding a rural increase of population in the analyzed communes - the rural environments they mostly return to are situated at great distances from the town, to the less-developed south, centered on activities of exploiting underground resources.

Even in 1990, the building in Sub-lieutenant Gh Bărboi Street had some uninhabited apartments, the owners living in rural areas (Padeş, Colţeşti, Bălăneşti etc.). The ones who migrated during the transition period have migrated to Stăneşti, Padeş, Dăneşti, Lugoj, Târgu Jiu (both to central zones and to zones with a more pronounced degree of marginality, with P+12-type buildings).

The areas of origin of the population migrated prior to the transition period (moment 0 of the investigation) were represented by the following localities: Dăneşti (returned to Dăneşti in 1995), Vărsături (re-migrated in 1995), Vărsături (re-migrated in 2001), Colţeşti (returned to Colţeşti in 2001), Musculeşti, Dobriţa, Padeş, Stăneşti, Târgu Jiu, Tulcea, Rovinari etc. ***The fact that in the same building, there are families from the same rural localities, confirms once again the supposition of cluster migration from the same rural localities to the same urban periphery during the 1960's – 1980's.***

Those who came during the transition period have come generally from rural areas, from Roşia de Amaradia (in 2002 spread to other areas of the town of Târgu Jiu in 2004), Băleşti, or from smaller urban areas: Bumbeşti Jiu, Rovinari, in almost all cases being persons with a higher social status (teachers - 3, sub-engineers - 2, civil servants - 1), all inputs being persons with higher education or colleges, found *in life stages that do not require very much space* (with one exception, it was a case of single persons or *empty nester*), but who, ***because of the prohibitive prices of housing in areas with a more pronounced centrality degree had access only to such housing in urban areas,*** producing a small-sized "gentrification" of the building. This *new residential mobility is rendered visible* (in a building with an initial reputation

of "bad payers") *through a series of modifications of the common infrastructure, the improvement of facilities, improvements brought to housing or at the micro-community level* (intercom-based access, roof insulation, basement drainage, exterior thermal insulation and exterior renovation of the building). The share of apartments in the building which were subjected to residential mobility was not very high (37.5%). *Only the dwellings of those who did not manage to live in urban or rural areas without selling, it entered into "circulation" (those sales for debt liquidation),* where this was possible, the apartment was preserved.

6. CONCLUSIONS

The dynamic tendencies at the level of demographic load of the residential areas with apartment buildings during the transition age, observed in the city of Târgu Jiu, in its ultra central and central areas, are the following:

- the growingly obvious cluster, or the social homogenization at the upper classes level («positive» homogenization) and the «elimination» of the lower class exponents through mobility during the transition age – «elimination» which, overlapped with the translocation of residents on even higher levels of the assessed dimensions, justify an up warding of the building from the middle-upper class and real estate status to upper-upper class;

- as opposed to the previously explained process, in the case of real estate placed in semi central or average residential areas, there can be noticed a throng around higher values than the previous, or towards the base of the original interval, a fact which reflects a lower level homogenization («negative» homogenization) – dynamics that justify a descending shift (downwarding) from middle-middle class to the immediately lower stage – lower-middle class;

- the dispersal of the more homogenous lower class at the beginning of the transition age, leading to the outlining of extreme situations of aggravated pauperization, which remain singular, but are dominated by a spread towards higher classes; this leads to a «positive» heterogenisation – taking into account the dominant tendency – of the class of the residential demographic load of real estate, which, in our opinion, justifies the supposition of a dynamic shift or transgression tendency of the class category, following this assessment, from the central area of the interval described by the term «lower class» (middle-low class) to the higher limit of lower class, the upper-low class.

In the studied urban context, the outlying residential districts with apartment buildings are the turntable or the urban spot of the «first come» rural migrator, being the least exploited residential area designed for the «working class» under communist rule, and thus centered upon working class districts (such as the large residential habitats created during communist rule). In order to fully grasp the filtration and deterioration processes of the ex-working class districts – generally placed in the suburbs or adjacent to industrial platforms – and especially of the residents' behaviour in the urban area and their new migration to their original rural area, one must understand this peculiarity of some limited Romanian urban areas, mostly created or developed in the age of forced industrialisation, by the emphatic migration from rural areas, preponderantly between the years 1960 – 1980, that of newly migrating from urban areas in the first decade of the transition age, as a consequence of pauperisation. These exits from urban areas, which do not occur in North American city modelling – a probable reason why nowadays we are witnesses of endless degradation of low class inhabited areas – most certainly contribute to creating the dynamics difference at the level of real estate, in comparison to the previously mentioned patterns.

On the other side, the constraint of the sub dimensioned number of flats available in apartment buildings, in relation to the demand for them (the ones with the most affordable prices) and the incessant price increase, caused by the super dimensioned number of demands in relation to the one of offers, constantly leads to the temptation of vacancy of the unsustainable, and the improvement of the residential area demographic load, thus permanently forcing the socio-economic upgrade, in contrast with the classically designed urban area. At superior quality levels of residential mobility (from average or semi central areas to central and/or ultra central areas) the residential exchange does not take place due to or along with the degradation of the real estate quality. Except for the previously mentioned extremity (the case in which, for a certain amount of time, there are dynamic oscillations) the real estate quality is regarded as constant, not dynamic (or at least not negative) – increasingly higher in the succession suburb – semi central – ultra central – modern suburban residential areas with apartment buildings designed for one family. The transformations may mean, at most, the constant upgrading of the buildings, on all levels.

R E F E R E N C E S

1. *** (1984), *Geografia României*, II, *Geografia economică şi umană*, Academia Română, Bucureşti.
2. *** (2005), *Mărginimea Târgu Jiului iarna*, rubrica „Raid-Anchetă”, *Gorjeanu*, 23. 01. 2005.

STUDIA UNIVERSITATIS BABEŞ-BOLYAI, GEOGRAPHIA, LIV, 2, 2009

NEW TENDENCIES IN THE INTERNATIONAL TOURISM TRANSPORTATION WITH A SPECIAL LOOK ON AIR TRANSPORTATION AND TOURISM CRUISES

AL. PĂCURAR[1]

ABSTRACT. – New Tendencies in the International Tourism Transportation with a Special Look on Air Transportation and Tourism Cruises. Transportation became, in course of time, the vectors of representation of tourism, being alongside accommodation infrastructure an essential element of tourism. A place (sit) cannot become tourism until it does not become accessible through a mean of transportation and until it does not offer accommodation. In the course of time the ponderability of different means of transportation have changed, air transportation and maritime cruises are amongst the most dynamic ones, the last ones being somehow more exclusive regarding the profile of the consumers.

Keywords: *tourism transportation, common evolution, used mean of transportation, regional differentiations, indicators regarding air passenger transportation, maritime cruises, cruise operators.*

INTRODUCTION

Intenational tourism transportation. An essential distinction must be established, from the very beginning, between the multipurpose formulas of transportation, which respond to all motivations of traveling, among which, in general, the one that dominates is the one done from professional reasons and specific tourism formulas.

The first type includes all means of transportation, regular and permanent ones that are used by all types of travelers, including those who travel in tourism purpose – business travels, visits to parents and friends, pleasure and recreation trips, etc. On the occasion of summer and winter tourism trips, these companies are lead in order to be suited to the demand, supplementing the numbers of trains and flights, but this supplementary traffic is but a circumstantial and small part of their activity. The perspectives of development of this market could join the societies of regular transportation, so that they might create branches specialized in transportation on demand, "charter", on the production of voyages and of tourism accommodations.

Besides these multipurpose firms, other companies of various proportions emerged, that were strictly specialized in the transportation and voyage of tourism customers. In the simplest case, they strive to assure transportation, without any other labour conscription, towards the most requested destinations during peak periods. It is about the charter transportation companies (or of freight), well known in air transportation, but they operate in the collective road transportation as well in order to respond, for example, to the demand of a group of travelers constituted in an association. The expansion of these and the simultaneous

[1] *"Babeş-Bolyai" University, Faculty of Geography", 400006, Cluj-Napoca, Romania, e-mail: sandu@geografie.ubbcluj.ro*

development of the tourism destinations which they serve, from the preferential point of view, towards the places of pilgrimage, for terrestrial transportation, or more remote spa stations as the Balneare, Canare, Antilles, Indian Ocean, for air transportation, they often end by offering veritable regular services, not only for the period of maximum frequentation. For example USA with Transamerica Airlines for the American region, the British example Laker Airways, not existing today, for the North Atlantic region, or of the Canadian firm Wardair for the same region, the French examples Minerve for the Mediterranean and Antilles routes and Point-Air, not existing today, for Africa and Reunion, may illustrate this evolution.

A location (sit) cannot become tourism until this does not become accessible through a modern mean of transportation and until it does not offer accommodation. In this sense, transportation, as means (base) of accommodation, are the vectors of worldwide specialization of tourism.

From the tourism perspective, transportation is seen as a mean of acceleration and of extension of the tourism mobility (Duhamel, P., Sacareau, I., 1998).

The progresses recorded by the means of transportation, as the extension of the traveling networks, play an essential role in the expansion of the tourism space and to the diffusion of tourism in the world. The diminution of the distance-time factor and of the distance-price factor as well, favourized the access to tourism and to more and more remote tourism places, of a growing number of individuals. In this way, the evolution of tourism and its spatial enlargement are marked by the different stages of development of transportation.

From the point of view of the tourism service, transportation represents the possibility of access to the tourism consumption, being one of its important components. Its poderability, in the value of the tourism product, oscillates between 25% - 50%, according to the type of tourism, to the distance between the place of origin and the place of destination, to the method of transportation, season and price of the combustible. Transportation represents the first link of the tourism consumption of which the tourist, in his travel towards the place of destination, cannot do without. This is a galvanizing element of the internal and international tourism circulation. The improvement of the means of transportation in the course of time, stimulated the development of tourism, its spatial expansion (some tourism regions were included in the tourism circuit due to the improving of air transportation), and even the setting up of some new forms of tourism (of cruise trips, camping, caravanning). The liaison between tourism and transportation is so close and complex, that transportation, by its activity, is able to generate tourism, through the impulse given by it towards traveling. Three stages can be distinguished in its common evolution with tourism (Cristureanu Cristiana, op. cit., pp. 151-154):

1) the revolutionizing of transportation by introducing the steam engine, during the 19^{th} century, opens the era of railway transportation. In this way, the length and cost of the voyages were reduced, security grew and the development of the tourism spa resorts was impelled by the propinquity of the railway;

2) the interwar period, that consecrates the utilization of the automobile as mean of traveling in tourism purposes. Tourism obtains a high mobility, hotels and motels are built, petrol stations are constructed in the nearness of the major road axels, new forms of itinerant tourism emerge, of weekend and residential, as a consequence of the extension of the automobile production;

3) the post-war period, when the airplane stands out as a fast mean of traveling; the modernization of all the means of transportation takes place simultaneously. Transportation, besides its major functional role, receives an attractive role too both for the necessity of tourism access, and as a motivation for pleasure and rest, developing a sub branch that belongs to it – pleasure trips – nautical, terrestrial, by cable.

A tendency of reversal can be observed between the tourism-transportation report, emerging from a tributary relation of tourism towards transportation that had a galvanizing role, into a stimulating one, so that, an adaptation and a specialization of the means of transportation for tourism takes place inside the tourism transportation. The service of transportation is diversified both in quality and in price.

As one country goes along and is more intensely connected to the international tourism fluxes, it develops its infrastructure of transportation, its stock of means of transportation, impelling this economical activity towards the increase of its incomes.

The major ponderability, as quantity, in the international tourism transportation is held by the road-automobile transportations with 51, 9% in 1990, but in slight decrease in 2001, to 50, 6%, followed by air transportation, that grew in ponderability, from 35, 3% in 1990, to 39, 4% in 2001. Water transportation follows next, but its problems were maintained rather constant, 6, 4% in 1990, 6, 8% in 2001 (tables 1, 2, 3).

The evolution of the structure of the arrivals from international tourism, according to the used mean of transportation, from in between the years of 1990-2001

Table 1

Used mean of transpor-tation	International tourism arrivals (milions)				Ponderability of the worldwide total (%)		Variation (Δ) ponderability (%)		Annual average growth (%) 1990-2000
	1990	1995	2000	2001	1990	2001	00/99	01/00	
airplane air	161,1	207,0	275,9	269,4	35,3	39,4	6,8	-0,5	4,2
automobile, bus road	236,5	284,7	342,7	345,9	51,9	50,6	8,5	-2,3	5,5
train railway	22,0	16,9	19,7	20,3	4,8	3,0	5,9	0,9	3,8
river boats and maritime riverine and maritime	29,3	39,7	46,7	46,2	6,4	6,8	6,8	3,1	-1,1
not specified	7,0	2,0	2,3	2,2	1,5	0,3	3,7	-0,9	4,7
Worldwide total	**455,9**	**550,4**	**687,3**	**684,1**	**100,0**	**100,0**	**-**	**-**	**-**

Source: xxx, 2003, *Aperçu sur le tourisme mondial*, OMT, Madrid, pages 63-64

The evolution of ponderability of different means of transportation in the international tourism in between the years of 1990-2001

Table 2

Used mean of transportation	The evolution of ponderability of different means of transportation in the international tourism			
	1990	1995	2000	2001
Air transportation	35,3	37,6	40,1	39,4
Road transportation	51,9	51,7	49,9	50,6
Railway transportation	4,8	3,1	2,9	3,0
Water transportation	6,4	7,2	6,8	6,8
Not specified transportation	1,5	0,4	0,3	0,3

Regional differentiations of the ponderability of the means of transportation used in the international tourism displacements, in the year of 2001

Table 3

Used mean of transportation	Worldwide	The Continent				
		Africa	America	Asia-Pacific	Europe	Middle East
Air transportation	39,4 %	49,4 %	54,1	47,3 %	31,6 %	39,8 %
Road transportation	50,6	41,3	40,2	40,9	57,1	55,3
Railway transportation	3,0	0,3	0,1	0,5	5,0	0,0
Water transportation	6,8	7,1	5,5	9,9	6,2	4,9
Not specified transportation	0,3	2,0	0,1	1,3	0,0	0,0

Source: xxx, 2003, *Aperçu sur le tourisme mondial*, OMT, Madrid, pages 63-64

The railway transportation of the international tourists decreased from 4,8% in 1990, to 3% in 2001.

The evolution of the ponderability of different means of transportation in the international tourism, as the regional disparities are represented in figure 1.

It can be easily observed, out of the chart, that the ponderability of air transportation of the international tourists grew slightly, up until 2/5 out of their total in 2001, while the tourists that used to travel by car stabilized around the value of 50%.

The ponderability of railway transportation decreased from 4, 8% in 1990, to 2, 9% in 2000 and then it grew slightly up to 3% due to the facilities given to the tourists, especially young and senior ones. Water transportation held in 2001a ponderability of 6,8%, due to the proportions taken by cruise transportation. As a matter of fact, this type of transportation has a high ponderability in Asia-Pacific (9,9%) and Africa (7,1%).

In Europe, the automobile transportation clearly predominates with 57,1%, and in America it has a the lowest percent, of 40,2%; on the other hand, air transportation clearly predominates, with 54,1% out of the total.

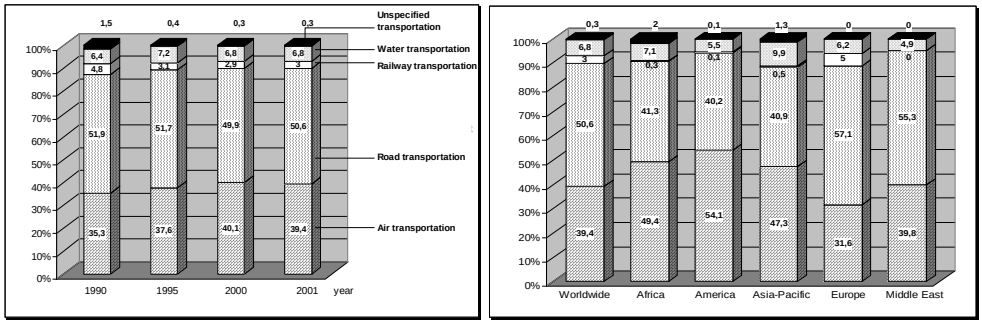


Fig. 1. The evolution of the ponderability of different means of transportaion in the international tourism, in between the period of 1990-2001, and the regional differetiations in the year of 2001.

Sursa: xxx, 2003, *Aperçu sur le tourisme mondial*, OMT, Madrid, pp. 63-64

The progressive development and democratization of **air transportation** (even in spite of some tragic events as the ones that took place on September 11, 2001), induce profound changes through the internationalization of tourism and "the conquering" of new and more remote tourism spaces. The introduction into exploitation of some flying aircrafts, powerful and of great capacity (the Jet at the end of the 1950s, Boeing at the end of the 1960s, Airbus A 320 and 340 at the end of the 1980s) and the progressive diminution of the tariffs, (on the average with 1-3% per year in the past 20 years), are among the causes of the development of the international tourism. Air transportation favoured the development of tourism both numerically (the increase of the number of transported tourists), and spatially; the relationship goes both directions, because tourism favoured on its turn the development of air transportation.

Air and road transportation are the ones that dominate the international tourism transportation; a hierarchy of the different types of transportation of the international tourists was established by OMT (see tables 1, 2, 3).

According to the OMT data, approximately 40% of the international tourists use the airplane as a mean of transportation in their travels from their place of residence to the place of vacation. Of course that for the long distances, that is to say for the interregional tourism fluxes, which frequently are international, the plane is the preponderant mean of transportation, and its main strong rival that competes with it is the road transportation.

Affected by numerous crises since the end of the 1990s, the international air transportation suffered a severe crisis that meant the drastic reduction of the quantity of transported passengers, massive dismissals of working personnel, and even measures of closing down and of limitation of the access into the national air space of some states.

According to the data of the International Civil Aeronautic Organization (ICAO), whose members in charge with the transportation belong to 188 states, cited by OMT (xxx, 2003, *Aperçu sur le tourisme mondial*, Madrid, pp. 105-108), in 2002 1,615 billion passengers were registered on air travels, out of which 545 million on international travels (table 4).

The main indicators regarding air passenger transportation in the years of 2001 and 2002

Table 4

Type of flight	**Number of passengers (milioane)**		**Variation (%) in quantity**		**Available seats / passenger / km (billions)**		**Paying passengers / km PKP* (billions)**		**Variation (%) in quantity**		**The degree of seat taking (%)**		
	2001	2002	01/00	02/01	2001	2002	2001	2002	01/00	02/01	2000	2001	2002
International	532	545	-1,1	2,4	4.245	4134	1716	1732	-3,5	1,0	72	70	73
Internal	1092	1070	-2,3	-2,0	-	-	1214	1210	-2,0	-0,3	69	69	67
Total	**1624**	**1615**	**-1,9**	**-0,6**	**-**	**-**	**2930**	**2942**	**-2,9**	**0,4**	**70,9**	**69**	**71**

* PKP–paying passenger transported per one kilometer

Source: xxx, 2003, *Aperçu sur le tourisme mondial*, OMT, Madrid, page 107

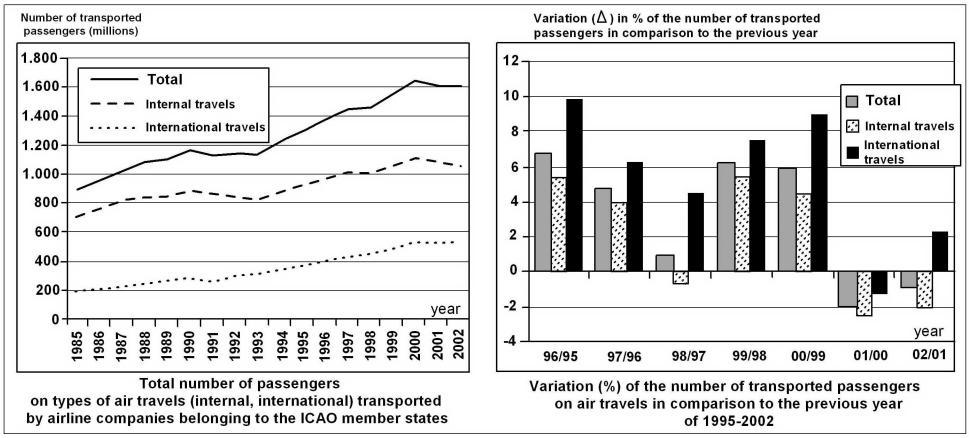


Fig. 2. The evolution of the number of passengers transported on air travels in the period between 1985-2002 (left) and the variation (Δ) expressed in % of the number of passengers transported by air travels in the period between 1995-2002 (right)

Source: xxx, 2003, *Aperçu sur le tourisme mondial*, OMT, Madrid, page 106

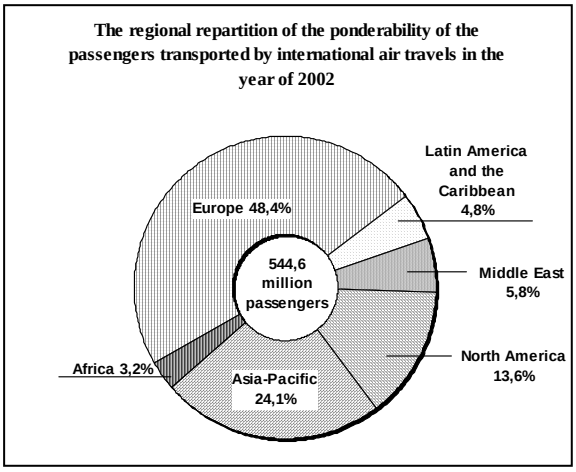


Fig. 3. The regional repartition of the ponderability of the passengers transported by international air travels in the year of 2002.

Air transportation developed constantly beginning with the year of 1985, with two inflexions, in 1990-1992 and 2000-2002, as a result of the oil crises and of the war conflict between Iraq and Kuwait, and then of the terrorist attacks from the year of 2001 (figure 2).

As it can be seen in table 4, the total number of the transported passengers on air travels diminished with 9 million (-0,6 %) in 2002 in comparison to the year of 2001, but in a differentiate way: while the international routes increased in number with 13 million passengers (from 532 to 545 million), that is to say with 2,4%, on the internal routes diminished with -2%, that is to say from 1092 to 1070 million passengers.

The degree of booked places in 2002 was of 67% for internal air transportation and of 73% for the international one, in comparison to the worldwide unified mean of 71%. The "paying passenger / kilometer" indicator or PKP expresses the number of paying passengers transported on a distance of one kilometer; it increased with 1% in 2002 in comparison to the year of 2001, while it diminished on the internal routes with -0,3%, but the tendency is of increase. A geographical regional distribution of the volume of

passengers registered on air travels show, for the year of 2002, that 48% were transported by companies from Europe, 24% by companies from Asia-Pacific, 14% by North American companies, 5% by transporters from Latin America and the Caribbean, 6% from Middle East and 3% from Africa (figure 3).

The synthetic table of the regional distribution of the number of transported passengers on internal and international air travels in the year of 2002 is reproduced below (table 5).

The synthetic table of the regional distribution of the number of transported passengers on internal and international air travels in the year of 2002

Table 5

Region	Number of passengers (milions)						Number of paying passengers/ km - PKP (billions)					
	Total	%	International travels	%	Internal travels	%	Total	%	International travels	%	Internal travels	%
North America	615,2	38,1	74,2	13,6	541,0	50,5	1082,3	36,8	322,4	18,6	760,0	62,8
Europe	422,6	26,2	263,7	48,4	158,9	14,8	769,7	26,2	643,8	37,2	125,9	10,4
Asia-Pacific	400,3	24,8	131,4	24,1	269,0	25,1	785,1	26,7	537,6	31,0	247,5	20,4
Latin America and the Caribbeans	97,1	6,0	26,4	4,8	70,7	6,6	132,3	4,5	77,4	4,5	55,0	4,5
Middle East	50,1	3,1	31,4	5,8	18,7	1,7	106,7	3,6	93,5	5,4	13,2	1,1
Africa	29,9	1,9	17,5	3,2	12,4	1,2	66,2	2,3	57,5	3,3	8,7	0,7
Worldwide total	**1615,2**	**100,0**	**544,6**	**100,0**	**1070,6**	**100,0**	**2942,6**	**100,0**	**1732,2**	**100,0**	**1210,2**	**100,0**

Source: xxx, 2003, *Aperçu sur le tourisme mondial*, OMT, Madrid, page 108

Precisely as the tourism fluxes, the air fluxes are concentrated from the spatial point of view: North America, Europe, Japan and the new industrialized countries from Asia hold 85% from the worldwide passenger traffic, but with having different rhythms of evolution. In this sense, Asia is prefigured to become an important pole of international tourism. Among the first 30 airline companies from the world, 46% are American (American Airlines, United Airlines, Delta Airlines), 33% are European (British Airlines, Lufthansa, Air France, Alitalia, Iberia, SAS) and 17% belong to Asia (Japan Airlines, Singapore Airlines, Cathay Pacific, Air India).

Air transportation was bowled over through the start of using charter drives by the private companies (Minerva, Brith Caledonian Ltd), often belonging to some turoperators (Britannia for Thomson, Orion, for Horizon Travel). The charter drives represent the main activity of numerous airports from the world: Rhodos, Heraklion, Djerba, Agadir, Malaga or Palma de Mallorca (Duchamel, O., Sacareau, I., 1998).

During the contemporary period, air transportation played a primordial role in the international tourism transportation because of their dynamics and the perspectives they open for the tourism circulation. As pioneers and promoters of new destinations, air transportation oversteps the contour of the tourism fluxes, having an ascending evolution that accompanied, was feed, and stimulated the growth of the international tourism circulation.

Maritime cruises offer an example of total integration of the diverse tourism functions, by only one company, which assures everything, starting from transportation, accommodation, restoration, animation on board and visits to land during stopovers.

The river and maritime boats began to be present in the international tourism, and were considered to be a tourism product of luxury, since the end of the 19th century and the first decades of the 20th century.

The attraction exercised by water travels, as main type of tourism of rest and pleasure trips, combined with the possibility of access to a tourism destination, gave birth to cruises. These are the tourism arrangements, which include, alongside transportation, a series of tourism services carried out during the voyage.

The American maritime company Carnival Cruise established in 1972 re-launches the maritime cruise (at the end of the 50s, over 1 million passengers were traveling between USA and Europe, so that 10 years later, to pass a little bit over 250 000), after a period of crisis. The packetboat becomes a floating vacation center, equipped on board with all means of animation: casinos, cultural and sports activities etc., making short stopovers for excursions and provisioning.

The diversification of the types of ships, as the increased conditions of comfort, rest and amusement, impelled the tourism demand for cruises. The cruise market, in comparison to 3 million in the year of 1986, it's in expansion, having approximately 5,6 million passengers in the year of 1995, 9,6 million in 2000. The degree of occupation of the space of the ship (the report between the number of days real passengers and the number of days potential passengers) oscillates around the value of 70% (60,3% in 1985, 69,1% in 1986, 72,2% in 1987 and 74,7% in 1988). This market is dominated by the companies from USA (it furnishes 2/3 from the worldwide customers), Great Britain, Scandinavia, Italy.

The market of the worldwide cruises includes two important regions – the basin of the Caribbean Sea with 36% from the worldwide volume and the basin of the Mediterranean Sea with approximately 34%. The market of the Mediterranean Basin recovered after the crisis that took place between the years of 86-87, when Arabian terrorist actions hijacked cruise ships – the case of the Italian ship Achile Lauro.

The market of cruise tourism has modified lately from an elitist market, of luxury, to a mass market and offer, destined to a larger and younger segment of public. The tendency of reduction of the duration of the cruises is observed in the last period, as the combination of these with air transportation and the diversification of the attractions that take place on the boards of the ships.

The maritime cruises became the object of an elaborated OMT study (xxx, 2003, Le secteur des croisieres, in Apercu sur le tourisme mondial, OMT, Madrid, p. 179-193), that pointed out a series of features. Therefore, in contrast with the classic transatlantics, modern packetboats are characterized by the fact that they are not only a mean of transportation, but especially they are a "destination in itself" that allows the agreeable spending of free time on their board during the travel of the tourists from one destination to another. In the year of 2000, over 10 million tourists practiced this form of tourism (table 6).

In Europe, the majority of the passengers belong to Great Britain (740 000), to Germany, Italy, to France and to Spain, and in Asia, they belong to Japan, the Republic of Korea and to Taiwan.

The most frequent destinations are, in the summer: the septentrional regions from Alaska, Atlantic Europe and Northern Europe, the region of the Mediterranean Sea, and during winter: the subtropical regions of the southern hemisphere – the Caribbean, Mexico and Central-isthmian America, the Indian Ocean, etc.

In January 2002, the cruise companies administrated a fleet of 183 steamships with a total displacement of 7, 8 million tons, having 213 000 cabins. The medium sized cruise ship has a displacement of 43 000 tones, 1.163 cabins and an oldness of 15 years, according to the OMT statistics.

The worldwide demand is dominated by North America and by Europe, and both of them together, concentrate over 90% of the demand (table 7).

The comparative size of some indicators from the sector of cruise tourism, in comparison with the international tourism, in the year of 2002

Table 6

	Cruise tourism (A)	**International tourism (B)**	**Weight (%) A din B**
Weight Total number of passengers (tourists) (milions)	9,6	697	1,4
Number of cabins / beds (milions)	0,2	34	0,6
Number of passing the night (milions)	67	4 500	1,5
The average number of passing the night / vacation	6,9	6,5	-
Incomes Total incomes (bilions USD)	13	477	2,7
Average incomes / passenger or tourist (USD)	1 341	685	-
Average income / passing the night	193	105	-

Source: xxx 2003, *Le secteur des croisières,* în *Aperçu sur le tourisme mondial*, OMT, Madrid, page 181

The evolution of the volume of demand, of the weight of the market and of the annual average growth in cruise tourism, in between the years of 1990-2000, in the great regions of the world

Table 7

	Number of passengers (milions)			**The weight from the worldwide market (%)**			**Annual average growth (%)**		
	1990	1995	2000	1990	1995	2000	90-95	95-00	90-00
Worldwide total	4,5	5,6	9,6	100,0	100,0	100,0	4,8	11,2	7,9
North America	3,6	4,4	6,9	81,4	77,6	71,6	3,8	9,5	6,6
Europe	0,6	1,0	1,9	13,9	17,1	20,3	9,3	15,0	12,1
Rest of the world	0,2	0,3	0,8	4,7	5,3	8,1	7,4	21,1	14,0

Source: xxx 2003, *Le secteur des croisières,* în *Aperçu sur le tourisme mondial*, OMT, Madrid, page 181

Considering the fact that the investments, in this type of tourism, are large, the concentration is advanced, therefore, four great cruise companies hold 78,5% out of the gross tonnage and 76% out of the number of cabins. It is about: Carnival Corporation (CCL), Royal Caribbean Cruises (RCC), P & O Princess Group (POC) and Star Cruises Group. From among these, RCC has the youngest fleet, with an average age of 5,6 years, and its steamships have, in average, over 2000 cabins each (table 8)

The „four great" cruise operators, in the year of 2002

Table 8

The navigation group (company)	The number of packetboats in use	% of the worlwide total	Gross tonnage (thousands tons)	% Of the worldwide total	Number of cabins	% of the worldwide total
Carnival Corporation (CCL)	14	37,8	1368	40,4	32 600	40,8
P & O Princess Group (POC)	8	21,6	703	20,8	16 840	21,1
Royal Caribbean Cruises (RCC)	6	16,2	621	18,3	14 506	18,2
Star Cruises Group	3	8,1	315	9,3	8 100	10,1

Source: xxx, 2003, *Le secteur des croisières*, în *Aperçu sur le tourisme mondial*, OMT, Madrid, page 186

In the course of practicing cruises, the most visited harbors became specialized in cruise tourism, like the ones existing in the Sea of the Caribbean. As a matter of fact, six destinations recorded over one million cruise tourists, in the year of 2002: Mexico – 5,1 million tourists, with Cozumel, the most important cruise harbor, Bahamas – 2,8 million tourists, the American Virgin Islands – 1,7% million tourists, the Caiman Islands – 1,6 million tourists, Porto Rico – 1,3 million tourist, with the specialized harbor San Juan and Saint-Martin – 1 million tourists.

The North American space is the main supplier of cruise tourists with a total of 6,3 million people from the USA and 300 000 from Canada. As a matter of fact, the harbors with the most intense cruise traffic in that region are: Miami – 3,4 million passengers in the year of 2000, Port Everglades – 2,7 million passengers, Port Canaveral and Tampa, but also New York, Los Angeles, Long Beach, San Diego, Seattle, Anchorage, Seward or Vancouver.

In Europe and the Basin of the Mediterranean Sea, the destinations of most cruise tourists were Greece (738 000), Malta (342 000), Morocco (255 000), Tunisia (276 000), Portugal (161 000). The harbors with the most heavy cruise traffic were Barcelona: 655 000 tourists, Palma de Majorca: 531 000, Malaga: 128 000, in Spain; in Italy the destinations worthy to be remarked are Venice: 526 000, Geneva: 471 000, Napoli: 470 000. Civitavecchia: 392 000, Livorno: 264 000, Palermo: 181 000, Messina: 126 000; in France, Nice-Villefranche: 251 000, Marsilia: 165 000, Ajaccio: 117 000, Cannes: 99 000. In Egypt the following destinations can be remarked: Port Said: 438 000 and Alexandria with 93 000 tourists. One more remark must be made for the over 914 000 cruise tourists that visited the Norwegian fyords (xxx, 2003, Le secteur des croisieres, in Apercu sur le tourisme mondial, OMT, Madrid, pp. 190-192.)

With regard to the river cruises, they are suitable, for now, only to some great rivers as the Nile, the Rhine, the Mississippi, and the Danube partially. The Danube, Volga and the river canals of Bega, du Midi etc., represent a potential that was not sufficiently explored yet. The Anglo-Saxon customers appreciate this type of tourism. In Europe, 328 companies organize cruises on the internal rivers for over 8 million tourists. In the year of 1995, in France alone, the river cruises had a turnover of over 1 billion FF (Duchamel, P., Sacareau, I., 1998).

CONCLUSIONS

For the offerer of tourism from the external market, the transportation services have a special importance, being the only service that is carried out on the external territory of the exporter country. In this case, it enters in comparison with the competitive offers, and if it does not satisfy the client, he may opt, because of this reason, for another destination. For that reason, the offerers of tourism from the international market confer a great importance to the organization of the transportation by the tourist, opting for a greater diversity of forms, modalities of transportation and means of commercialization, which would increase the stimulating role of transportation for the tourism consumption.

REFERENCES

1. Archambault, M., coord. (2002), *Le tourisme à l'heure des alliances, des fusions et des acquisitions*, OMT, Madrid.
2. Benavides, D. D. (2001), *The sustainability of International Tourism in Developing Countries*, WTO-UNCTAD, New York.
3. Ciangă, N. (1995), *Evoluție și tendințele cercetării în geografia turismului în România*, Studia UBB, 1-2 Cluj-Napoca.
4. Cocean, P. (1996), *Geografia turismului*, Edit. Carro, București.
5. Cocean, P., Dezsi, Șt. (2001), *Prospectare și geoinformare turistică*, Edit. Presa Universitară Clujeană, Cluj-Napoca.
6. Cristureanu, Cristiana (1992), *Economia și politica turismului internațional*, Casa Editorială pentru turism și cultură Abeona, București.
7. Duhamel, P., Sacareau I. (1998), *Le tourisme dans monde*, Edit. Armand Collin, Paris.
8. Frangialli, F. (1991), *La France dans le tourisme mondial*, Edit. Economica, Paris.
9. Hoerner, J. M. (1993), *Introduction au géotourism*, Edit. Presses Universitaires de Perpignan.
10. Hoerner, J.M. (1997), *Géographié de l'industrie touristique*, Edit. Ellipses, Paris.
11. Kindersley, D. (1988), *Atlas encyclopedique mondial*, Edit. Libre Expression, Montréal.
12. Mesplier, A., Duraffour, P. B. (2007), *Le tourisme dans le monde*, Edit. Bréal, Paris.
13. Muntele, I., Iațu, C. (2003), *Geografia turismului, concepte, metode și forme de manifestare spațio-temporală*, Edit. Sedcom Libris, Iași.
14. Nicoară L., Pușcaș, Angelica (2002), *Regionare turistică mondială*, Edit. Presa Universitară Clujeană, Cluj-Napoca.

15. Renucci, Jeannine (1990), *Tourisme international et tourisme national dans Etats de l'Europe méridionale,* Annalles de Géographie, 551 (janvier-février), 99ème année.
16. x x x, (1990–1997), *Atlasseco,* Atlas economique mondial, Paris.
17. x x x, (1982), *Dicţionar poliglot de comerţ exterior şi turism*, Edit. Sport-Turism.
18. x x x, (1984, 1988, 1992) – *Diercke Weltatlas,* Georg Westermann, Braunschweig.
19. Organisation Mondiale du Tourisme, (1984), *Étude économique du tourisme mondial.*
20. x x x, OMT, Organisation Mondiale du Tourisme, (1987), *Etude économique du tourisme mondial*, Madrid.
21. x x x, (1989), *Tourism policy and International Tourism în OECD,* Paris.
22. x x x, (2002), *Le tourisme à l'heure des alliances, des fusions et des acquisitions,* OMT, Madrid.
23. x x x, (2002), *Tourisme-horizon 2020,* OMT, Madrid.
24. x x x, (2003), *Aperçu sur le tourisme mondial et divers sujets d'actualité*, OMT, Madrid.
25. x x x, (2003), *L'activité des croisières dand le monde,* OMT, Madrid.
26. x x x, (2003), *Le secteur des croisières*, în *Aperçu sur le tourisme mondial*, OMT, Madrid.
27. x x x, (2003), *The International Meeting Market 1994-2003,* Rapport ICCA, Amsterdam.
28. x x x, (2005), *Tourism Market Trends. Europe,* OMT, Madrid.
29. x x x, (2006), *Compendium of Tourism Statistics. Data 2000-2004*, OMT, Madrid.
30. x x x, (2006), *Tourism Market Trends: Europe*, OMT, Madrid.
31. x x x, (2003), *MICE Outbound Tourism 2000*, OMT, Madrid.

ERASMUS IP PROGRAMME "EUROPE'S SOCIO-CULTURAL BORDERS – INHERITED PERCEPTIONS AND THE MODERN LANDSCAPES". INSIGHTS FROM LITHUANIA 2008

R. RUSU[1]

ABSTRACT. – Erasmus IP Programme "Europe's socio-cultural borders – inherited perceptions and the modern landscapes". Insights from Lithuania 2008. Between March 15 and March 26, 2008, 36 students and teachers from seven European universities participated to this geographical intensive programme (IP), which developed in Lithuania. Under the guidance of the current coordinator, professor Marko Krevs, from the University of Ljubljana, Slovenia, and other five professors, together with the local organizer, professor Stanaitis Saulius, from Vilnius Pedagogical University, the group traveled in four minivans along Lithuania's borders. The programme was really intensive, including a series of visits to national and regional parks, cities, tourist attractions, farms, strategic sites (such as the Nuclear Power Plant of Ignalina), and meetings with managers and local authorities, all of them related to the main topic of the IP. The final five days were spent in the small town and spa of Druskininkai, lying in Southern Lithuania, near the border with Poland and Belarus. There, students and teachers divided into four groups: environmental changes in border areas, economic changes in border areas, social and cultural changes in border areas, and physical vs. perceptual changes in border areas. Each group prepared its own programme and developed its own report, which was delivered during the last day of our stay in Druskininkai. The final reports proved the success of this intensive programme, which ended up in Vilnius, capital city of Lithuania.

Keywords: *Lithuania, border areas, tourism, national park, Druskininkai, Curonian Spit, Vilnius, Aukstaitija.*

1. INTRODUCTION

Between March 15 and March 26, 2008, 36 students and teachers from seven European universities participated to this geographical intensive programme (IP), which developed in Lithuania. Under the guidance of the current coordinator, professor Marko Krevs, from the University of Ljubljana, Slovenia, and other five professors – John Loder from the University of Aberdeen, Ana Firmino from the Universidade Nova of Lisbon, Frantz Klaus from the University of Innsbruck, Miguel Garcia Martin from the University of Sevilla, and Raularian Rusu, from "Babeş-Bolyai" University of Cluj-Napoca, together with the local organizer, professor Stanaitis Saulius, from Vilnius Pedagogical University, the group traveled in four minivans along Lithuania's borders. The programme was really intensive, including a series of visits to national and regional parks, cities, tourist attractions, farms, strategic sites (such as the Nuclear Power Plant of Ignalina), and meetings with managers and local authorities, all of them related to the main topic of the IP. The final five days were spent in the small town and spa of Druskininkai, lying in Southern Lithuania, near the border with Poland and Belarus.

[1] *"Babeş-Bolyai" University, Faculty of Geography, 400006 Cluj-Napoca, Romania, e-mail: rrusu@geografie.ubbcluj.ro*

There, students and teachers divided into four groups: environmental changes in border areas, economic changes in border areas, social and cultural changes in border areas, and physical vs. perceptual changes in border areas. Each group prepared its own programme and developed its own report, which was delivered during the last day of our stay in Druskininkai. The final reports proved the success of this intensive programme, which ended up where it started, in Vilnius, capital city of Lithuania.

2. VILNIUS

We took the first glance of Lithuania in Vilnius, a city of more than 500,000 inhabitants. Luckily, due to the flight schedule, I arrived a day earlier than the first day of the programme, so I had the opportunity to visit most of the city's old district (Senamiestis), which was a pleasant surprise from the point of view of an urban planner. As it covers 360 ha, it is one of the largest Old Towns of Central and Eastern Europe (G. Jankeviciute, 2006). The main sights of the Old Town are concentrated between the Old Arsenal and the Castle on the left bank of the river Neris, and the Gate of Dawn, the only remaining gate of the medieval town wall. A proper visit should start from the Higher Castle, and its Gediminas Tower, which can be reached by a funicular. The remains are not very impressive, but the panoramic views of the city are astonishing. The neighbouring hill of the Three Crosses, on the other bank of Vilnia rivulet, provides similarly spectacular views, for those who enjoy climbing, passing through the beautiful Sereikiskiu and Kalnu parks.

At the foot of the Castle Hill, the Old and New Arsenal are shelter for many of Lithuania's treasures, as they are housing sections of the National Museum. Parts of the Lower Castle are visible in their courtyards, while history, ethnography and applied art collections are exhibited inside.

A short walk through a park leads to the main building of the castle complex, the Cathedral. It was rebuilt and renovated a number of times, and the present shape dates from 1820. Near the main building, one can admire the 57m high Cathedral Belfry.

Two of the main streets of the city, Pilies Street and Gedimino Prospect, start from the Cathedral Square.

Pilies Street is believed to be one of the most ancient streets of the city, as it leads from the Castle to the Town Hall. Historical buildings are found on both sides of the street. From the Russian Orthodox Church of St. Paraskeva, the street is called Didzioji. The Town Hall, initially built in the 14th century, acquired its present form during the 18th century. On the south side of the Town Hall Square, one can see the Church of St. Casimir, reconsecrated in 1991, after being used as the Museum of Atheism during the Soviet rule. Further on, the Philarmonic Society modern building (1902) lies at the entrance of Ausros Vartu Street. Three impressive churches are located on this street: the Basilian Monastery, the Russian Orthodox Church of the Holy Spirit and the Church of Saint Theresa. Finally, the street reaches the Gate of Dawn. Above the gate, a small room shelters a painting of the Blessed Virgin Mary, dating from the 17th century, and believed to have miraculous powers. The entrance to this painting is across the Church of Saint Theresa.

Once arrived to the Gate of Dawn, one actually leaves the Old Town. However, there is still much left to see. Vilnius is very rich in 17th, 18th and 19th century buildings, and somehow escaped the "Sovietization" of its architecture, with the exception of some marginal, mainly residential and industrial districts. For a city which was capital of a Soviet republic for so many decades, it has surprisingly many churches, most of them Catholic, as this is the religion embraced by about 80% of its inhabitants.

Fig. 1. Vilnius Old Town.

Some of these churches are architectural masterpieces, such as the baroque Dominican Church of the Holy Spirit, the late gothic Church of St. Anne, the gothic Franciscan Church of the Assumption, the baroque Church of St. Peter and St. Paul.

Nevertheless, there are also other historical buildings which deserve a closer look. The University of Vilnius, founded by the Jesuits in 1579, is one of the oldest higher education institutions in Eastern Europe. It is located in the very centre of the Old Town, near the Presidential Palace, a masterpiece itself, rebuilt in 1824-1832 in an empire style.

A sightseeing tour of Vilnius represents a good introduction to Lithuania itself. The streets of the Old Town bear the signs of a rich history, but they are also a good introduction to the present-day Lithuanian culture and society. Museums, supermarkets, libraries, restaurants, churches, pubs, they all provide insights of the Lithuanian daily life, which is not at all different from other European cities.

3. AUKSTAITIJA

Literally, Aukstaitija means "The Highlands", a paradoxical name for an area which barely reaches 200 m in several points. To add more flavour to this paradox, the recently declared highest peak in Lithuania, Aukstojas (294 m), is not located in this region.

We stayed in Paluse, a beautiful village which lies in the Aukstaitija National Park (405.7 km^2). This was the first national park in Lithuania, established in 1974, under the name of Lithuanian SSR National Park. In 1991, when other four national parks were established in the newly independent country, each received a name of a region. The Lithuanian National Park became the Aukstaitija National Park.

The park administration has its headquarters in Paluse. Benefiting from the full cooperation of the park rangers, we were provided a very detailed presentation of the park and then a tour of the park.

The park is a very important tourism attraction in Lithuania. Previously, the village of Paluse was rather a resort, as it provided accommodation for the thousands of tourists which came from all over the Soviet Union. Tourism declined after the fall of the Soviet Union. Now, the park mainly attracts domestic tourists, but the administration does well in trying to enlarge the catchment area to the other Baltic States, Poland or Germany.

The main attractions in the park are the hills, the lakes, the mounds and the villages, which preserve ancient buildings and traditions. The Ladakalnis Hill, 175 m high, provides the "best panoramic view in Lithuania", according to the locals. One can see no less than six lakes surrounding the hill. In fact, there are 126 lakes (including some very small lakes) in the entire park. Lake Kretuonas is the largest of them (829 ha), while Lake Tauragnas is the deepest (60.5 m) not only in the park, but in Lithuania as well.

While hiking on the trails of the park, we visited a number of Stone Age mounds, as well as ruins of fortresses dating from the Middle Ages. They make the visitor aware of the strategic importance of this area, located between two major drainage basins, and therefore a natural border.

There are more than 100 villages in the park, but their total population is just over 2000 inhabitants. Many of these villages are almost uninhabited, and the largest of them, Kaltanenai, has less than 300 inhabitants. Many of them are in fact simple farmsteads. However, the size is not their strength. Six old villages were designated as architectural monuments, and one of them, Salos II, became a Cultural Reserve. Other villages attract tourists due to their museums: the Lithuanian Museum of Ancient Beekeeping in Stripeikiai, the water mill in Ginuciai, the oldest wooden church in Lithuania, in Paluse itself.

Tourists may even get to know better the rural life and economy of Lithuania, as traditional agriculture and forestry are still the main activities of the inhabitants.

Nevertheless, the park is first a destination for nature lovers. Apart from the beautiful landscape, the park is famous for its biodiversity. Numerous species of plants and birds, some of them included among the endangered species, are found here.

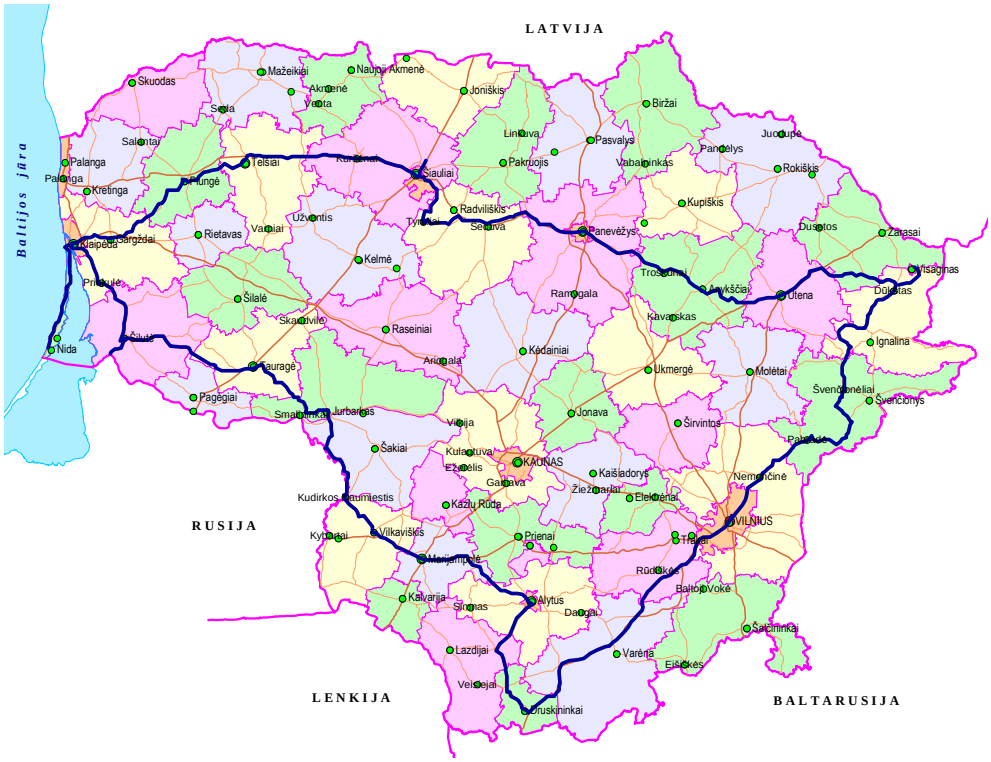


Fig. 2. Route plan of the IP in Lithuania.

The small distance from Vilnius provides the opportunity for the Aukstaitija National Park to become mainly a week-end tourism destination for the urban dwellers, longing for the great outdoors.

The town of Ignalina is just a few kilometers away from Paluse, outside the national park. The town has a bit more than 6,000 inhabitants and it is mainly an industrial town, built during the 19th century more or less as a consequence of the railway station raised here on the Sankt Petersburg – Warsaw line. The town is the seat of Ignalina district, covering a large area of Utena County, in North-Eastern Lithuania.

We were received at the Town Hall and then we headed for the most famous brand of the area: the Ignalina Nuclear Power Plant. In spite of its name, the nuclear power plant is quite far from the town itself: about 50 km. It is located very near the border with both Latvia and Belarus, on the shores of Druksiai Lake, the largest lake in Lithuania (shared with Belarus), which provides cooling water.

The Ignalina Nuclear Plant was built in order to supply electricity for the entire North-Western corner of the former Soviet Union, rather than to meet the demand of Lithuania alone. After the independence, Lithuania became one of the countries most dependent on nuclear energy, as about 80% of the electricity was supplied by this nuclear plant.

When first designed, Ignalina Nuclear Plant was to have four units. Preparation for the construction started in 1974. As there was need for housing the workers, a new town, Visaginas (initially called Snieckus, after a communist leader), was established near the site in 1975, receiving city status in 1977. Unit 1 was commissioned in late December 1983. Unit 2 was scheduled for launch in 1986, but because of the Chernobyl accident, its commissioning was postponed for August 1987. Unit 3 was started but never finished, while Unit 4 never existed outside the paper. The designed deadline of operations for the two functional units was initially 2013 and 2017.

As a condition of entry to the European Union, Lithuania agreed to close down the existing units. After the decision was made to decommission the Ignalina Nuclear Plant, Unit 1 was shut down on December 31, 2004, while Unit 2 is scheduled to be operated until the end of 2009. Defuelling, dismantling of plant and equipment, decontamination and other decommissioning operations will take place for the next 25 years.

The main reason for closing down the nuclear plant is the similarity with the Chernobyl Nuclear Plant, as it lacks a robust containment structure and it has the same type of reactor (RBMK). Although the reactor was de-rated from 1500 MW to 1360 MW immediately after the Chernobyl accident, there is still a lack of confidence in this type of reactors among the members of the European Union. The European Union agreed to pay significant decommissioning costs: over 200 million Euros for preparatory work of decommissioning in 2004-2006, and other 815 million Euros for further works between 2007 and 2013. Parts of the funds allocated by the EU are used for updating other power stations that will supply electricity after Unit 2 is shut down.

The closing down of the nuclear plant has to cope with the huge opposition of the Lithuanians and especially among the locals. In Visaginas (almost 30,000 inhabitants), most of the active population works in the nuclear plant or in activities related to it. The shutting down of the plant would lead to unemployment. Other people fear that Lithuania will no longer be able to ensure enough electricity for itself, and will become dependent on Russia in terms of energy.

Because of these arguments, a Referendum was held in 2008, proposing the extension of the operations at Unit 2 for a technically safe period, but no longer than the completion of a new nuclear power plant. More than 91% of the voters agreed, but the referendum was invalid because of the low turnout (only 48.44%, compared to the minimum 50% which was required).

Nevertheless, a new nuclear power plant would soon emerge on the same site, as the Lithuanian Parliament passed a law in 2007 on this matter. The future Visaginas Nuclear Power Plant will be completed between 2015 and 2018 and it will have a capacity of about 3,000 MW. The project is supported by the power companies of Lithuania, Latvia, Estonia and Poland.

In these conditions, the future of the people from Visaginas City seems assured. The city itself deserves a closer look, as it represents the model of a Soviet communist town, built on the ashes of four former villages. More than that, the city preserves its “Soviet” community, because the inhabitants arrived here from all the corners of the Soviet Union. Most of the inhabitants are Russians, but the city might be regarded as a melting pot of nationalities, which live together in perfect understanding. The city would be a fine research ground for urban planners and political geographers.

4. SAMOGITIA

Samogitia (or Zemaitija, in Lithuanian) is a large region covering most of the central, northern and western Lithuania. Opposite to Aukstaitija, the name means "the Lowlands", and this time it matches the landscape perfectly.

During our one-day travel from Paluse to Klaipeda, we visited a number of interesting sites. One of them was the Hill of Crosses (Kryziu kalnas), located 12 km North of Siauliai and not far from the border with Latvia.

No matter how much one reads on the subject, one cannot be less amazed by the density of crosses on this mound. According to G. Jankeviciute (2006), the first crosses were erected in 1831 by the families of dead rebels, unable to commemorate the places where their loved ones were killed. The crosses multiplied during the 19th century, and the hill soon became known as Sventakalnis (Holy Hill). During the Soviet communist period, there were several attempts to destroy the site. The crosses were torn down and the hill ploughed under in 1963 and 1973 (G. Jankeviciute, 2006, p. 256-257). But the crosses reappeared despite the supervision of the authorities. There were hundreds of crosses by the end of 1980s, but their number multiplied significantly after the independence, and they are now more than 50,000. The site became world famous after the visit of Pope John Paul II in 1993.

The hill is now a crowded tourism attraction, but also a pilgrimage site. Smaller crosses, rosaries, pictures of the saints hung on every larger cross. A path leads the visitor among the crosses, crucifixes, effigies and rosaries. Although the site is basically Catholic, one can also see Orthodox crosses or even religious symbols belonging to non-Christian denominations, such as the star of David. There are also wooden carvings, representing Lithuanian heroes or religious figures.

Further on, we stopped in the Zemaitija National Park (217.2 km^2), established in 1991 to conserve the lakes and forests of the Zemaitija Hills and the existing cultural heritage. As in the case of Aukstaitija National Park, the lakes are the main attraction, and the Plateliai Lake is the largest (1,205 ha) and the deepest (47 m) of the park and of all Samogitia. The seven islands on the lake and the small town of Plateliai on the western shore of the lake should be added on the visitor's list.

However, the landmark of this park is curiously the military exposition, in Plokstine. The former missile base was built rapidly by the Soviets between 1960 and 1962, due to the Cuban crisis, and it was one of the first underground military bases in the Soviet Union. The location in the Plokstine forests was considered to be ideal, and the few farmers who lived in the nearby Ploksciai village were paid to leave the area. Four R12 nuclear missiles, 23 meter high, including the 4 meter warhead, were installed in the excavated silos. According to our guide, the rockets were fuelled with a mixture of kerosene and nitric acid and were aimed at different western countries. Every 3-4 years, the targeted countries were changed.

The military base, together with the one in nearby Sateikiai, where surface missiles existed, was the headquarters of the 179th rocket regiment. There were no incidents and the nuclear missiles were fortunately never used. The missiles were removed from the base on June 18, 1978.

The military base looked pretty deserted at the time we were visiting. Without the help of the guide, it would have taken hours to get to the entrance and to find the right path in the labyrinth underground. The military base is not yet suitable for ordinary tourism. The missing floor and military tools indicate that it was "visited" by many people in search of some cheap equipment. Reconditioning seems to be the very first step in order to make it a

reliable tourism destination. Then, tourism facilities should be built nearby, and there should be permanent staff at the entrance, because the wired fence is not an efficient protection anymore. The truly remarkable sights - such as the silos for the former rockets – should have better access and lighting. Everything should look cleaner.

Nevertheless, the visit is unforgettable. Those who are interested in the life of a Soviet soldier or want to see where a nuclear missile once stood should definitely pay a visit.

5. THE CURONIAN SPIT AND THE NEMUNAS DELTA

Klaipeda, the formerly German populated Memel, is the third largest city in Lithuania and its only seaport, having the quality of being ice-free all year round. It has a complicated history, and an urban landscape which is a reminder of all the historical stages. Today, it is a developing industrial city, perfectly located at the mouth of the Curonian Lagoon. The visit to the University was fruitful, as we learned more about the city and its surroundings.

We crossed the narrow lagoon by ferry, from Klaipeda to the Curonian Spit. The Curonian Spit (Kursiu Nerija) is a unique national park, which acquired the status of World Heritage Site by UNESCO in 2000. It represents a sandbar, closing the Curonian Lagoon to the West, 98 km long and 0.4 to 4 km wide. The northern 52 km belongs to Lithuania, forming the Neringa district (or municipality), while the other 46 km belong to the Russian Kaliningrad Oblast. In both countries, the spit is a national park and the main activities are tourism and fishing.

The area of the national park on the Lithuanian side is 264.74 km^2, of which only 97.74 km^2 of land, while the rest are parts of the Curonian Lagoon (42 km^2) and the Baltic Sea (125 km^2).

The Curonian Spit was formed about 5,000 thousand years ago and it was inhabited from an early stage by the now extinct Curonians. The sand was initially stable, but the continuous deforestation of the spit due to overgrazing, timber harvesting and boat building led to an increasing instability of the sand dunes since the 16^{th} century. During the 18^{th} century, 14 villages were buried under the thick layer of sand. Large scale revegetation and reforestation efforts took place during the 19^{th} and the 20^{th} centuries. Today, about 70% of the land is covered by pine forests.

However, the sand dunes did not stop from drifting, and their size is impressive. The North-to-South road along the spit crosses mainly forests, so there is quite a big surprise, when only a few meters from the apparently thick forest, one sees the Sahara-like dunes. The teacher from the University of Klaipeda who was in charge of this tour led us on a path made of timber, partly covered by sand. The path climbed on the dunes and soon the forest was left behind: the landscape consisted of sand dunes only. A short climb and we arrived on the top of the Great Dune Ridge, and the panorama of the Curonian Lagoon opened up in front of our eyes. The spit shore is barely seeable because of the development of the dunes, and their steep slope towards the lagoon. Across the lagoon, one can see the Nemunas Delta on a clear day.

The Curonian Spit is also famous for its biodiversity. There are almost 1000 species of plants, of which 31 are on the Red List of Lithuania, about 40 species of mammals, of which 10 rare species, more than 200 species of birds, and a large variety of fish, beetles and butterflies. Compared to other national parks, where one only hears about these species, we had the opportunity to actually see a number of elks moving on the dunes.

We then headed to Nida, the seat of Neringa municipality (the only one in Lithuania not to be named after one of its composing settlements). At the Town Hall, we were provided information on the development of cross-border relations between the Lithuanian and Russian side of the Curonian Spit. Despite the success of some projects, like the one envisaging a cycling route along the entire spit, the present visa regulations are impeding a further development of cross-border relations. The visit to the nearby border crossing point was convincing: almost nobody crossed the border during our stay.

Nevertheless, Nida is a flourishing seaside resort. There are about 1,500 permanent inhabitants and about 50,000 people who spend their holidays in Nida every year. Apart from the enchanting natural landscape, one may visit one of its museums, such as the Memorial Museum of Thomas Mann, or visit the other villages of the spit, Juodkrante, Pervalka or Preila.

Most of the tourists are Lithuanians, but the Curonian Spit becomes more and more an international destination. Except for the traditional tourists from former Soviet states (Russia, Belarus, Latvia, Estonia, Ukraine), many Westerners find the beaches of the Curonian Spit worthy of their attention. Many of them are Germans, and some of them are the descendants of the former German settlers who also have a cultural interest, as they are in search of the land of their fathers.

Discussions are raised about the opportunity to raise a bridge at the northern end of the Curonian Spit, to make the access easier from Klaipeda. The number of tourists would certainly increase, but their impact on the fragile environment should be carefully assessed. The bridge should be designed only after a thorough analysis of the potential consequences on the economy and the environment.

South from Klaipeda, on the mainland, and opposite from Nida, one can reach the Nemunas Delta. The Nemunas Delta Regional Park was created in 1992, covering an area of 239.5 km^2. In 1993, it was added on the list of internationally significant marshlands, according to the Ramsar Convention. Part of the delta is on the Russian side, as the Nemunas (Neman) river forms the border between Lithuania and Russia (Kaliningrad Oblast).

The gateway to the delta is the town of Silute (about 20,000 inhabitants), where most of the landmarks are concentrated along the Lietuvininku Street. After a short travel around, we were received at the Town Hall, where the representatives of the local authorities provided a detailed image on the cross-border relations between Lithuania and Russia, concerning especially the protection of the Nemunas Delta ecosystem. Other facts on Silute district and Nemunas Delta were debated, as the regional park administration has also its headquarters in Silute.

Then we headed for the smaller town of Rusne, located on the border and on the exact point where the delta begins, as the two main distributaries of the Nemunas, Atmata and Skirvyte, separate here. The local guide took us on a nice walk along the river banks. Then we went to the visitor's centre, to see the permanent exposition on the delta.

The delta proper is very impressive. Water is everywhere, and water-covered areas count for about 20% of the delta, but we arrived there in the middle of the spring flood, when the water reaches even the roads. The delta is especially important for ornithologists, due to the high number of bird species – about 200, of which 40 are on the Red List of Endangered Species. There also a high number of species of fish and mammals, many of them protected by law. The greatest environmental threats are the pollution of the nearby Silute industry, the intensifying agriculture and fishing, as well as tourism, which became an important source of income for the inhabitants, especially in Rusne.

The lighthouse of Uostadvaris and the nearby polder museum (formerly a water lifting station) are nevertheless among the main attractions of the park. Up in the lighthouse, the tourist has a beautiful panoramic view of the delta. As the lighthouse is 2 km away from the Curonian Lagoon, it is not used for navigational purposes. The polder museum, located on Vilkine River, presents aspects regarding the everyday life in the delta, together with a collection of technical equipments.

Back in Silute, we followed the road along the Lithuanian-Russian border to the East, reaching Panemune, a border crossing point. Once again, we reached the Northern bank of the Nemunas river to admire the splendid Queen Louise Bridge and the arch leading to the Russian town of Sovetsk (former Tilsit). On the other bank, the communist-style architecture of identical blocks-of-flats dominated the landscape. Once again, because of the visa requirements, we had to stay only on the Lithuanian side.

6. DRUSKININKAI

We passed the final days of the IP in the wonderful spa resort of Druskininkai, in Southern Lithuania, near the border with both Poland and Belarus. The location was perfectly suitable for the subject of the IP, because the changes regarding the status of the borders deeply affected the economy of this tourism town. For instance, the border between Lithuania and Poland was difficult to cross during the communist period, and very few Polish tourists came to Druskininkai those years. On the opposite, the borders with the other states of the Soviet Union, such as Belarus, were wide open, and people flocked to this very busy resort. The situation reversed during the latest years. Now, as Lithuania is a member of the EU and part of the Schengen Area, there are no restrictions to cross the border with Poland, and further in the European Union. On the other hand, tight visa regulations hinder the relations with Belarus or Russia. We only crossed the border in Poland, to visit the small town of Sejny and the village of Punsk, the latter inhabited mostly by Lithuanians.

Druskininkai literally means “salt makers” (G. Jankeviciute, 2006, p. 396), indicating that the local people once used to earn their living by extracting salt from the mineral waters which have their springs along the Nemunas. The settlement is only attested in the documents at the end of the 16th century, and amateur healers were present here during the next centuries. Druskininkai became a real spa during the 19th century and treatment facilities were built. The development continued in the first decades of the 20th century.

As it came out from the interviews conducted by the students with the local residents and managers, the golden age of Druskininkai was during the Soviet communist period. Very large block-like sanatoriums were built, and people from all over the Soviet Union arrived to fill them completely, so that local residents had the opportunity to rent their houses or spare rooms to those who could not find any other accommodation. Most of the tourism was however strictly organised by the trade unions, which had agreements with the sanatoriums (Report: Economic Changes in the Border Areas, 2008). Each sanatorium was specialized in some type of treatment, and they were full all year round. Trains arrived each day with carriages full of holiday makers. Those who were on their own had often to look for accommodation at the local residents. One supplementary reason for tourism was the fact that some products, missing in other parts of the Soviet Union, could be found in Druskininkai. Queues often developed when such food products were on sale. This was a sad reality of the communist age: some products were difficult or even impossible to find. Druskininkai, however, was a well supplied resort, and this aspect was also important in attracting tourists.

After the collapse of the Soviet Union, the newly independent Lithuania entered a period of crisis, which affected all the branches of the economy. Tourism in Druskininkai declined very much, because the trade unions did not send people anymore, and the potential individual tourists were looking for new attractions. Many people from Druskininkai lost their jobs and emigrated in Western Europe, as sanatoriums and hotels closed down. The 1990s was the most difficult period for the economy and tourism of Druskininkai.

After 1999, and especially after 2002, the economy began to rise again (Report: Economic Changes in the Border Areas, 2008). Many new hotels opened and some former sanatoriums were renovated by private developers. Tourism developed greatly during the latest years. There is a complete shift concerning the countries where the tourists are coming from. Although there is still a large number of Russian and Belarusian tourists, the majority of foreign tourists are now coming from Poland, Germany, Latvia and other countries of the European Union. Of course, domestic tourism is very important, and most of the tourists are Lithuanians, who come with their families from Vilnius or Kaunas.

There are two types of tourists. The "traditional" tourists are the elderly, who come for the treatment facilities of the renovated sanatoriums to improve their health. However, it should be noted that not all the former sanatoriums reopened, and the largest one in Druskininkai, Sanatorium "Nemunas" is still closed. The second type of tourists are young adults with or without children, who are more interested in the leisure facilities, such as the new Aqua Park, Bowling Centre, Spa Centre and Sport Centre. In the creation of the Aqua Park, the most important facility, much inspiration has been drawn from similar ones in Germany, showing an awareness in promoting attractions which would appeal to German tourists, whom they are trying to attract (Report: Economic Changes in the Border Areas, 2008).

According to local planners, more strategies are to be implemented in the following years, especially regarding the building of sports centres, such as a centre for Olympic sports, a swimming pool, an indoor ski slope, usable all year round, an outdoor ski slope, and a golf course. There is an EU funded project to build a new bridge over the river Nemunas, in order to have better access to the future ski resort, water cleaning facilities, bicycle routes, waste storage facilities. However, the sporting facilities and the infrastructure leading to them will certainly have an impact on the forest-covered areas and on the environment, generally (Report: Environmental Changes in the Border Area, 2008).

Rural tourism also developed around Druskininkai. Some of the former collective farms, now run by local families, transformed into rural tourism farms. An example is the farm called Storo Romo Sodyba, near Druskininkai. Most of the visitors are Lithuanian "week-end tourists" from Vilnius or Kaunas. The farm provides, besides the picturesque landscape and a recreation area, a high number of activities, such as fishing, horse riding, bicycling, and has their own sporting grounds. The neighbourhood of Druskininkai is also important, as other rural tourism farms we visited, like the one in Pazapsiai, are not so much developed, possibly because they are quite far from any other tourism attraction. Rural tourism in Poland is less developed, as proved by the visit to a similar rural tourism facility in Zegary (Report: Economic Changes in the Border Areas, 2008).

7. CONCLUSIONS

Lithuania is a country which changed the direction in which it looks for its cultural and economic influences, from the East to the West (Report: Physical and Perceptual Changes in Border Regions: Lithuania as a Border Region between East and West, 2008). The

transformation process is a long one and the shift from the Soviet Union to the European Union involved high costs, a deep crisis which affected the economy of the country and determined many Lithuanians to seek their fortune in Western European countries. However, the economy revitalized during the latest years, and tourism seems to be one alternative of development, especially in the national parks and spa resorts like Druskininkai. The development of Druskininkai, for instance, is attracting many highly-skilled professionals from larger cities, like Vilnius or Kaunas, who may find a better job here, in tourism.

The changes in the status of the borders are also essential for the understanding of the economic changes. Lithuania's accession to the European Union and the Schengen Area provides the opportunity for the country to open up on the wider European market. However, competition on the market is very high, and the economy has to adjust to the higher demands of Western European customers. For instance, tourism facilities in Druskininkai developed taking as a model similar facilities in Germany. New hotels are built taking into account Western standards: glass, wood and post-modern aesthetics. Nevertheless, architectural, social, economic and cultural Eastern features are still to be found in the Lithuanian society (Report: Physical and Perceptual Changes in Border Regions: Lithuania as a Border Region between East and West, 2008). Lithuania in itself is a border region between the West and the East.

REFERENCES

1. Jankeviciute, G. (2006), *Lithuania. Guide*, R. Paknys Publishing House, Vilnius.
2. xxx (2008), *Report: Economic Changes in the Border Areas*, http://e-ucenje.ff.uni-lj.si/mod/resource/view.php?id=7588
3. xxx (2008), *Report: Environmental Changes in the Border Area*, http://e-ucenje.ff.uni-lj.si/mod/resource/view.php?id=7588
4. xxx (2008), *Report: Physical and Perceptual Changes in Border Regions: Lithuania as a Border Region between East and West*, http://e-ucenje.ff.uni-lj.si/mod/resource/view.php?id=7588
5. xxx (2008), *Report: Social and Cultural Changes in the Border Areas*, http://e-ucenje.ff.uni-lj.si/mod/resource/view.php?id=7588

STUDIA UNIVERSITATIS BABEŞ-BOLYAI, GEOGRAPHIA, LIV, 2, 2009

EUROPEAN AND NATIONAL RECOGNITION OF VOCATIONAL QUALIFICATIONS AND COMPETENCES IN TOURISM

SILVIA IRIMIEA[1]

ABSTRACT. – E**uropean and National Recognition of Vocational Qualifications and Competences in Tourism.** The paper seeks to look at the present system of recognition of ***qualifications and vocational competences*** operating nationally and internationally in an attempt to enhance the recognition of certificates and diplomas. Since the recognition system is, first of all, a twofold process, the study examines, on the one hand, the way the nationally awarded diplomas are recognized by European forums and, on the other, it seeks to consider ways in which diplomas acquired in Europe can be recognized by the Romanian national authorities. The study first looks at the documents that regulate tourism training in Romania and then proceeds to discuss the norms that regulate the 'certification' of qualification and competences acquired in other European countries as a result of formal or non-formal training. The paper provides, finally, a way to acquire European and national recognition.

Keywords: *tourism education, framework, competences, qualification, certification, accreditation.*

1. INTRODUCTION

Although tourism education has emerged slowly, it has developed incredibly over the last 50 years, according to several researchers in an *ad hoc* and unplanned way in several countries, the consequence of which is its profound *fragmentation*. Goeldner (1988) argues that tourism education is still emerging as a discipline. Similarly, Airey (1988) suggests that even the origins of tourism education in the UK, for example, cannot be traced accurately and offers four different approaches to the conception of tourism education: a first one that locates its origin in the early 1900s when the first training courses for chefs and waiters were introduced, a second one according to which tourism education started in the 1950s when training courses for ticket agents and travel agency staff were initiated, a third approach holding the view that it emerged in the 1960s as a separate domain for hotel management courses, and, finally, a fourth approach according to which tourism education has always been part of geography or economics studies.

This entire root-tracing attempt makes tourism educators and researchers face a dilemma: should they consider tourism education a discipline *per se*, a relative newcomer discipline to the academic world, or an older subliminal, accessorial discipline that springs out from more vigorous subject areas?

According to Cooper, Shepherd and Westlake(1996), in developed countries tourism courses were organized only in the 1970s and 1980s. The same researchers note that: 'As there were no accepted academic or institutional frameworks for these courses,

[1] *Babeş-Bolyai University, Faculty of Geography, Center for Tourism Training, 4F00006 Cluj-Napoca, Romania, e-mail: s_irimiea@yahoo.com*

they developed in an *ad hoc* and unplanned way'. Such courses were hosted by geography studies, some courses emerged as recreation and sports-related activities, while others became part of hotel management studies. This resulted in a wide spread and inconsistent range of provisions, with no or little provision that regarded its coordination and quality standards. In some countries governments and the public sector made attempts to intervene in order to control and standardize training in the 1970s and 1980s. In the last decades, given the momentous growth of most subject areas and their maturing, more institutions and professional bodies have initiated self-regulate and quality assurance actions.

Cooper(1996) discerns three ways in which the study of tourism has matured into an academic endevaour: 1) sectorally-based courses have developed and influenced tourism education and training, 2) tourism courses have developed as fertilizers to other business studies by providing them with a vocational orientation- in this context tourism training has become an industry application, 3) tourism has grown out of traditional disciplines (like geography, sociology and linguistics) which have expanded their concern over tourism. However, gradually, tourism education has turned from a simple 'add-on' discipline into a comprehensive area of newly conceived courses. The wealth and consistency of tourism education is also given by its high degree of interdisciplinarity. In this respect, Jafari and Richie (1981) have designed a model of tourism which draws its characteristics from 16 different areas and disciplines, including: anthropology, business, law, psychology, economics, political science etc. The implications of this *multi-disciplinarism* make curriculum design and the organization of training activities more difficult, let alone the recognition of formal or informal academic or vocational training Europe-wide.

The present study, therefore, seeks to look at the recognition of training courses in this highly complex and much complicated educational area. Since recognition is a two-way process, the study looks at both how Romanian courses can be recognized by European overarching forums and at how the Romanian National Board accommodates the issue.

2. THE ROMANIAN RECOGNITION NORMS AND PRACTICES

The Romanian context for vocational training is surprisingly effective and simple as compared with other national environments. In Romania, tourism education is the exclusive activity of both academic environments and of vocational institutions, private and public. Academic recognition has been very much regulated by European documents, including The Bologna Declaration, and more recent ones like the Bordeaux Communiqué 2008 and the Helsinki Communiqué 2006.

We shall, however, look at the recognition of competences acquired through *formal vocational education and training*, particularly in tourism. First, the Romanian authority which handles and authorizes tourism education is the National Council for Adult Education, whose role is to coordinate at national level the accreditation of the training providers through 42 local accreditation commissions, to approve the national standards for some professions, and to recognize the competences formed through assessment centres. The Council operates country-wide through appointed regional or local commissions. In spite of the authority the National Council represents, it is the regional commissions which finally authorize tourism education institutions to function, subsequent to a thorough audit. The audit is carried out by nationally-appointed evaluators. Upon the completion of the authorized formal training module, the attendees are awarded diplomas issued by the

National Council under the auspices of the Ministry of Education and Research and the Ministry of Labour and Family. In this context, the competences are recognized nationally. In addition, by virtue of the Hague Agreement, the Ministry of Labour, Family and Social Protection's certificates or diplomas are officially recognized by the European Union and its institutions. Thus, to the whimsical question: are the Romanian vocational certificates and diplomas recognized in Europe, the answer is simple: if the institution is an authorized institution, issued the diplomas are fully recognized internationally.

Let us reverse the perspective and address the question: how can certificates acquired in other countries be recognized by the Romanian national authorities or institutions. A closer look at the *Ministry of Education and Research* site clears up the issue and provides the answer. The Ministry operates a unit called the *National Center for Recognition of Diplomas*, whose website pinpoints a few issues: rules and procedures, procedures, academic recognition, recognition of qualifications, recognition of professional qualifications. The formal European document that this recognition is based upon is the EC Directive 05/36/CE of the European Parliament and of the Council of September, 7 2005. The professions envisaged by the document are in the area of health and veterinary services. For the remaining qualifications the Ministry gives clear indications regarding the documents that must be submitted for the formal recognition.

Apart from creating a functional framework for the national recognition of competences, the Ministry of Education and Research has thus created a standardised system for the operation of tourism training institutions. Tourism education is nationally controlled, planned and quality assured through the auditing system and through the use of national standards for tourism training. Any tourism school or academy must first comply with and adopt the national standards issued and authorized by the Ministry for particular positions in tourism. Even if the Ministry has not provided standards for all tourism jobs, for most of the jobs in the tourism sector the national standards are provided and are successfully used. It must be, however, pointed out that the Ministry does not accredit an institution for an indefinite period of time. The validity of accreditation lasts for four years, subsequent to which the institution must file again for accreditation. This four-year accreditation system secures a smooth operation of the institution for four years, while constraining it to permanently assess its progress against some norms which have to be met. There is no guarantee, however, that an accredited institution will be re-accredited if it does not meet the national requirements and does not undergo the accreditation audit.

In spite of the regulatory provisions operating in the Romanian educational sector, and the centralized system that exerts control and monitors the way the institutions function, there are, however, some aspects involved in tourism education which cannot be clearly stated and checked. These variables have to do with the trainer's training and qualification and with quality standards.

3. THE EUROPEAN CONTEXT AND ITS REGULATORY DECISIONS

An attempt to seek European recognition for tourism training is a bewildering issue, merely because, at first sight there is no European training authority subordinated to or working under the supervision of the European Commission that could serve this particular purpose, for a sector that is rapidly growing and in an educational environment

that is permanently changing at all levels. If academic and vocational training, in general, are coordinated by the EC, and are organized according to specific and agreed on norms, regulated through substantial documents, and quality-assured, these regulatory documents and organizations do not operate in the tourism-training sector.

Tourism training, in general, both in Europe and in different countries, has developed since the mid -1980s, when governments have increasingly recognized the contribution of tourism to their country's welfare and therewith acknowledged the imperative to grow significantly the well-trained or better-qualified work force involved in the delivery of the tourism product.

The EC has had a tremendous contribution to the development of training in Europe. First, the EC's role has been that of creating institutions and forums, second, it has issued and agreed on norms which composed formal documents, third, it has created tools or instruments for the enforcement of norms, and finally it has created certain *practices*, which were necessarily adopted by most European national or local institutions. Amongst the frameworks and tools destined to enhance transparency, recognition and quality of competences and qualifications are: the Qualifications Framework (EQF), the Europass, the European Credit System for VET(ECVET), the European Quality Assurance Reference Framework for VET(EQARF).

There have been some efforts initiated by the CEDEFOP (European Centre for the Development of Vocational Training) which sought to standardise European tourism qualification by detecting the knowledge, skills and training required for particular posts. A second attempt, launched in the 1990s as well by CHRIE (Council on Hotel, Restaurants and Institutional Education, 1993) sought to develop and implement national standards on skills and abilities required for particular posts in the tourism industry.

The adoption of the *common reference framework* has become an ample on-going European consultation process followed recently by consultations on the *recognition of prior learning*. The process initiated by the CEDEFOP seeks to pilot national and European guidelines designed to encourage the take up of recognition procedures for prior learning. It is the latest initiative of the CEDEFOP that brings vocational training closer to the objectives outlined in the Copenhagen Declaration.

In spite of the strenuous efforts made by the European Commission to standardize and 'watchdog' the smooth adoption and use of norms, in practice, in the field of tourism, there is no overarching Directorate General, whose area of concern is exclusively devoted to tourism education, an authority which should congruently devise, monitor, and assess tourism training.

Concomitantly, the World Tourism Organisation (WTO), a specialized United Nations agency, committed to open trade for the benefit of all countries and tourism businesses, has stepped in the development of a coherent training system for tourism through publishing an impressive series of books, manuals, reference materials and informative materials on tourism and related issues. Since its foundation in 1995, the WTO has endeavoured to create a strong and prosperous world trading system. With its 153 members, of which 117 are developing countries, it has contributed unprecedently to global economic growth. However, the organization is not aimed at developing an efficient work force for the tourism sector. Its only departments which, consistently seek to gear the WTO's efforts towards training concerns are: the Trade-Related Technical Assistance (TRTA), which offers assistance activities and programmes oriented towards sustainable trade capacity-building in beneficiary countries, and the *WTO publishings*.

The WTO operates, amongst other councils, with the *WTO Executive Council* and the *WTO Education Council***.** The World Tourism Organization, with the Tourism Administrations of 141 countries as member States, is one of the few intergovernmental institutions in the world which includes representatives from civil society in its membership with members from more than 80 universities, business schools and other training and research centres with programmes in tourism. To belong to the Education Council these institutions must have obtained the WTO **TedQual Quality Certification** by successfully completing an independent audit of their programmes. Henceforth, the only European and, indeed, world institution vested with certifying authority in tourism education is the TEDQUAL.

The WTO has developed the TEDQUAL (Tourism Education Quality), located in Andorra, in order to standardize tourism training and ensure high quality benchmarks to tourism education and training. Ever since its foundation, Tedqual stands for quality assurance in tourism training. According to its stated aim, quoted from the website, 'It is a methodology aimed at improving the quality and competitiveness of Education, Training and Research specialized in Tourism and Hospitality to meet the needs of the Tourism administrations and industry. It is especially useful for governments and industry as it gives them an opportunity to check the capacity of their human capital'.

The specific aims of the TedQual Certification System are: (i) to establish a quality assurance model, through voluntary standardization of tourism education and training systems, and (ii) to smooth the way towards greater pedagogic productivity and efficiency in tourism.

A closer look at the benefits that the TedQual Certification System can offer to any institution or educational programme in tourism will shed light on a few core principles that its activity is grounded on. First, the TedQual Certification System offers European recognition of the quality of a particular institution's programmes in the tourism education market and, from an internal point of view, it enables the institutions to take advantage of the benefits of continuous self-assessment using an internationally recognized model.

These advantages create further on the following specific benefits:

a) adapting the contents given during the education process to the real expectations of demand
b) establishing continuous improvement, through regular audits which allow the current processes to be corrected and simplified, existing deficiencies to be remedied and pedagogic methodology and contents to be updated
c) improving internal communication among the different components of the Institution, by reinforcing the idea that all members play an important role in achieving quality, thus fostering staff motivation and productivity
d) obtaining a uniform and constant level of quality in the training given through the standardization of processes in the Institution, which in turn guarantees greater reliability to the consumer
e) ensuring the credibility of the academic degrees obtained by graduates of the Institution, which will positively affect their entry into the tourism labour market
f) joining the move for progressive standardization of the different types of tourism accreditation and degrees, thus putting an end to the confusion of tourism students and employers, and fostering academic and professional mobility
g) offering the possibility of continuous collaboration with WTO through standardized education services designed by this Organization (such as the GTAT courses and exams).

h) including the Education Institution responsible for the certified TEPs (Tourism Education Programs) in all the international promotional programmes which WTO carries out, as an Associate Centre of the WTO·THEMIS Foundation.

The mentioned benefits are definitely aimed at increasing the effectiveness of a teaching institution's performance, including the Romanian training centres.

4. WHO TO TURN TO FOR EUROPEAN RECOGNITION

In the European educational landscape tourism education tends to become an established discipline both academically and vocationally. In higher education there is a tendency to establish tourism as a distinct area of study. There is also a tendency accompanied by a strong commitment at all educational levels to continue this development in an orderly and structured way. Cooper admits that 'without a theoretical basis on which the subject can develop and grow, there currently exists a fragmented approach to tourism education. This accentuates a lack of clear direction for sustained development, an absence of theory and focus and the lack of an embracing and comprehensive framework within which the subject may be effectively taught'(Cooper, at al.1996:147). In the absence of this *framework* some theorists would see there a danger of disintegrating, with the subjects that make it up reverting back to their original disciplines.

The only available 'framework' for the development of a coherent, planned and uniform European tourism study programme can be provided by the Tedqual *quality framework*. The Tedqual site attractively claims that 'Developing a Quality Assurance framework is not an end in itself. It is its application and the consequent improvement in the quality of the student experience that will be the real measure of success.' Such a framework, although not exclusively based on curricular standardization and centralisation, supplies straightforward guidelines for the development of a quality culture in the training institution. The merit of establishing and nurturing an institutional quality culture lies in its focus on quality assurance, ie 'an open and active commitment to quality at the institutional level and an enthusiasm for and commitment to teaching and learning and students' needs' (http://www.onecaribbean.org/content/files/QAFramework.pdf). This further involves a 'willingness to engage in self-evaluation and to adopt a self-critical approach to academic activities with a focus on development and continuous improvement'.

The Tedqual is committed to defining what is quality in tourism education and to propose widely-acceptable quality standards. This means building up tourism education systems of quality, a task that the WTO has voluntarily accepted. The Tedqual has addressed this issue by creating a standard methodology, which consists of: making use of Total Quality techniques to determine the training gaps, hierarchiesing them and dealing with them, drawing up a standard map of tourism professions to deal with the inherent complexity of the tourism industry, investigating through specific methods the need in demand for tourism qualifications.

The WTO has become involved in designing a framework of common accreditation standards. There has been a steady interest in analysing the feasibility of a worldwide standard examination, called the GTAT (Graduate Tourism Aptitude Test) that could become instrumental in helping students occupy specific positions or continue their post-graduate studies. In addition, the Tedqual supplies a specific methodology designed to improve the training of tourism workers and professionals. Tedqual enables the identification of future needs and finding answers to the current quality gaps existing in various national and

international environments, it establishes long-term education and training aims, avoiding the risk of curricula becoming prematurely outdated and the trainers being underqualified.

In spite of the fact that the way to acquire Tedqual recognition or accreditation is a lasting and demanding endeavour, to seek such a recognition will definitely ensure not only an institutional qualification, but it would ensure consistent quality standards.

5. ACCREDITATION OF RURAL TOURISM "TRAIN THE TRAINER" PROGRAMME

It is against this background that an international network called *Rural Tourism International Training Network* (RTITN) seeks to achieve international recognition and to find ways to meet national training standards.

The RTITN was established through a Leonardo Da Vinci project 'Hospitality in Rural Tourism' (2001-2004). The network has dedicated its activity to developing training materials and programmes which are appropriate for trainers to deliver to rural communities, farm families and rural tourism entrepreneurs. RTITN has relied heavily on the training activity and publishing materials of *The European Centre for Eco and Agricultural Tourism* (ECEAT), an international NGO working for the promotion and integration of tourism with rural development, sustainable land use and nature protection, with representative offices in 22 European countries, including 10 countries in Central and Eastern European. The Center for Tourism Training of the Faculty of Geography is an active member of the network.

Building upon its past successes, RTITN instigates a process towards *accreditation* for the rural tourism 'train the trainer' programme through an international accreditation initiative spanned within the framework of a Leonardo da Vinci Lifelong Learning Programme. The rural tourism 'train the trainers' programme, if accredited, will provide a VET course which will embody the competences of tourism entrepreneurship and set clear guidelines on the competences of an effective rural tourism trainer. Such an attempt to standardise tourism training for rural entrepreneurship is based on sharing knowledge and experience with the end goal of providing rural dwellers with appropriate skills and knowledge to generate a sustainable economic income through tourism.

The network of tourism training institutions will draw on the experience of social partners operating in the field of rural tourism development and training with vocational education training institutions. It will turn for accreditation to the Tedqual and CEDEFOP. The network will further make it its second goal to have the 'train the trainer 'courses recognised by the partner institutions' national boards. The initiative relies on the recognition process described previously.

It is hoped that the training network will also provide expertise and good practices to Tedqual and enrich its methodology with viable field data.

6. CONCLUSIONS

Tourism has progressed rapidly over the last 50 years, spawning all over Europe a wide range of institutions which deliver tourism courses and a growing number of textbooks. The extremely rich diversity of institutions, trainers, and academics, on the one hand, the mushrooming of texts, journals and other resources raise a number of questions related to what is the most accurate and acceptable approach to tourism education, and how to keep educators updated and informed on current sectoral developments and industry

practice, let alone know what quality standards should a training course meet to be regarded as such. How can Romanian tourism educators know what is 'European' and how will this European dimension of training be pursued?

In a Europe fragmented by the lack of a coherent approach to tourism education, where the work force will relocate and move freely in search for better jobs, the need for recognition is more stringent than ever before. The recognition of competences and diplomas acquires a new impetus and calls for visible and transparent norms. In some countries like Romania the recognition and transfer of credits system functions smoothly and steadily as compared to other European countries, where no national authority oversees the process of competence recognition. Such is the case of Ireland, Italy etc. In North America the broad number of qualifications and standards along with a lack of consistency and coherence in curriculum design has only desoriented both employers and recipients of education. North America, for example, offers currently a dozen different qualifications as compared with the 1980s when only two were available (Morrison, 1992). This is why more and more institutions Europe-wide are looking for European certification or accreditation, and that is where they need to turn to Tedqual for certification.

R E FE R E N C E S

1. Airey, D. (1988), *Cross-Cultural Approaches to Teaching Tourism, Tecahing Tourism into the 1990s*, International Confereence for Tourism Educators, University of Surrey.
2. Cooper, C., Shephard, R., Westlake, J. (1996), *Educating the Educators in Tourism: A Manual of Tourism and Hospitality Education*, WTO University of Surrey, Madrid.
3. Goeldner, C.R. (1988), *The Evaluation of Tourism as an Industry and as a Discipline*, Proceedings of the First International Conference for Tourism Educators, University of Surrey.
4. Cooper, C. Fayos-Sola, E., Hawkins, D., Spivackl, S. (1997), *An Introduction to Tedqual: A Methodology for Quality in Tourism Education and Training*, WTO Madrid.
5. Jafari, J. and Richie, J.R. Brent (1981), *Towards a Framework for Tourism Education*, Annals of Tourism Research, No 8(1).
6. Morrison, A.M., et al. (1992), *Certification in the Travel and Tourism Industry: The North American Experience*, *Journal of Tourism Studies*, Vol 3(2), pp32-40.

Internet sources:

http://www.mg.gov.pl/NR/rdonlyres/83E7FDD6-7A3B-4833-8F0A-3B49FD226716/14678/TQCTDA01ENExecutiveIntroductionVolume2.pdf

http://europa.eu/pol/emu/index_en.htm

http://ekm.unwto.org/english/themis.php

http://www.onecaribbean.org/content/files/QAFramework.pdf

RECENZII – BOOK REVIEWS

George Cristea (2007), *Regi şi diplomaţi suedezi în spaţiul românesc (secolele XVII-XX)* [*Swedish Kings and Diplomats in the Romanian Space (17th - 20th centuries)*], Romanian Academy Publishing House. Transylvanian Study Center, Cluj-Napoca, ISBN (13) 978-973-7784-18-6, 273 pages, numerous figures, illustrations, alphabetical index (ALEXANDRU PĂCURAR)

A beautiful, pure, delicate, well informed and original book, like a breeze of cold refreshing northern air, offers us our compatriot Mr. George Cristea, who has lived since 1976 in Sweden, a professor at Dramatiska Institutet – the Stockholm University College of Film, Radio and Television.

The book was born from Mr. George Cristea's interest in the research, the identification and the valorization of Swedish archive documents on Swedish-Romanian relations and events that took place in the Romanian geographical space. As the author confesses, "this volume includes travel notes, documents, chronicles and comments written by or regarding Swedish travelers, diplomats and kings who, driven by destiny, during official missions or private visits, came to our country", because "the testimonies of foreign travelers have always been fascinating for readers with a passion for the past of their people" (p. IX).

The book fits in the current trend of Romanian editorial publications that valorize our past, the memory of places, in the context of liberation from the single party ideology of sad memory; we rediscover and present ourselves or have others present us, after a period of "freezing" of authentic self consciousness.

In 20 chapters, the author shows us the results of his archive researches, bringing to the foreground valuable testimonies. In this way, we find out that in the Visby museum on the Gotland Island, an 11th century tombstone discovered in 1715 is exhibited, whose runic inscription – a dedication of parents to their son killed during his journey to Constantinople – mentions the "Blakumen" – Wallachs, the frequent expeditions of the Varegs who moved along the Dnieper and the Black Sea cost towards the south being well known.

Chapters 2 and 3 mention the development of Sweden as a maritime and military power, whose interests, resulting from its increasing importance, were mainly opposed to those of Tsarist Russia, which started to actively orientate towards the west, during the 17th and especially during the 18th-19th centuries, from the North Sea up to the Black Sea. Consequently, Sweden "associated" with the Ottoman Empire in an anti-Russian alliance. In this general context, many travelers, emissaries, ambassadors, scholars, culminating with King Charles XII, visited the Romanian Countries – Transylvania, Moldavia and Wallachia, which were in a relation of vassality with the Sublime Porte. Thus, the diplomat Claes Ralamb, one of the "first and most important" Swedish diplomats who came to the Romanian Principalities, is introduced to us.

On his way to Constantinople, he arrived in Oradea in April 1657, being welcomed by the mayor – "Capitaneus Varadinensis", he followed his journey to Cluj through Aleşd-Ciucea, crossing the northern side of the Apuseni Mountains, where he met Wallach peasants in charge with keeping malefactors at a distance because otherwise „no one could ever keep evildoers at a distance" and „no one could travel on these roads any longer", their service being rewarded by tax exemption, as „they were poor people because there are no wheat fields in the mountains", who only made a living from animal breeding and the transportation of salt to Hungary.

Through Cluj - Alba-Iulia – Sibiu – Braşov – Bran – Târgovişte – Bucarest - Călăraşi, the Swedish diplomat crossed the Romanian Principalities, being charmed by the Romanian peasants from Rucăr and Dragoslavele, with whom he could communicate in Latin, having the feeling that „he was 2000 years back in Rome". He believed about Wallachia that „this country is full with all the treasures that can be possibly imagined".

Chapters 5-12 make reference to the Charles XII episode, i.e. the 1709-1714 period, when the king and the rest of his army set up camp in Bender and „Sweden was ruled from Moldavia" as George Cristea puts it, as well as to related events: the forced departure from Bender

described by an anonymous Pole in the army of the fugitive king (Chapter 6), the echoes of the king's stay in Moldavia in Romanian chronicles (Chapter 7), the conference of the brilliant Nicolae Iorga on the „Bender episode" in Uppsala, the travel impressions from Bender to Constantinople of Michael Eneman – „the exploring priest, a highly skilled man, whose life burned like a flame", who accompanied the young king, or those of the „soldier-chronicler E.H. Weismantell", one of the „many young German people eager for adventure, who entered the service of Charles XII".

We find out that after the battle of Poltava (June 1709), in which the Swedes were completely defeated, they withdrew to the western bank of the Dniester, "ancient Moldavian land" and with the Sultan's approval, they settled in Bender, building a small town "that people started to call Carlopolis", the expression of the organizing genius of the young king. Life was that of a military camp, but for the hyperactive king, those were "idle days". After the Russians were defeated by the Ottomans at Stănileşti, the safety of the Swedish colony increased but the floods made them move to Varnița. There too, they organized their life conscientiously, building a complex of edifices for the use of the king and the court, as well as 400 dwellings for the soldiers, the small settlement being called the "New Stockholm". Then, in February 1713, Charles XII left for Constantinople, but he stopped 40 km from Adrianople, where he stayed for one year, and finally, in September 1714, he decided to go back to Sweden following the Balkans – Wallachia – Transylvania - Habsburg Empire route.

On 8 October, after crossing the Danube, he arrived in Piteşti, where the Swedes left in Moldavia joined him on 16 October. The king organized the 1168 soldiers into contingents of 100 each, which he sent to Sweden at 1 day intervals, then he left Piteşti on 27 October, accompanied by only two people. On 10 November, he arrived in Stralsund, which means that he covered 2175 km in 14 days!

The brief information of the "soldier-chronicler" Henrik von Weismantell is interesting. Thus, he writes about the peasants "whose name has a major significance: land owners" that they "take a piece of land at their own choice […]. The next year they choose another piece of land which they plough", which demonstrates the fallow farming system. He briefly refers to: the name of the country, the elements of the natural setting – geographical position, waters, soil fertility, population – language, clothing, religious beliefs, morality, economy, etc.

If certain information is available on the Colței Tower of Bucharest, in whose construction Swedish soldiers participated, the details on "a Romanian officer in the army of Charles XII, as well as the role of the Wallachian regiment Valakerna and its commander, colonel Sandu Kolza", are almost completely new.

After the freezing of Swedish-Ottoman relations between 1714-1734, Edvard de Carleson became chargé d'affaires in Constantinople until 1746 when, on his return from mission, his companion and translator Paul Jamjouglou described the whole journey. His notes are of special interest, but for us, the travel from Silistra, through Dobroudja, Isaccea, to Iaşi and Hotin on the Dniester is particularly interesting. Thus, we find out that between Medgidia (Karagath by its old name) and Babadag "villages are quite beautiful […], but water is very bad, brackish" and crops were destroyed by fires and locusts, the invasion of "this army of winged insects which devastated the entire country" being witnessed. Ismail, "a large and beautiful town, with an important harbor" was "in the past under Moldavian rule, but the Turks took possession of it some time ago". In Iaşi, the ceremony of reception of the Swedish diplomat by the Moldavian dignitary is described, with protocol, court and manners scenes.

The great social, political, military events in the Romanian Principalities were not left without echo in Stockholm. Thus, the diplomat Lars von Engeström in service in the capital of the Habsburg Empire – Vienna, mentions the Viennese echoes of the Horea's uprising of 1784-1785. The collection of documents and the impressions of the Swedish ambassador show his attitude of belonging to a privileged social class that had an aversion for violence and anarchy and the reports he sent to Stockholm reflect his sympathy for the Romanians who "are of Roman origin" and their language "which is very similar to Latin witnesses their kinship with the Romans". He also noted that "most of the Wallachs are found on Hungarian properties. They belong to the land and cannot leave it without the approval of their masters. The masters distinguish themselves

by cruelty towards them. […] When a population such as that of the Wallachs, larger than all the other nations in Transylvania together … is driven to desperate acts, when it considers that its present state is worse than death, then even more attempts like those that have recently failed can be expected anytime", Lars von Engeström concludes, correctly understanding the causes of Horea, Cloşca and Crişan's uprising.

Chapters 15-20 refer to aspects of the relations and the mutual visits of the kings of Sweden and Romania, as another original topic of the book is „the rediscovery of the family relationships between the Swedish and the Romanian Royal Houses", according to the author himself. At „the Stockholm Royal Palace – and not only there – Romania was not a casual subject of conversation: it was a common subject, the country was known and appreciated". It is up to the readers to discover, by reading the book, these connections, which, why not, might be reestablished after 1990, when we „took our portion of freedom" as they say, but is it just a portion or all of the freedom?

To conclude, this is a wonderful, information-rich book, the fruit of archive researches with such surprising results, written by a compatriot who chose to live in a prosperous kingdom, a mathematician by his first profession, who, like others, allowed himself to be seduced by the „permanencies of history". A book that brings a breeze of healthy oxygenated air, which recommends itself as pleasant reading and which should not miss from the library of any geographer, especially one involved in teaching.

Lecturer Dr. ALEXANDRU PĂCURAR

Alain Kerjean (2007), ***Voyage en Roumanie, de la Transylvanie au Delta du Danube*** **(A Journey to Romania, from Transylvania to the Danube Delta), Editions Glénat – La Société de Géographie, Paris (ALEXANDRU PĂCURAR)**

In 2007, the Glénat Publishing House of the French Geographical Society published an album dedicated to Romania, on the occasion of its accession to the EU. The author is Alain Kerjean, a man of culture, a passionate traveler and writer. The text is brief but comprehensive and is illustrated with many original photographs, some of which are new, by both the author and his collaborator, Valentin Brutaru, as well as from archives.

The author mostly retraces the route of the travels that the French geographer Élisée Reclus undertook to Transylvania in 1873 and ten years later, to Bucharest, on his way to Constantinople, which allows for comparisons, reflections and historical digressions on the places and people encountered. Alain Kerjean and the photographer Valentin Brutaru covered together more than 6000 km in their wish to "show Romania's image in snapshots".

The book has a preface and an introduction signed by prestigious names – the soprano Angela Gheorghiu and Prof. Jean Bastié, the President of the French Geographical Society. The book has 158 pages, in large format. Between the prologue and the epilogue, in which the author sets the main historical-geographical landmarks of the Romanians, as well as the perspectives opened after Romania's accession to the EU, there are four large chapters, to which brief historical landmarks, notes and bibliography are added, as well as an index at the end.

In the preface, the soprano Angela Gheorghiu recalls our artistic-musical traditions, our Latinity and connections to France. Professor Jean Bastié of Sorbonne recalls the historical context of the affirmation of the principle of nationalities promoted by Napoleon III, in which the Romanian principalities were united and subsequently the Romanian Kingdom was created, as well as the scientist geographer Emmanuel de Martonne, his book on Romania "La Valachie" and his unquestionable expertise in the setting of the western Romanian border, at the end of World War I. Referring to Bessarabia, Professor Bastié noted: "Hélas, aujourd'hui encore, la Roumanie demeure amputee des territories situés à l'ouest de Dniestre, dont l'URSS s'est emparée

en 1940 avec l'accord d'Hitler" [Alas, Romania remains to this day amputated from the territories situated to the west of Dniester, of which USSR took possession in 1940 with Hitler's consent], characterizing us as "un people ami et fidèle" [a friendly and faithful people]. Romanian geographers who are appreciated in France are also mentioned: George Vâlsan, Vintilă Mihăilescu, Alexandru Ungureanu, Ioan Şandru and Pompei Cocean.

In the Prologue, the author delineates the space between the Carpathians, the Danube and the Black Sea, within which the Romanians – a Latin people, have lived their destiny. The brief but persuasive text is enriched by many suggestive photographs, such as those of the friezes of Trajan's Column, which present the conquest of Dacia, those of Constantin Brâncoveanu, this prince of culture, a fervent Christian, who left us among others the Mogoşoaia Palace, brought to life from anonymity by Martha Bibescu, those of the Râşnov Castle with the Bucegi Mountains in the background, or those of the coronation of King Ferdinand and Queen Marie at the Unification Cathedral in Alba-Iulia in 1922, after the achievement of the national ideal – the union of all Romanian provinces, sanctioned by treaties.

The chapter "Forteresse chrétienne et rêve byzantin" [Christian Fortress and Byzantine Dream] represents in fact the author's conclusion after he crossed the Southern Carpathians through Slănic Prahova and the Bratocea Pass, entered the Bârsa County and, after zigzagging through the Făgăraş and Sibiu depressions, the Târnavelor Plateau, crossed the Eastern Carpathians through the Bicaz Pass. In Moldavia he visited Iaşi, Botoşani, the monasteries of Bucovina, then, from Câmpulung through the Prislop Pass, he arrived in Maramureş – all these ethnic regions, some of those so heterogeneous, allowing the author to indulge in real "excursions into the memory of places", evidencing major facts in the light of historical truth.

Braşov allows him "de découvrir un joyau du patrimoine européen dans son jus medieval" [to discover a jewel of the European patrimony in its medieval juice] and in Prejmer he takes pleasure in "plonger à l'époque des chevaliers teutons" [plunging into the age of Teutonic Knights], at the peasant citadel that he recalls. In Sibiu, he is impressed by the Traditional Art Museum – Astra from Dumbrava, born from the sociological school of Dimitrie Gusti and the geographical schools of Cluj and Bucharest, and in Răşinari, he recalls O. Goga and E. Cioran, etc., in a cultural geographical excursion.

In the Târnavelor Plateau, the author recalls the Saxons and their fortified churches Slimnic, Moşna and Biertan, some of the 150 churches preserved of the 200 built, mentioning not without sadness the advanced state of decay of Saxon villages after the massive immigration of the Saxons to Germany after 1990 and their occupation by gypsies, drawing attention to this endangered valuable patrimony.

The visit to the "Szeklers' County" offers the author the occasion of a memory exercise, in which he correctly recalls the settlement of the Szeklers in this part of the Carpathians, their complex culture, as well as their "capital" – Târgu-Mureş, where the Culture Palace and Samuel Teleki's library impress him.

Reaching Moldavia, Alain Kerjean recalls the monuments of Iaşi, a francophone city where "geography is taught in French": the University, the "Three Hierarchs" Church, the Culture Palace, the monasteries Cetăţuia, Golia, as well as the monasteries of Bucovina – Putna, Voroneţ, Sucevița, Dragomirna. The frequent historical digressions remind him of the Jews, who are so widely spread in Moldavia and Transylvania, during their most tragic period 1940-1944, which the Romanians assumed with both the bad things – the pogrom of Iaşi, the deportations – and the good things – the actions for their protection, coordinated, to the extent to which this was possible under German occupation, by Queen Elena of Romania.

The author crosses the historical Maramureş with its wooden churches, with living traditions, then the villages of the Apuseni Mountains inhabited by the "Moți" but also by Hungarians, where the Remetea village impresses him by the careful restoration and maintenance of the miners' houses, of which Élisée Reclus wrote that "au Xe siècle déjà, cette colonie de Magyars exploitait les mines de fer de la contrée" [as early as the 10th century, this colony of Hungarians worked in the iron mines of the region]. In the shadow of the ruins of the feudal citadel, the restored houses are the valuable secondary residences of the inhabitants of Cluj.

Seeing the villages of the Haţeg County, which allow him an excursion into the Daco-Roman world, Alain Kerjean concludes that "l'éternité est née dans le village" [eternity is born in the village], by paraphrasing Lucian Blaga.

The memory of the poet of "our suffering" – Octavian Goga, whose nephew Mircea Goga, a man of letters, facilitates the author's understanding of the evolution of local mentalities, brings forth the image of Ciucea, and especially of Cluj with its university that becomes, after the union with the Romanian Kingdom, "King Ferdinand" University. Here, like in other universities of the country, the Romanian authorities, who organized the professional activity of the institutions of the new state extended within its natural borders, invited a number of French scientists for the organization of the university scientific life. These included Emmanuel de Martonne, René Jeannel, Robert Ficheux à Cluj. Through his scientific travels organized to our country, Emmanuel de Martonne outlined in a visionary manner – which only few exegetes can do – the general framework of the formation and evolution of the Romanian geographical space, a true source of ideas for many generations of Romanian geographers.

The travel through the Banat Plain and Timişoara city reminds the author of the beginning of the Revolution of 1989, as well as the present development of this region. Suggestive images include that of the Orthodox Cathedral in Timişoara, a foundation of King Michael I of Romania, inaugurated in 1946. "Entre fleuve et forêt" [Between river and forest] (the title of a chapter!) lies "la Valachie de Brâncuşi" [the Wallachia of Brâncuşi], starting with Porţile de Fier and the ancient city of Drobeta. The author mentions the monasteries of Tismana, Hurezi and Curtea de Argeş, each one with its significance for "our cultural geography", and also Hobiţa, the place of birth of the sculptor Constantin Brâncuşi who, after being refused by the illiterate political leaders brought to the Romanian government by the red Soviet army, offered his workshop from Impasse Montparnasse to the French state. Câmpina, the town of Nicolae Grigorescu or B.P. Haşdeu, and the oil "boom" that the Wallachian sub-Carpathian area experienced in the early 20th century are also presented.

Many pages and highly suggestive old and new photographs are dedicated to Bucharest, Bucur's city, which appeared rather suddenly in 1456, and later became the "Paris of the East". The images show its resemblance to Paris during its normal periods of development – The Romanian Athenaeum, the Royal Foundations, the CEC Palace, the History Museum (the former Central Post), or to a new foreign world – the Free Press House. I would like to insist on two symbol images. One shows the House of Architects (p. 121) with a touching significance: the old building was the Austro-Hungarian Embassy until 1918, then, after 1947 it became one of the security headquarters, being destroyed during the 1989 events. On its ruins, a symbol of the dark age of atheistic Stalinist communism, a modern building was erected, a symbol of the pure aspirations of honest people.

On page 122, the image of the Novotel hotel, a symbol of French-Romanian cooperation, presents the old façade of the National Theatre destroyed by German bombings in 1944, which is continued by the modern hotel building. This is similar to Nice, where on the Promenade of Anglais, an Arabian sheik bought a historical building with the intention of demolishing it in order to build a modern hotel. He had to preserve the façade of the building – like in Bucharest – because our duty in this globalized world is to preserve the valuable identity patrimony.

The last chapter, "Frontière sauvage de l'Europe" [Wild European frontier] is dedicated to Dobruja and the Danube Delta, whose color, manners and harbor life was made known to the French public by Panait Istrati's writings. The author takes snapshots of the wild life of the Delta, its inhabitants and synthesizes the activity of the European Danube Commission.

By crossing Dobruja – a melting pot of cultures and civilizations materialized in ruins that the author recalls, a cradle of the Christianization of the Romanians through the Apostle Andrew – Alain Kerjean ends his journey in Constanţa, the ancient Tomis, named after emperor Constantin's sister, Constantia, where the poet Ovidius was exiled, one more proof of our perennial Latinity. "Looking at the image of the beautiful Casino edifice in art nouveau style, I don't know whether I am in Constanţa, Deauville or Nice...".

The album dedicated to Romania has an „epilogue"; one of the images, also symbolic, shows the CEC Palace, a symbol of our rich past, behind which the tall modern figure of blue color (the color of hope!) of a bank emerges, the hopeful

symbol of our future, of the return of Romania to the family of European countries, which the author announces with emotion: "C'est avec le coeur que nous nous sommes livrés à une cascade d'émotion pour announcer le retour d'un pays ami de la France et dont nous avons besoin: la Roumanie" [We lent ourselves with all our heart to a cascade of emotion to announce the return of a friend country of France, which we need: Romania].

The book ends with "Historical landmarks", a map and an index. Written in a concise style, "Historical landmarks" are correct, they reflect historical truth. The collaboration with Mircea Goga and Dan Lungu proved extremely beneficial for the author. The map of Romania – "pays de l'Europe Centrale" [a Central European country], presents the itinerary of a 6000 km journey across Alain Kerjean's and Valentin Brutaru's Romania. The itinerary chosen is almost complete for a radiograph of the Romanian space; maybe the inclusion of Craiova – the city of the Craioveşti Bans, the capital of Oltenia, would have been necessary, as well as of the Duca and Greceanu fortified mansions on the road from Râmnicu Vâlcea to Horezu.

To conclude, I thank Alain Kerjean and his collaborators for the book they offered us, for this cultural geographical excursion on a Latin country, unjustly abandoned for half a century, which is almost fatal in the present context, when societies develop rapidly in an increasingly globalized world, when the preservation and the promotion of identity values within the concert of the world's nations is a duty. Queen Anne said about Romania that "… There is poetry in Romania, I have seen it. In the land, in the fields, in the Romanian valleys, everything sings. The Romanian people is exceptionally gifted. People should be allowed to gain courage, because they were completely knocked down. If only the Romanians became proud of themselves again!"

I thank Alain Kerjean for giving me the opportunity, among many disappointments, of taking enormous pleasure in this book. In 2008, the Rao publishing house published the book in Romanian version; this should not miss from any public or private library and all the more so from a geographic library.

Lecturer Dr. ALEXANDRU PĂCURAR

Pop Călin Cornel (2008), ***Turism şi dezvoltare durabilă. Judeţul Sălaj (Durable Development and tourism. Sălaj County),*** Publishing House Casa Cărţii de Ştiinţă, Cluj-Napoca, 193 p., format B5, ISBN 978-976-133-198-0.

The study, result of the involvement and collaboration of a research contract, its beneficiary being the Sălaj County Council, it has a complex structure developed on 193 pages, in eight chapters, tables, logical drafts, maps and map drafts, photos and transcripts, an annex concerning the housing base of the county and a reference list constituted from 92 titles, plus geographical information sources of general interest, monographs.

In the first chapter, „*Tourism, domain of economical activity*", the author analyzes the impact components in tourism and their effects, theoretical and methodological aspects and the role of the transport infrastructure.

„*The conceptual content of the durable development*" analyzes one of the obvious aspects of nowadays, underlining the definition problems of the concept, of the general principles on which they count and the factors and hierarchical levels of scalar takling. Forward, after an approach of the geographical and historical premises which leaded to the individualization of the geographical-historical space of Sălaj, there are analyzed the arguments supporting the development of tourism as a viable alternative.

Hereby, in the chapter named „*Potential of the curing tourism*" it is described and analyzed the hydromineral and thermal dower from Sălaj County, noticing two different qualitative zones: the one from north-west mainly thermal, and the one from north-east where is remarkable the accent on the field from Bizușa-Băi and Jibou. It is realized a very well informed study about the hydrothermal resort Boghiș.

The anthropological touristic potential is analyzed in three different chapters because it represents the components of touristic attraction which give touristic personality to the county: „*The touristic potential of the churches (moreover wooden churches) and of the monastries* ", „*The historical objectives of Middle Age*" *and* „*Vestiges and archaeological Roman objectives (historical) with historical attraction*".

Yet, in the approach of the aspects about *methods of valuing and administration of the protected areas*, there are analyzed the natural reservation and monuments and the ecotouristic context of introducing it into the circuit.

Remarkable are also the *case studies* with concrete and complex research of some rural settlements with representative and complex touristic potential (Ileanda, Cizer, Benesat) or some reference objectives from a scientific point of view - of knowledge but also touristic (Jibou with Grădina Botanica-Botanical Garden).

Making groups of objectives with touristic attraction not only spatial but also typological, the author realized a „*touristic zonation and the phenomena of touristic risk*" with the three specific zones (west, north, south) with the signs and processes of touristic risk which are determinate by an intense usage or an usage which is not in accordance with ecodevelopment and durable tourism.

The promotion of the touristic product is in the chapter „*Touristic marketing specific for Sălaj County*" and this chapter also includes the key-factors, the motivations and the course of the market and touristic consumption, the typology of the touristic products, measures and strategies of promotion. The target objectives have been „*The Dragons Garden*", natural objective, and Bic Monastry. On the related data was performed the SWOT analysis of the territory and durable development.

The annex with „*housing base*" from Sălaj County, very useful for the interested people, shows the dimension and the yield through improvement of the touristic potential from Sălaj County.

We consider the study of the Professor Ph. D. Călin Cornel Pop a useful contribution to the cognizance of a domain - tourism, yet very little known and harness from Sălaj County.

Prof. Univ. Dr. NICOLAE CIANGĂ