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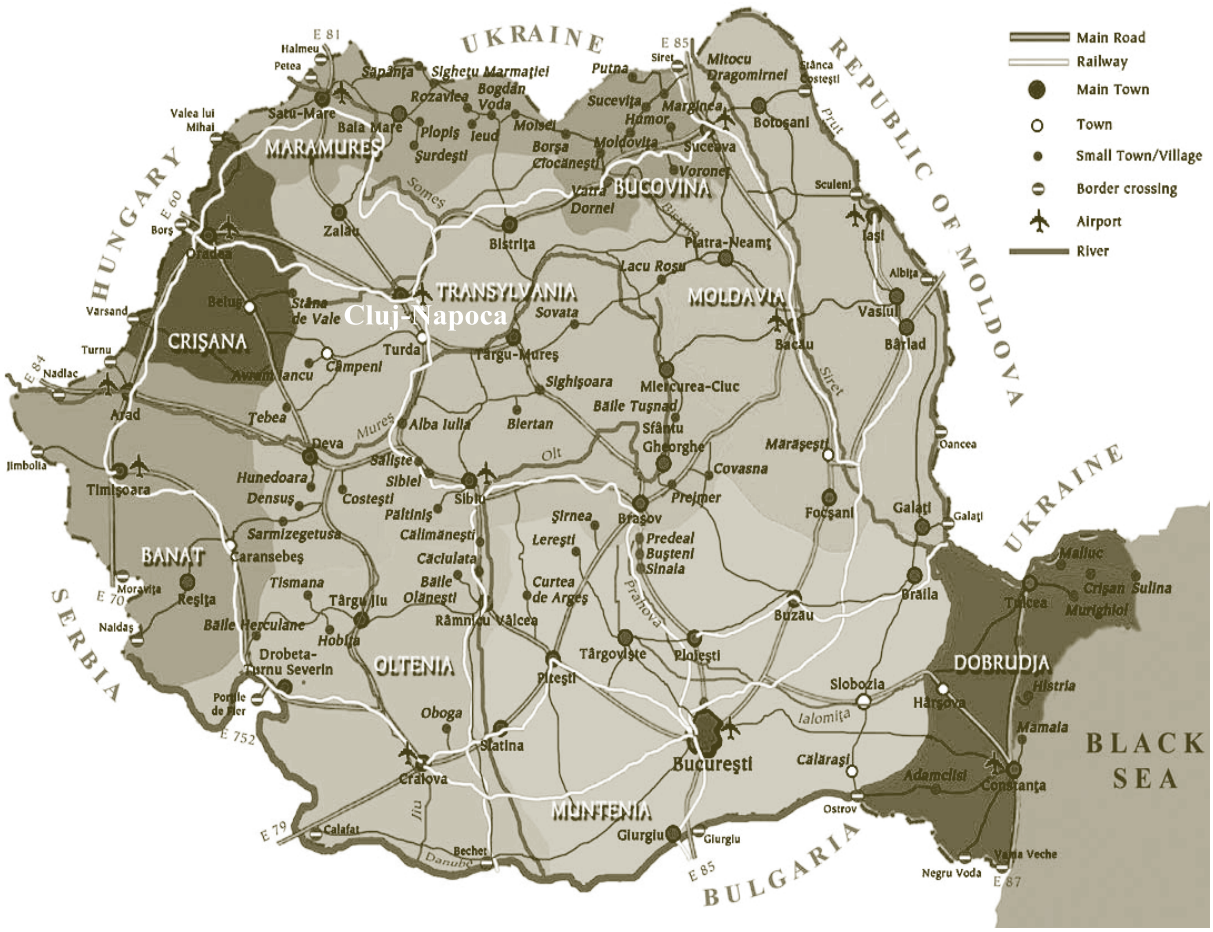


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## Notes and Book Reviews – Note şi recenzii

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# THE NATIONAL STRUCTURE OF THE ROMANIAN POPULATION AT THE 20TH OF OCTOBER 2011 CENSUS

**GR. P. POP[1], R. RUSU[1]**

**ABSTRACT. – The National Structure of the Romanian Population at the 20th of October 2011 Census.** This is the third study regarding the national structure of the population of Romania. The first two approached the 1992 and 2002 censuses and were published in Studia UBB, Geographia, 2 (1991) and the Romanian Review of Political Geography (2004)[2]. On the census day, Romania had 20,121,641 inhabitants, of which 83.45% (16,792,868) are *Romanians*, while the other 16.55% belong to: *Hungarians* 6.10% (1,227,623 inhabitants), *Gypsies* 3.09% (621,573 people), other *18 national minorities* (Ukrainians, Germans, Turks, Russian-Lipovans, Tartars, Serbs, Slovaks, Bulgarians, Croats, Greek, Italians, Jews, Czechs, Poles, Chinese, Armenians, Csangos, Macedonians) and the category "*other national groups*" have together only 1.21% (242,767 inhabitants). There is also a category of people for which the information was "*unavailable*", totaling 6.15% (1,236,810 people) of the Romanian population (fig. 1). As requested to assess the essential issues of such a subject, one needs to analyze the distribution of the national minorities across Romania, at the level of the counties and the eight geographical-historical provinces of Romania: Transylvania, Moldavia, Dobrudja, Muntenia, Oltenia, Banat, Crişana and Maramureş. Generally, regarding the presence of the *Romanian* population, one notices the following situation at the level of the counties: in 18 counties of the total of 41 in Romania, **the weight of the Romanian population is over 90%**, including all the eight Moldavian counties (Bacău, Botoşani, Galaţi, Iaşi, Neamţ, Suceava, Vaslui, Vrancea), six out of the ten counties of *Muntenia* (Argeş, Brăila, Buzău, Dâmboviţa, Prahova, Teleorman) and four out of five counties of *Oltenia* (Dolj, Gorj, Olt, Vâlcea). The highest weight of Romanians is recorded in the counties of Gorj (94.17%) and Botoşani (94.08%). A **weight between 80 and 90%** was recorded in five out of the ten counties of *Transylvania* (Alba, Bistriţa-Năsăud, Braşov, Hunedoara, Sibiu), in both counties of Dobrudja (Constanţa, Tulcea), in four out of ten counties of Muntenia (Călăraşi, Giurgiu, Ialomiţa, Ilfov), one in Oltenia (Mehedinţi), two in Banat (Caraş-Severin, Timiş), and in the city of Bucharest. The other nine counties have a weight of **70-80%** of Romanian population (Cluj, Arad, Maramureş), **60-70%** (Sălaj, Bihor, Maramureş) and **under 60%** (Covasna 21.41%, Harghita 12.61%, Mureş 50.35%). The *Hungarian national group* has a weight of 6.10 % at national level and is present most of all in *Transylvania*, where it represents 21.56% of the population of this province (858,454 locuitori). The highest weight has been registered in the counties of Harghita (82.90%), Covasna (71.53%), Mureş (36.46%), Sălaj (22.36%) and Cluj (14.99%). Values above 15% have been also recoreded in the counties of Satu Mare (32.69%) and Bihor (24.02%). Compared to the situation of the counties in the center and western Romania, in the East, South-East and South the Hungarians are almost completely absent,

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[2] See the references. The publication in 1991 of the study regarding the 1992 census was due to the late publishing of the journal Studia UBB, Geographia.

as their weight is largely below 1%. *The Gypsy population* represents 3.09% (621,573 people) of the Romanian population and is present in all the 42 administrative units. One remarks a rather homogeneous distribution of the Gypsies, as their weight is higher than 5% in only a number of counties: Mureş (8.52%), Sălaj (6.69%), Dâmboviţa (5.27%), Giurgiu (5.41%), Ialomiţa (5.21%), Bihor (6.02%) and Satu Mare (5.05%). In all other counties, as well as at the level of provinces, the Gypsies have weights below 5%. All the *other national minorities* have together a weight of only 1.21% (242,767 people) of the Romanian population.They have weights between 1% and 7% in only ten of the Romanian counties: Sibiu, Suceava, Constanţa, Tulcea, Arad, Caraş-Severin, Timiş, Bihor, Satu Mare and Maramureş, and in four provinces out of eight. The analyzed census presents a peculiarity which did not exist before, the column entitled "*Unavailable information*". For 6.15% of the Romanian population (1,236,819 people) the information regarding ethnicity was unavailable. At the level of the counties, in 14 cases this group represented less than 5%, in all other counties it represented between 5% and 10% while in the city of Bucharest the information was unavailable for 11.68% of the population.

***Keywords:*** *census, national groups, 2011, Romania, Romanians, Hungarians, Gypsies, Ukrainians, Germans, territorial distribution.*

## 1. INTRODUCTION

Throughout the time, the national structure of the territory inhabited by the Dacian, Dacian-Roman and then Romanian population suffered certain changes determined by the gradual penetration of different foreign populations in the Carpathian-Danubian-Black Sea space. However, one should mention that the autochthonous population always remained a majority in this space. This was determined by the specificity of geographical factors: the Carpathian crown, surrounding the impressive Transylvanian Depression in the center, then the hills and lowlands outside the Carpathians, made up a favorable morphological organization. To this, one should add the other favorable factors: climate, drainage, soils and mineral resources. A fundamental role was played also by the characteristics of the people who live in the studied territory.

Without taking into account a thorough analysis, which exists in the geographical and historical scientific literature, even for the 1992 and 2002 censuses (Gr. P. Pop, 1991; Gr. P. Pop, 2004), a brief survey of the national structure of the Romanian population since the 1930 census is needed. In 1930, under the specialised supervision of Sabin Manuilă, the first census has been performed in the newly formed Romanian National Unitary State. It was one of the most advanced censuses at international level at the time.

In a very generalised synthesis, one remarks that at the census performed on December 2, 1930, the population of Romania was made up by 77.9% Romanians, 10.0% Hungarians, 4.4% Germans and 7.7% others and undeclared. Later, due to the major events that took place in the social and historical evolution of the country, including World War II, and the remigration of some of the national groups which had arrived on the Romanian territory in different historical stages, the weight of the Romanian population has gradually increased, exceeding 85% in 1956 and getting closer to 90% in 1992 and 2002.

In relation to the mentioned situation, there were rather important changes regarding the weight of the national minorities. For instance, the main minority group – *the Hungarians* – decreased from 10% in 1930 to 9.1% in 1956 (1,597,675 people) of the total population of Romania (17,489,450 inhabitants). The decreasing trend continued afterwards: 8.4% in 1966, 7.9% in 1977, 7.1% in 1992 and 6.6% in 2002. A similar trend was recorded for the *German* and *Jewish* minorities. The Germans reduced their weight from 4.4% in 1930 to 2.2% in 1956 (383,708 people), then 1.6% in 1977 (332,205 Germans), 0.5% in 1992 (119,462 people) and 0.3% in 2002 (59,764 Germans). The Jews, well represented in Romania until the Second World War, had a weight of only 0.8% (146,264 people) in 1956, only 0.1% (24,667) in 1977, while in 2002 there were only 5,785 Jews in Romania.

**Table 1**

**National structure of the population of Romania at the 2011 census**

| Crt. no. | Nationality | Number of inhabitants | % |
|---|---|---|---|
| 1 | Romanians | 16792868 | 83.45 |
| 2 | Hungarians | 1227623 | 6.10 |
| 3 | Gypsies | 621573 | 3.09 |
| 4 | Ukrainians | 50920 | 0.25 |
| 5 | Germans | 36042 | 0.18 |
| 6 | Turks | 27698 | 0.14 |
| 7 | Russians-Lipovans | 23487 | 0.12 |
| 8 | Tartars | 20282 | 0.10 |
| 9 | Serbians | 18076 | 0.09 |
| 10 | Slovaks | 13654 | 0.07 |
| 11 | Bulgarians | 7336 | 0.04 |
| 12 | Croats | 5408 | 0.03 |
| 13 | Greeks | 3668 | 0.02 |
| 14 | Italians | 3203 | 0.02 |
| 15 | Jews | 3271 | 0.02 |
| 16 | Poles | 2543 | 0.01 |
| 17 | Czechs | 2477 | 0.01 |
| 18 | Chinese | 2017 | 0.01 |
| 19 | Csangos | 1536 | 0.01 |
| 20 | Armenians | 1361 | 0.01 |
| 21 | Macedonians | 1264 | 0.01 |
| 22 | Other nationalities | 18524 | 0.09 |
| 23 | Unavailable information | 1236810 | 6.15 |
| | **Romania** | **20121641** | **100.00** |

Apart from those mentioned above, one should highlight that during the same period there was an increase in weight of the Gypsies. This situation was determined, on one hand, by the higher natural growth and, on the other hand, by their higher awareness regarding self-identification as Gypsies, especially after 1990. As a result, the number and weight of Gypsies increased from 0.6% (104,216 inhabitants) in 1956 to 1.8% (401,087) in 1992 and 2.5% (535,140 people) in 2002.

As a novelty, it should be mentioned that certain minorities increased their population on the Romanian territory after 1990, although their numbers are very low: Greeks, Italians and Turks. The Chinese national group also emerged.

## 2. THE NATIONAL STRUCTURE OF THE ROMANIAN POPULATION IN 2011

The population census in Romania was organized and took place in rather modest conditions on October 20, 2011. Its quality was harshly contested, both regarding the determination of the total number of inhabitants in Romania and the fair highlighting of the total number of the Romanian population and of the national minorities.

In order to have an overall view concerning the approached subject, it is necessary to maintain a certain logic and order in the analysis of the issues which are specific for such a study. Therefore, *the general national structure of the population of Romania* is presented first, followed by the detailed analysis of the *Romanian population* and of the *20 national minorities* that are mentioned in the census with corresponding values (starting with the Hungarians and ending up with the Macedonians). After that, the categories "*Other ethnic groups*" and "*unavailable information*" are mentioned (table 2).

### *2. 1. The general national structure of the population of Romania*

The total population of Romania, as registered at the October 20, 2011 census, was 20,121,641 inhabitants. The data (as shown in table 1) highlight the fact that the overwhelming majority of the inhabitants are **Romanian**. They represent 83.45% of the population or 16,792,868 people in absolute numbers. The difference of 16.55% (3,328,773 inhabitants) is made up by the **national minorities** (10.40% or 2,091,963 people) and by people for whom the information regarding their ethnicity was unavailable (6.15% or 1,236,810 people).

Concerning the national minorities, a weight above 1% is registered only by the *Hungarians* (6.10% or 1,227,623 people) and *Gypsies* (3.09% or 621,573 people). Other 18 national minorities have between 50,920 people (0.25% *Ukrainians*) and 1,264 people (0.01% *Macedonians*). All the other remaining minorities have together a weight of only 0.09% or 18,524 inhabitants.

### *2. 2. The Romanian population*

The analysis of the evolution of the Romanian ethnic group at national level between 1930 and 2011 indicates that its weight increased from 77.85% in 1930 to 89.48% in 2002, and then it dropped significantly to 83.45% of the total of 20,121,641 in habitants of Romania in 2011. However, it is most likely that a large part of those for whom the information was unavailable were also ethnic Romanians, so the real weight of the Romanian population is similar to that registered in 2002.

The autochthonous population has an absolute majority in all the Romanian administrative units, except for the counties of Covasna and Harghita, where in 2011 the Romanians represented 21.42% (45,021 people) and 16.61% (39,196 inhabitants) of the total population.

In all the eight counties of *Moldavia* (table 2), the Romanian population exceeds 90%, while the counties of *Dobrudja* have more than 80% Romanians: 83.43% (out of 570,754 inhabitants) in Constanța County and 84.71% (out of 180,496 inhabitants) in Tulcea County.

Regarding the situation in the geographical-historical province of *Muntenia*, it comes out that six out of 10 counties have more than 90% Romanian population (Argeș, Brăila, Buzău, Dâmbovița, Prahova and Teleorman), while in the other four

**Table 2**

**The national structure of the population of Romania at the 20 October 2011 census, by counties and geographical-historical provinces**

| A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nr. crt. | Counties and geographical – historical provinces | Total table population | Romanians | Hungarians | Gypsies | Ukrainians | Germans | Turks | Russians - Lipovans | Tartars | Serbians | Slovaks | Bulgarians | Croats | Greeks | Italians | Jews | Czechs | Polish | Chinese | Armenians | Csangos | Macedonians | Other nationality | Unavailable information |
| 1 | Alba | 342376 | 291850 | 14849 | 14292 | 17 | 728 | 24 | 15 | - | * | 12 | 8 | 4 | 7 | 68 | 20 | 7 | 10 | 10 | * | 14 | - | 22 | 20416 |
| 2 | Bistriţa-Năsăud | 286225 | 247627 | 14350 | 11937 | 55 | 428 | 18 | 18 | - | * | * | - | * | 3 | 35 | 13 | - | 6 | 4 | * | * | * | 50 | 11672 |
| 3 | Braşov | 549217 | 453325 | 39661 | 18519 | 66 | 2923 | 81 | 90 | 12 | 20 | 11 | 18 | 5 | 79 | 119 | 77 | 5 | 17 | 14 | 7 | 41 | 9 | 368 | 33750 |
| 4 | Cluj | 691106 | 520885 | 103591 | 22531 | 173 | 687 | 89 | 58 | 10 | 25 | 54 | 21 | * | 78 | 154 | 185 | 11 | 29 | 11 | 66 | 16 | 6 | 1715 | 40709 |
| 5 | Covasna | 210177 | 45021 | 150468 | 8267 | 14 | 114 | 6 | 9 | - | * | * | 4 | - | * | 16 | 12 | - | 6 | * | 6 | 83 | * | 26 | 6117 |
| 6 | Haghita | 310867 | 39196 | 257707 | 5326 | 14 | 70 | 11 | 5 | 3 | 5 | 3 | - | - | * | 3 | 5 | * | 3 | * | 6 | 30 | - | 45 | 8432 |
| 7 | Hunedoara | 418565 | 368073 | 15900 | 7475 | 114 | 971 | 33 | 25 | * | 33 | 64 | 21 | 3 | 43 | 115 | 46 | 17 | 51 | 60 | * | 18 | 8 | 263 | 25228 |
| 8 | Mureş | 550846 | 277372 | 200858 | 46947 | 40 | 1478 | 51 | 47 | 3 | 10 | 8 | 12 | 4 | 8 | 63 | 86 | 5 | 16 | 6 | 15 | 11 | * | 257 | 23547 |
| 9 | Sălaj | 224384 | 148396 | 50177 | 15004 | 29 | 57 | * | 5 | * | * | 1118 | 3 | - | 4 | 40 | 5 | - | 4 | - | * | 13 | - | 57 | 9467 |
| 10 | Sibiu | 397322 | 338505 | 10893 | 17946 | 28 | 4244 | 28 | 62 | 3 | 22 | 4 | 4 | * | 33 | 69 | 31 | 4 | 30 | 4 | 18 | 8 | * | 363 | 25020 |
| **I** | **Transylvania** | **3981085** | **2730250** | **858454** | **168244** | **550** | **11700** | **341** | **334** | **31** | **115** | **1274** | **91** | **16** | **255** | **682** | **480** | **49** | **172** | **109** | **118** | **234** | **23** | **3166** | **204358** |
| 1 | Bacău | 616168 | 558507 | 4208 | 15284 | 30 | 99 | 51 | 36 | 5 | 4 | * | 3 | - | 37 | 91 | 43 | 3 | 14 | 6 | 29 | 829 | 4 | 296 | 36588 |
| 2 | Botoşani | 412626 | 388195 | 38 | 4155 | 659 | 28 | 23 | 404 | - | * | - | * | - | 16 | 20 | 54 | * | 3 | - | 21 | * | - | 62 | 18942 |
| 3 | Galaţi | 536167 | 482932 | 133 | 16990 | 48 | 62 | 78 | 180 | 4 | 8 | * | 7 | - | 156 | 68 | 57 | * | 3 | 4 | 29 | 6 | 6 | 477 | 34916 |
| 4 | Iaşi | 772348 | 703422 | 146 | 11288 | 60 | 88 | 74 | 2848 | 7 | 6 | * | 5 | - | 193 | 99 | 221 | - | 22 | 10 | 14 | 5 | 7 | 1300 | 52531 |
| 5 | Neamţ | 470766 | 439834 | 98 | 6398 | 23 | 72 | 40 | 204 | 4 | 4 | 4 | * | * | 27 | 79 | 34 | * | 4 | * | 9 | 6 | - | 70 | 23852 |
| 6 | Suceava | 634810 | 588358 | 183 | 12178 | 5916 | 717 | 34 | 1721 | - | 16 | - | 5 | - | 21 | 59 | 70 | * | 1922 | 5 | 22 | 8 | * | 376 | 23196 |
| 7 | Vaslui | 395499 | 364530 | 52 | 5913 | 7 | 13 | 12 | 83 | 3 | * | - | * | * | 22 | 18 | 14 | - | * | 4 | * | - | * | 49 | 24772 |
| 8 | Vrancea | 340310 | 308390 | 68 | 11966 | 12 | 10 | 33 | 8 | * | * | - | - | - | 6 | 25 | 8 | - | 7 | * | 9 | * | * | 124 | 19638 |
| **II** | **Moldavia** | **4178694** | **3834168** | **4926** | **84172** | **6755** | **1089** | **345** | **5484** | **23** | **38** | **4** | **20** | | **478** | **459** | **501** | **3** | **1975** | **29** | **133** | **854** | **17** | **2754** | **234435** |
| 1 | Constanţa | 684082 | 570754 | 450 | 8554 | 94 | 143 | 20826 | 3568 | 19601 | 16 | 5 | 35 | 4 | 266 | 60 | 36 | * | 22 | 8 | 263 | 35 | 503 | 654 | 58183 |
| 2 | Tulcea | 213083 | 180496 | 70 | 3423 | 1083 | 23 | 1674 | 10342 | 119 | 4 | 4 | 23 | * | 1181 | 57 | 7 | * | 4 | - | 58 | 17 | 59 | 132 | 14305 |
| **III** | **Dobrudja** | **897165** | **751250** | **520** | **11977** | **1177** | **166** | **22500** | **13910** | **19720** | **20** | **9** | **58** | **4** | **1447** | **117** | **43** | * | **26** | **8** | **321** | **52** | **562** | **786** | **72488** |
| 1 | Argeş | 612431 | 571149 | 237 | 16476 | 18 | 63 | 82 | 61 | 3 | 20 | 3 | 4 | - | 49 | 72 | 15 | - | 5 | 8 | 35 | 12 | 5 | 150 | 23964 |
| 2 | Brăila | 321212 | 291899 | 60 | 8555 | 30 | 31 | 184 | 1940 | 7 | * | * | 12 | - | 182 | 43 | 26 | - | - | - | 10 | 5 | 35 | 68 | 18123 |
| 3 | Buzău | 451069 | 409316 | 81 | 20376 | 11 | 19 | 55 | 12 | * | - | * | * | * | 7 | 39 | 5 | - | * | 32 | * | * | 3 | 64 | 21083 |
| 4 | Călăraşi | 306691 | 259310 | 72 | 22939 | 8 | 13 | 513 | 17 | 5 | 5 | * | 11 | - | 8 | 18 | 6 | * | 3 | 5 | 17 | * | 32 | 68 | 23638 |
| 5 | Dâmboviţa | 518745 | 470136 | 156 | 27355 | 20 | 43 | 63 | 21 | * | 466 | - | 1586 | * | 32 | 51 | 6 | * | 3 | 3 | 3 | 8 | * | 135 | 18653 |
| 6 | Giurgiu | 281422 | 248355 | 59 | 15223 | 4 | 18 | 52 | 12 | * | 3 | - | 8 | - | 6 | 8 | 3 | * | - | 8 | 4 | 8 | * | 61 | 17590 |
| 7 | Ialomiţa | 274148 | 241765 | 28 | 14278 | 17 | 14 | 73 | 360 | * | 7 | - | * | - | 11 | 27 | * | - | - | - | 10 | - | 28 | 38 | 17482 |
| **A** | **B** | **C** | **D** | **E** | **F** | **G** | **H** | **I** | **J** | **K** | **L** | **M** | **N** | **O** | **P** | **Q** | **R** | **S** | **T** | **U** | **V** | **W** | **X** | **Y** | **Z** |
| 8 | Ilfov | 388738 | 341895 | 242 | 15634 | 39 | 111 | 538 | 95 | 30 | 10 | * | 45 | 3 | 120 | 98 | 114 | * | 20 | 681 | 62 | 22 | 64 | 1015 | 27897 |
| 9 | Prahova | 762886 | 712886 | 447 | 17763 | 16 | 149 | 166 | 53 | 6 | 17 | - | 17 | 4 | 75 | 71 | 33 | 4 | 11 | 3 | 14 | 37 | 5 | 158 | 30951 |
| 10 | Teleorman | 380123 | 345949 | 18 | 8198 | 3 | 5 | 30 | * | * | * | - | 7 | - | 9 | 5 | - | - | * | - | - | 5 | - | 40 | 25848 |
| **IV** | **Muntenia** | **4297465** | **3892660** | **1400** | **166797** | **166** | **466** | **1756** | **2571** | **51** | **528** | **3** | **1690** | **7** | **499** | **432** | **208** | **4** | **46** | **740** | **155** | **89** | **172** | **1797** | **225229** |
| 1 | Dolj | 660544 | 594841 | 192 | 29839 | 17 | 60 | 46 | 11 | 3 | 99 | 3 | 65 | 3 | 91 | 68 | 60 | * | 4 | - | * | 16 | 134 | 243 | 34747 |
| 2 | Gorj | 341594 | 321686 | 134 | 6698 | 24 | 22 | 11 | 11 | * | 17 | 7 | * | * | 8 | 28 | - | 10 | * | 3 | - | * | - | 48 | 12879 |
| 3 | Mehedinţi | 265390 | 236908 | 153 | 10919 | 13 | 151 | 40 | 10 | - | 996 | * | 6 | 3 | 21 | 16 | 11 | 466 | 3 | 16 | * | 3 | - | 29 | 15624 |
| 4 | Olt | 436400 | 400089 | 66 | 9504 | 5 | 11 | 27 | 7 | - | 6 | - | 5 | * | * | 19 | * | * | 6 | - | * | 3 | 4 | 53 | 26588 |
| 5 | Vâlcea | 371714 | 347806 | 207 | 6939 | 13 | 63 | 42 | 8 | * | 6 | * | 4 | * | 9 | 29 | 8 | * | 3 | * | 3 | * | 3 | 60 | 16503 |
| **V** | **Oltenia** | **2075642** | **1901330** | **752** | **63899** | **72** | **307** | **166** | **47** | **3** | **1124** | **10** | **80** | **6** | **129** | **160** | **79** | **476** | **16** | **19** | **3** | **22** | **141** | **433** | **106341** |
| 1 | Arad | 430629 | 340670 | 36568 | 16475 | 1261 | 2909 | 48 | 33 | 3 | 849 | 4462 | 549 | 10 | 14 | 291 | 116 | 118 | 32 | 21 | 6 | 19 | * | 352 | 25821 |
| 2 | Caraş-Severin | 295579 | 243933 | 2938 | 7272 | 2483 | 2897 | 19 | 28 | - | 5036 | 192 | 27 | 5094 | 9 | 37 | 29 | 1556 | 10 | 3 | - | 7 | 6 | 287 | 23716 |
| 3 | Timiş | 683540 | 550836 | 35295 | 14525 | 5950 | 8504 | 127 | 109 | 16 | 10102 | 1424 | 4478 | 242 | 75 | 341 | 220 | 185 | 65 | 26 | 30 | 151 | 45 | 1404 | 49390 |
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| 1 | Bihor | 575398 | 366245 | 138213 | 34640 | 101 | 735 | 45 | 32 | * | 26 | 6091 | 29 | 3 | 47 | 160 | 176 | 7 | 21 | 14 | 7 | 10 | * | 397 | 28359 |
| **VII** | **Crişana** | **575398** | **366245** | **138213** | **34640** | **101** | **735** | **45** | **32** | * | **26** | **6091** | **29** | **3** | **47** | **160** | **176** | **7** | **21** | **14** | **7** | **10** | * | **397** | **28359** |
| 1 | Maramureş | 478659 | 374488 | 32618 | 112211 | 30786 | 1054 | 25 | 18 | * | 6 | 11 | 4 | 3 | 6 | 52 | 46 | 3 | 8 | * | 8 | 8 | - | 179 | 27123 |
| 2 | Satu Mare | 344360 | 188155 | 112580 | 17388 | 1340 | 5006 | 9 | 6 | - | 15 | 125 | 4 | - | * | 42 | 36 | 20 | 5 | 8 | * | 31 | * | 90 | 19495 |
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| **IX** | **Bucharest City** | **1883425** | **1618883** | **3359** | **23973** | **279** | **1209** | **2315** | **913** | **417** | **205** | **35** | **296** | **10** | **707** | **430** | **1333** | **40** | **160** | **1032** | **565** | **46** | **278** | **6879** | **220064** |
| | **ROMANIA** | **20121641** | **16792868** | **1227623** | **621573** | **50920** | **36042** | **27696** | **23487** | **20282** | **18076** | **13654** | **7336** | **5408** | **3668** | **3203** | **3271** | **2477** | **2543** | **2017** | **1361** | **1536** | **1264** | **18524** | **1236810** |

**Source**: National Statistics Institute, Table 8. Stable population by nationality – counties, cities, towns and rural municipalities.

* Very small numbers (lower than 3).

there are more than 80% Romanians (Călăraşi, Giurgiu, Ialomiţa and Ilfov). In this province, one should mention the situation of Bucharest City, where 85.95% of the inhabitants declared themselves as Romanians, or 1,618,883 out of the total population of 1,883,425 inhabitants of the capital.

The other geographical-historical province of southern Romania – *Oltenia* – is characterized by a weight of over 90% of the Romanian population in four of its counties: Dolj, Gorj, Olt and Vâlcea. In the fifth county, that of Mehedinţi, the percentage of Romanians is only a little below 90%, more precisely 89.27% out of its 265,390 inhabitants.

The western part of Romania corresponds (from West to East) to the Western Plain, the Western Hills, the western part of the Western Carpathians and a sector of the northern Eastern Carpathians and it includes six counties. Due to the historical and social events that took place over a large amount of time, the Romanian population suffered important changes. Therefore, the three counties of *Banat* have a weight of around 80% Romanian population: 79.11% in Arad County (out of 430,629 inhabitants), 82.53% in Caraş-Severin County (out of 295,579 inhabitants) and 80.59% in Timiş County (out of 683,540 inhabitants).

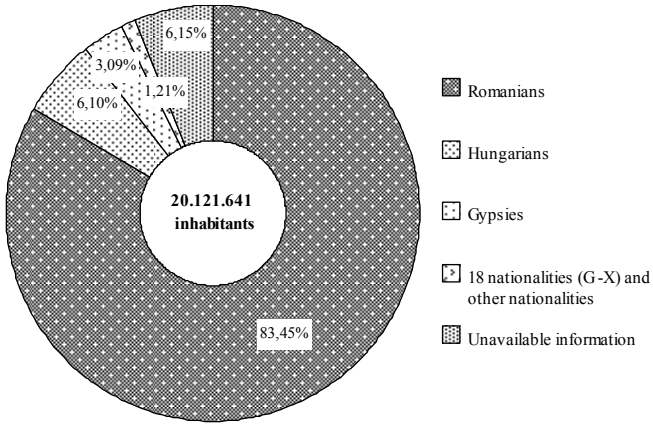


**Fig. 1.** The national structure of the Romanian population at the 2011 census.

To the North, in Bihor County, which corresponds to the geographical-historical province of *Crişana*, in 2011 the Romanians had only 63.65% of the population (366,245 Romanians out of 575,398 inhabitants). The weight is even lower to the North, in Satu Mare County, where the Romanians had a share of only 54.64% (188,155 out of the total of 344,360). However, in the next county, that of Maramureş, the weight of the Romanian population was higher, 78.24% (374,488 Romanians out of the total population of 478,659 inhabitants) as the county includes larger mountain areas, where other national groups hardly adapted.

In the geographical-historical province located inside the Carpathian arch – *Transylvania* – many times properly characterized as the "heart of Romania", the intense colonization with foreign people coming from the West determined a special situation regarding the weight of Romanian population.

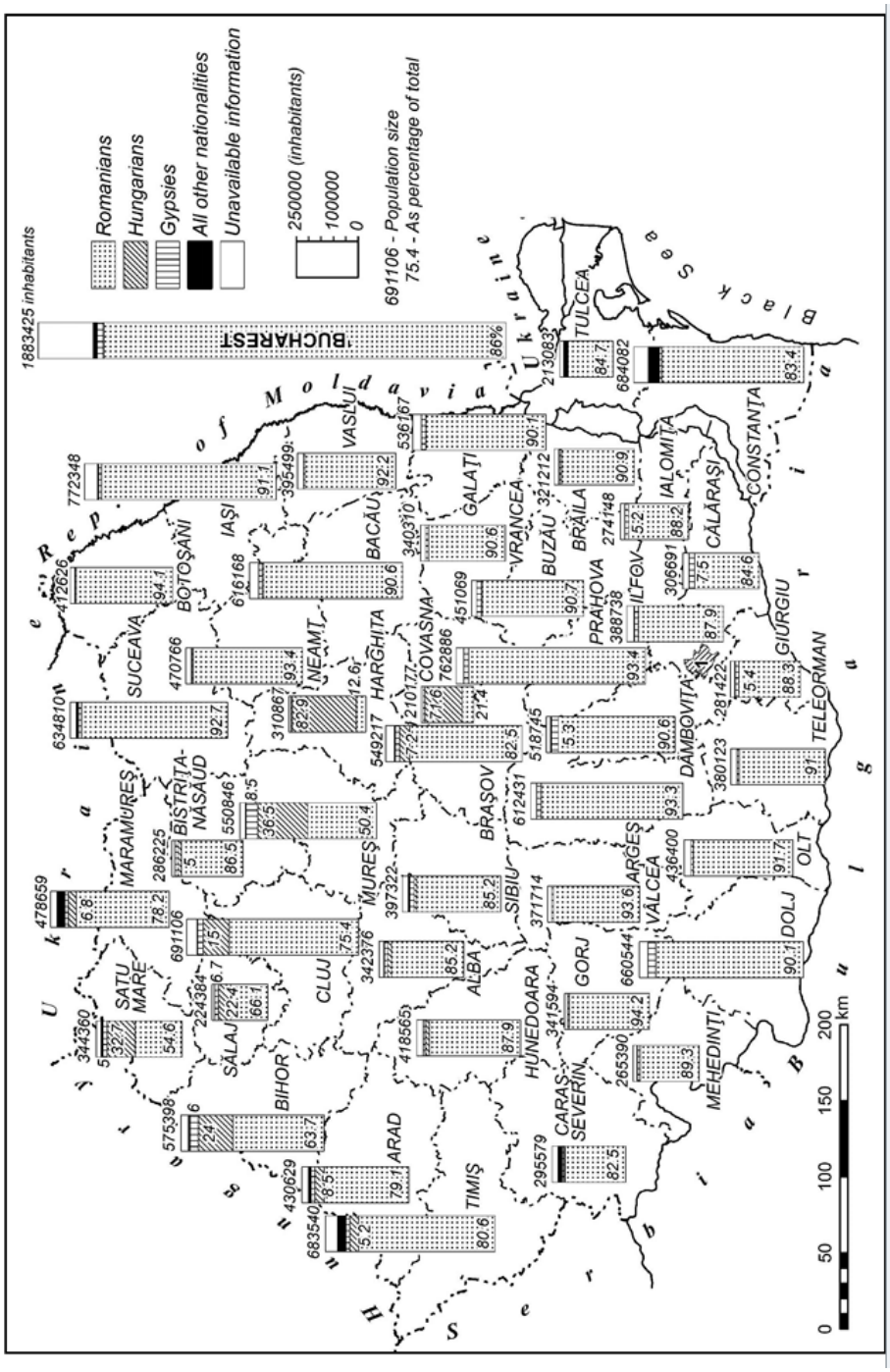


**Fig. 2.** The national structure of the population of Romania, by counties, at the 2011 census.

As a consequence, there is a lower percentage of Romanians in the counties of eastern Transylvania, where Romanians represent only 21.43% in Covasna County (45,021 Romanians out of the total of 210,177) and only 12.61% in Harghita County (out of the total of 310,867 people in this county). Lower weights of the Romanian population have also been registered in the counties of Cluj (75.37% out of 691,106 inhabitants), Sălaj (66.13% out of 224,384 people) and Mureş (50.35% Romanians out of 550,846 inhabitants of this county). In northern, southern and south-western parts of Transylvania, there are five counties with larger mountain areas where the Romanian population exceeds 80%: Bistriţa-Năsăud (86.51% out of 286,225 inhabitants), Braşov (82.54% out of 549,217 inhabitants), Sibiu (85.20% out of 397,322 people), Hunedoara (87.94% out of 418,565) and Alba (85.24% out of the total of 342,376 inhabitants).

Besides the county level, one should also emphasize the situation of the Romanian population in Bucharest City, where it has a weight of 85.95% (1,618,883 inhabitants out of the total of 1,883,425).

In order to have a better perspective on the distribution of the Romanian population, we also analyzed it at the level of the *geographical-historical provinces*. This highlights even more the majority of the Romanian population and fully justifies the national character of the Romanian state.

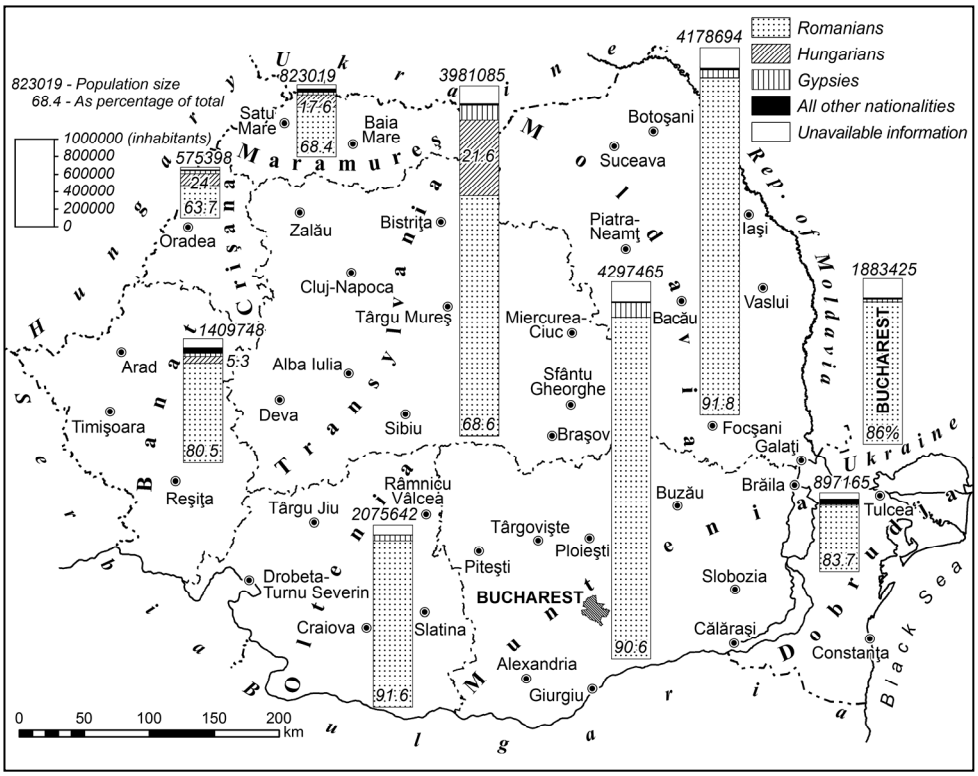


**Fig. 3.** The national structure of the population of Romania, by geographical-historical provinces, at the 2011 census.

Thus, in the eight counties of Moldova, paired from North to South (Suceava and Botoşani, Neamț and Iași, Bacău and Vaslui, Vrancea and Galați), the weight of the Romanian population is 91.74% (3,834,168 Romanians of the total number of inhabitants). The national minorities represent only 2.63% while for 5.13% the information is unavailable. In *Dobrudja*, the national minorities are better represented (8.18% out of the total of 897,165 inhabitants) and the information is not available for a higher number of inhabitants (8.08%), therefore the Romanian population has a weight of only 83.74% in the province bordering the Black Sea.

Regarding *Muntenia*, in its 10 counties (Argeş, Brăila, Buzău, Călăraşi, Dâmboviţa, Giurgiu, Ialomiţa, Ilfov, Prahova, Teleorman), the *Romanians* are also very well represented, 90.58% (3,892,660 people of the 4,297,465 inhabitants of the province). A similar percentage was registered in *Oltenia* (the counties of Dolj, Gorj, Mehedinţi, Olt and Vâlcea), 91.60% or 1,901,330 Romanians out of 2,075,642 inhabitants.

The other four geographical-historical provinces of Romania (Transylvania, Banat, Crişana and Maramureş) are characterized by a specific situation concerning the weight of the Romanian population. In the 10 counties of *Transylvania* (Alba, Bistriţa-Năsăud, Braşov, Cluj, Covasna, Haghita, Hunedoara, Mureş, Sălaj and Sibiu) the weight of the Romanian population was 68.58% in 2011 (2,730,250 people out of the total of 3,981,085 inhabitants). The difference of 31.42% is represented by Hungarians (21.56%), Gypsies (4.23%), other national minorities (0.50% altogether) and unavailable information (5.13%). In western Romania, the Romanian population has 80.54% in *Banat* (the counties of Arad, Caraş-Severin and Timiş, 1,135,439 inhabitants of the total of 1,409,748 inhabitants), 63.65% in *Crişana*, made up by Bihor County alone (362,245 out of 575,398 inhabitants), as a consequence of the higher proportion of Hungarians (24.02%), and 68.38% in *Maramureş*, including Maramureş and Satu Mare counties (562,643 Romanians out of 823,019 people).

### *2. 3. National minorities*

At the 2011 census, besides the Romanian population (83.45% out of the total of 20,121,641 inhabitants), a number of *20 national minorities* were recorded: Hungarians, Gypsies, Ukrainians, Germans, Turks, Russian-Lipovans, Tartars, Serbs, Slovaks, Bulgarians, Croats, Greeks, Italians, Jews, Czechs, Poles, Chinese, Armenians, Csangos and Macedonians. Together, they represent 10.31% (2,073,439 people) of the population of Romania. There are also other national minorities, which together form the category "others" and represent 0.09% (18,524 people). Regarding the distribution of the national minorities across the country, one remarks that they are usually located in the marginal areas of Romania, a situation which is related to the directions where they came from, with some exceptions.

#### *2. 3. 1. The Hungarian minority*

This minority is ranked first among the 20 national minorities registered on the Romanian territory. The Hungarians entered in their present areas of residence gradually, during several centuries. Usually, they live together in normal conditions with the Romanian autochthonous population, both in urban and rural communities. From time to time, however, as a consequence of the emergence of social and economic events at European and regional scale, there are certain tensions, especially due to some of the leaders, which may also disseminate such states to the commoners. It is therefore necessary to assert that such a manner of action does not bring any good to anyone. There are many examples in this sense, either recently or in the past, both in Europe and elsewhere.

The analysis of the national structure of the population of Romania must approach scientifically the real situation regarding the presence of the Hungarian minority in Romania. Lately, the numbers have been over-evaluated in some cases, even in several official papers. For instance, certain Hungarian representatives, inside or outside Romania, frequently assert that there are about two million Hungarians in Romania or even more. In fact, at the 2011 census, only 1,227,623 Hungarians have been officially registered, representing 6.10% of the 20,121,164 inhabitants of Romania.

Regarding the evolution of the Hungarian population between 1930 and 2011, it is noticeable that it increased in absolute numbers from 1,423,459 in 1930 to 1,713,928 in 1977, than it decreased to 1,227,623 inhabitants in 2011. In relative terms however, during the same period, the evolution of the Romanian population and other national minorities determined a gradual decrease of the weight of Hungarians in Romania from 9.97% in 1930 to 6.10% in 2011 (table 3).

**Table 3**

**The evolution of the Romanians and Hungarians in Romania, between 1930 and 2011**

| Year | Total population | Romanians | % | Hungarians | % |
|---|---|---|---|---|---|
| 1930 | 14280729 | 11118170 | 77.85 | 1423459 | 9.97 |
| 1956 | 17489450 | 14996114 | 85.74 | 1587675 | 9.08 |
| 1966 | 19403163 | 16746510 | 86.31 | 1619592 | 8.35 |
| 1977 | 21559910 | 18999565 | 88.12 | 1713928 | 7.95 |
| 1992 | 22810035 | 20408542 | 89.47 | 1624959 | 7.12 |
| 2002 | 21680974 | 19399597 | 89.48 | 1431807 | 6.60 |
| 2011 | 20121641 | 16792868 | 83.45 | 1227623 | 6.10 |

Concerning the distribution of the Hungarians across Romania, as it comes out from the 2011 census data, it is noticeable that they are present almost exclusively in the counties of central and western Romania, belonging to the geographical-historical provinces of Transylvania, Crişana and Maramureş.

In fact, generally, it comes out that the highest weight of the Hungarian population is concentrated along a large strip corresponding to the space where the Hungarians entered this territory, starting from Satu Mare County (32.69% Hungarians) and Bihor County (24.02% Hungarians) and continuing in Transylvania with the counties of Sălaj (22.36% Hungarians), Cluj (14.99%) and then the counties of Mureş (36.46%), Harghita (82.90%) and Covasna (71.59% Hungarians).

For a certain justification of those mentioned above, it is sufficient to point out the weight of the Hungarian population to the North and South of the mentioned strip: Maramureş (6.81% Hungarians), Bistriţa-Năsăud (5.01%), Braşov (7.22%), Sibiu (2.74%), Hunedoara (3.80%), Alba (4.34%) and Arad (8.49%), to which we add the other two counties of Banat, Timiş (5.16%) and Caraş-Severin (0.99%). The high weight of the Hungarians (in fact, Szeklers) in eastern Transylvania is a consequence of their colonization by the Hungarian medieval kings in the three basins of the Eastern Carpathians, Gheorgheni, Ciuc and Braşov, in the upper Mureş and Olt catchments, facing the mountain passes linking Transylvania and Moldova: Ditrău (1036 m), Bicaz (1256 m), Ghimeş (1159 m) and Oituz (866 m).

One step further, it should be mentioned that in the 25 counties of eastern, south-eastern and southern Romania, including the capital city, the Hungarians are almost absent. More than 200 Hungarians have been recorded in the counties of Bacău (4208 Hungarians), Constanţa (450), Argeş (237), Ilfov (242), Prahova (447), Vâlcea (207) and Bucharest City (3359 Hungarians). In the counties of Galaţi, Iaşi, Suceava (in Moldavia), Dîmboviţa (Muntenia), Dolj, Gorj and Mehedinţi (Oltenia), there are between 100 and 200 Hungarians while in all other counties, there are less than 100 Hungarians. The minimum number of Hungarians was recoreded in Teleorman County. Regarding the *relative values* of the Hungarian presence in the counties of Moldavia, Muntenia and Oltenia, it comes out that the percentage of Hungarians is below 0.1%, except for Bacău County (0.68% Hungarians) and Bucharest City – 0.19% (table 4).

Synthetically, we bring forward the issue of the presence of the Hungarian minority in Romania at the level of geographical-historical provinces. Thus, in Transylvania, there are 858,454 Hungarians (21.56% of the inhabitants of the province), in Moldavia only 4,926 (0.12%), in Dobrudja 520 (0.06%), in Muntenia 1400 (0.03%), in Oltenia 752 (0.04%), in Banat 74,801 (5.31%), in Crişana 138,213 (24.02%), in Maramureş 145,198 (17.64%), and in Bucharest City 3,359 Hungarians (0.19%).

**Table 4**

**National Structure of Romania at the 20th October 2011, by Counties and Geographical-Historical Provinces**

| Crt. no. | Counties and geographical - historical provinces | Total population | Romanians | % | Hungarians | % | Gypsies | % | All other nationalities | % | Unavailable information | % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Alba | 342376 | 291850 | 85,24 | 14849 | 4,34 | 14292 | 4,17 | 966 | 0,28 | 20416 | 5,96 |
| 2 | Bistriţa-Năsăud | 286225 | 247627 | 86,51 | 14350 | 5,01 | 11937 | 4,17 | 630 | 0,22 | 11672 | 4,08 |
| 3 | Braşov | 549217 | 453325 | 82,54 | 39661 | 7,22 | 18519 | 3,37 | 3962 | 0,72 | 33750 | 6,15 |
| 4 | Cluj | 691106 | 520885 | 75,37 | 103591 | 14,99 | 22531 | 3,26 | 3388 | 0,49 | 40709 | 5,89 |
| 5 | Covasna | 210177 | 45021 | 21,42 | 150468 | 71,59 | 8267 | 3,93 | 296 | 0,14 | 6117 | 2,91 |
| 6 | Haghita | 310867 | 39196 | 12,61 | 257707 | 82,90 | 5326 | 1,71 | 203 | 0,07 | 8432 | 2,71 |
| 7 | Hunedoara | 418565 | 368073 | 87,94 | 15900 | 3,80 | 7475 | 1,79 | 1885 | 0,45 | 25228 | 6,03 |
| 8 | Mureş | 550846 | 277372 | 50,35 | 200858 | 36,46 | 46947 | 8,52 | 2120 | 0,38 | 23547 | 4,27 |
| 9 | Sălaj | 224384 | 148396 | 66,13 | 50177 | 22,36 | 15004 | 6,69 | 1335 | 0,59 | 9467 | 4,22 |
| 10 | Sibiu | 397322 | 338505 | 85,20 | 10893 | 2,74 | 17946 | 4,52 | 4955 | 1,25 | 25020 | 6,30 |
| **I** | **Transylvania** | **3981085** | **2730250** | **68,58** | **858454** | **21,56** | **168244** | **4,23** | **19740** | **0,50** | **204358** | **5,13** |
| 1 | Bacău | 616168 | 558507 | 90,64 | 4208 | 0,68 | 15284 | 2,48 | 1580 | 0,26 | 36588 | 5,94 |
| 2 | Botoşani | 412626 | 388195 | 94,08 | 38 | 0,01 | 4155 | 1,01 | 1290 | 0,31 | 18942 | 4,59 |
| 3 | Galaţi | 536167 | 482932 | 90,07 | 133 | 0,02 | 16990 | 3,17 | 1193 | 0,22 | 34916 | 6,51 |
| 4 | Iaşi | 772348 | 703422 | 91,08 | 146 | 0,02 | 11288 | 1,46 | 4959 | 0,64 | 52531 | 6,80 |
| 5 | Neamţ | 470766 | 439834 | 93,43 | 98 | 0,02 | 6398 | 1,36 | 580 | 0,12 | 23852 | 5,07 |
| 6 | Suceava | 634810 | 588358 | 92,68 | 183 | 0,03 | 12178 | 1,92 | 10892 | 1,72 | 23196 | 3,65 |
| 7 | Vaslui | 395499 | 364530 | 92,17 | 52 | 0,01 | 5913 | 1,50 | 225 | 0,06 | 24772 | 6,26 |
| 8 | Vrancea | 340310 | 308390 | 90,62 | 68 | 0,02 | 11966 | 3,52 | 242 | 0,07 | 19638 | 5,77 |
| **II** | **Moldavia** | **4178694** | **3834168** | **91,76** | **4926** | **0,12** | **84172** | **2,01** | **20961** | **0,50** | **234435** | **5,61** |
| 1 | Constanţa | 684082 | 570754 | 83,43 | 450 | 0,07 | 8554 | 1,25 | 46139 | 6,74 | 58183 | 8,51 |
| 2 | Tulcea | 213083 | 180496 | 84,71 | 70 | 0,03 | 3423 | 1,61 | 14787 | 6,94 | 14305 | 6,71 |

| Crt. no. | Counties and geographical - historical provinces | Total population | Romanians | % | Hungarians | % | Gypsies | % | All other nationalities | % | Unavailable information | % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **III** | **Dobrudja** | **897165** | **751250** | **83,74** | **520** | **0,06** | **11977** | **1,33** | **60926** | **6,79** | **72488** | **8,08** |
| 1 | Argeş | 612431 | 571149 | 93,26 | 237 | 0,04 | 16476 | 2,69 | 605 | 0,10 | 23964 | 3,91 |
| 2 | Brăila | 321212 | 291899 | 90,87 | 60 | 0,02 | 8555 | 2,66 | 2573 | 0,80 | 18123 | 5,64 |
| 3 | Buzău | 451069 | 409316 | 90,74 | 81 | 0,02 | 20376 | 4,52 | 247 | 0,05 | 21083 | 4,67 |
| 4 | Călăraşi | 306691 | 259310 | 84,55 | 72 | 0,02 | 22939 | 7,48 | 729 | 0,24 | 23638 | 7,71 |
| 5 | Dâmboviţa | 518745 | 470136 | 90,63 | 156 | 0,03 | 27355 | 5,27 | 2440 | 0,47 | 18653 | 3,60 |
| 6 | Giurgiu | 281422 | 248355 | 88,25 | 59 | 0,02 | 15223 | 5,41 | 187 | 0,07 | 17590 | 6,25 |
| 7 | Ialomiţa | 274148 | 241765 | 88,19 | 28 | 0,01 | 14278 | 5,21 | 589 | 0,21 | 17482 | 6,38 |
| 8 | Ilfov | 388738 | 341895 | 87,95 | 242 | 0,06 | 15634 | 4,02 | 3067 | 0,79 | 27897 | 7,18 |
| 9 | Prahova | 762886 | 712886 | 93,45 | 447 | 0,06 | 17763 | 2,33 | 839 | 0,11 | 30951 | 4,06 |
| 10 | Teleorman | 380123 | 345949 | 91,01 | 18 | 0,00 | 8198 | 2,16 | 104 | 0,03 | 25848 | 6,80 |
| **IV** | **Muntenia** | **4297465** | **3892660** | **90,58** | **1400** | **0,03** | **166797** | **3,88** | **11380** | **0,26** | **225229** | **5,24** |
| 1 | Dolj | 660544 | 594841 | 90,05 | 192 | 0,03 | 29839 | 4,52 | 923 | 0,14 | 34747 | 5,26 |
| 2 | Gorj | 341594 | 321686 | 94,17 | 134 | 0,04 | 6698 | 1,96 | 189 | 0,06 | 12879 | 3,77 |
| 3 | Mehedinţi | 265390 | 236908 | 89,27 | 153 | 0,06 | 10919 | 4,11 | 1784 | 0,67 | 15624 | 5,89 |
| 4 | Olt | 436400 | 400089 | 91,68 | 66 | 0,02 | 9504 | 2,18 | 146 | 0,03 | 26588 | 6,09 |
| 5 | Vâlcea | 371714 | 347806 | 93,57 | 207 | 0,06 | 6939 | 1,87 | 251 | 0,07 | 16503 | 4,44 |
| **V** | **Oltenia** | **2075642** | **1901330** | **91,60** | **752** | **0,04** | **63899** | **3,08** | **3293** | **0,16** | **106341** | **5,12** |
| 1 | Arad | 430629 | 340670 | 79,11 | 36568 | 8,49 | 16475 | 3,83 | 11093 | 2,58 | 25821 | 6,00 |
| 2 | Caraş-Severin | 295579 | 243933 | 82,53 | 2938 | 0,99 | 7272 | 2,46 | 17720 | 6,00 | 23716 | 8,02 |
| 3 | Timiş | 683540 | 550836 | 80,59 | 35295 | 5,16 | 14525 | 2,12 | 33494 | 4,90 | 49390 | 7,23 |
| **VI** | **Banat** | **1409748** | **1135439** | **80,54** | **74801** | **5,31** | **38272** | **2,71** | **62307** | **4,42** | **98927** | **7,02** |
| 1 | Bihor | 575398 | 366245 | 63,65 | 138213 | 24,02 | 34640 | 6,02 | 7901 | 1,37 | 28359 | 4,93 |
| **VII** | **Crişana** | **575398** | **366245** | **63,65** | **138213** | **24,02** | **34640** | **6,02** | **7901** | **1,37** | **28359** | **4,93** |
| 1 | Maramureş | 478659 | 374488 | 78,24 | 32618 | 6,81 | 12211 | 2,55 | 32217 | 6,73 | 27123 | 5,67 |
| 2 | Satu Mare | 344360 | 188155 | 54,64 | 112580 | 32,69 | 17388 | 5,05 | 6737 | 1,96 | 19495 | 5,66 |
| **VIII** | **Maramureş** | **823019** | **562643** | **68,36** | **145198** | **17,64** | **29599** | **3,60** | **38954** | **4,73** | **46618** | **5,66** |
| **IX** | **Bucharest City** | **1883425** | **1618883** | **85,95** | **3359** | **0,18** | **23973** | **1,27** | **17149** | **0,91** | **220064** | **11,68** |
| | **ROMANIA** | **20121641** | **16792868** | **83,45** | **1227623** | **6,10** | **621573** | **3,09** | **242767** | **1,21** | **1236819** | **6,15** |

*2. 3. 2. The Gypsy (Roma) minority*

The number of Gypsies, according to the manner of self-identification, registered rather different values in Romania from one census to the other: 242,656 (1.70% of the population) in 1930, only 64,197 in 1966 (0.60%), then reaching 401,087 (1.76%) in 1992, 535,140 (2.47%) in 2002 and 621,573 (3.09%) in 2011. Therefore, the Gypsies represent the second largest minority in Romania, after the Hungarians. They are present everywhere across the country, especially in the large cities and nearby, while their numbers decrease in the farther rural areas. Such a territorial distribution is explained by the habits and occupations of many Gypsies. They are seldom involved in productive activities (mainly as craftsmen) and many of them practice specific kinds of trade and commerce, while some are unemployed. As a consequence, they sometimes contribute to the emergence of social issues, which are difficult to manage, in several states of Western Europe even since 1900. One should underline, however, that there are also cases when they are integrated in the social and economic life of the community. In such situations, the Gypsy families are also resized.

Analyzing the presence of *the Gypsies* across Romania at the level of the geographical-historical provinces and counties, it comes out that the highest weight was registered in the province of *Crişana*, made up by Bihor County only, where the Gypsies have 6.02% (34,640 people) of the total population of 575,398 inhabitants. It is followed by *Transylvania*, where the Gypsies represented 4.23% (168,244 Gypsies out of 3,981,085 inhabitants). Within the province, one remarks the county of Mureş, where the Gypsies had a weight of 8.52%. It is in fact the county with the highest number of Gypsies (46,947) in Romania. Weights higher than 4% are recorded also in this province in the counties of Sălaj (6.69%, 15,004 people), Alba (4.17%, 14,292), Bistriţa-Năsăud (4.17%, 14,350) and Sibiu (4.53%, 17,946 Gypsies). Values close to the average (3.09%) are found in the counties of Braşov (3.37%, 18,519), Cluj (3.26%, 22,531 Gypsies) and Covasna (3.96%, 8,267 people). At the lower end, values under 2% characterize the counties of Harghita (1.71%, 5,326 Gypsies) and Hunedoara (1.79%, 7,475 Gypsies).

In the geographical-historical province of *Banat* there are 38,272 Gypsies (6.10% of the total number of Gypsies in Romania) representing 2.71% of the population of this province. A higher weight was recorded in Arad County (3.83%, 16,475 Gypsies), followed by Caraş-Severin (2.46%, 7,272 persons) and Timiş (2.12%, 14,525 Gypsies).

In the other province of western Romania, *Maramureş*, a number of 29,599 Gypsies was recorded at the census, representing 3.60% of the total number of inhabitants of the province (823,019). At the county level, the Gypsies represented 5.05% in Satu Mare County (17,388 Gypsies out of 344,366 inhabitants) and 2.55% in Maramureş County (12,211Gypsies out of 478,659 inhabitants).

The analysis shows that 45.5% of the Gypsies in Romania live in these four provinces (Transylvania, Banat, Crişana and Maramureş) while the total population of these provinces together represents 33.74% of the total population of the country.

The average weight of the Gypsies in the other four geographical-historical provinces of Romania is close to the national average: 2.85% and 3.09% respectively. The Gypsies represented 2.01% (84,172 people) in *Moldavia*, 1.33% (11,977) in *Dobrudja*, 3.88% (166,797) in *Muntenia* and 3.08% (63,899 Gypsies) in *Oltenia*.

The analysis of the situation in the 26 administrative units of these provinces indicates that the highest weight of Gypsies has been registered in the counties of: Călăraşi (7.48%, 22,939 Gypsies), Giurgiu (5.41%, 15,223), Dâmboviţa (5.27%, 27,355) and Ialomiţa (5.21%, 14,278), followed by counties with a weight above 4%: Buzău (4.52%), Ilfov (4.02%, 15,634), Dolj (4.52%) and Mehedinţi (4.11%), other two having above 3%: Galaţi (3.17%) and Vrancea (3.52%). A weight below 3% Gypsies has been registered in the counties of Bacău, Argeş, Brăila, Prahova, Teleorman and Olt. A weight between 1% and 2% Gypsies has been registered in five of the eight counties of Moldavia - Botoşani (1.01%, the lowest percentage of Gypsies at national level), Iaşi, Neamţ, Suceava and Vaslui, in both counties of Dobrudja - Constanţa and Tulcea and in three out of five counties of Oltenia - Gorj, Olt and Vâlcea, as well as in Bucharest City (1.27%, 23,973 Gypsies out of 1,883,425 inhabitants of the capital). Around the capital, there are important areas where Gypsies are concentrated, as shown above, in the counties of Călăraşi, Dâmboviţa, Giurgiu, Ialomiţa and Ilfov.

As in the case of the Hungarian minority, regarding the presence and number of the Gypsies in Romania, there are many times estimations which go far beyond the scientific norms, unanimously and globally recognized concerning the censuses, which are

based on the principle of *selfidentification*. This means that each person has the right to freely declare whatever he/she likes concerning its ethnicity. *The heteroidentification*, in which the ethnicity of a person is defined by somebody else, perhaps the census clerk, is not allowed and would be totally improper anywhere in the world.

*2. 2. 3. The category of other national minorities*

Together with the Romanians (83.45% of the 20,121,641 inhabitants of the country) and the two main national minorities, the Hungarians (6.10%) and the Gypsies (3.09%), the 2011 census comprises data regarding other *18 national minorities*: Ukrainians (50,920 people, the highest number in this category), Germans, Turks, Russian-Lipovans, Tartars, Serbs, Slovaks, Bulgarians, Croats, Greeks, Italians, Jews, Czechs, Poles, Chinese, Armenians, Csangos and Macedonians (only 1,264 people, the lowest number). There are also 18,524 people of *other ethnicity*, apart from those mentioned. Together, the 18 national minorities sum up a number of 224,243 people, representing 1.11% of the Romanian population, and together with those comprised in the category *other ethnicity* (18,524 people, 0.09%) make up 1.20% (242,767 people) of the population of Romania. Adding the two main national minorities, the Hungarians (1,227,623 inhabitants, 6.10%) and the Gypsies (621,573 inhabitants, 3.09%), one may state that the *national minorities* represent 10.40% of the population of Romania, or 2,091,963 people.

***The Ukrainian minority*** accounted for 50,920 people in 2011 (0.25% of the population of Romania), 10,178 people less than in 2002, a situation which characterizes also other national minorities. The Ukrainians are present in the counties located at the northern, south-western and eastern margins of Romania. It comes out that the highest number and weight is in the *North*, in *Maramureş County* (30,789 Ukrainians, 6.43% of the county population), where they are located in several communes in Vişeu catchment area (Ruscova, Petrova, Poienile de sub Munte, Bistra, Repedea, Leordina). There are also Ukrainians in other northern counties: Satu Mare (1,340 people, 0.39%of the county inhabitants), Suceava (5,916 Ukrainians, 0.93%), where some of them are known also under the name of Hutsuls or Rusyns, and Botoşani (659 people, 0.16%). Therefore, in the geographical-historical province of Maramureş, there are 32,126 Ukrainians (3.90% of the total population of the province), while in the province of Moldavia, if one adds the 180 Ukrainians from the other six counties, their total number is 6,755 or 0.16% of the province population. In *South-West*, more precisely in Banat, 9,694 Ukrainians were recorded, representing 0.69% of the province population. 5,950 Ukrainians (0.87%) are in Timiş County, 2,483 (0.84%) in Caraş-Severin County and 1,261 (0.29%) in Arad County. As for the *eastern part* of the Romania, the Ukrainians are present in Tulcea County (1,083 people or 0.51%). The Ukrainians are located everywhere in the country, but numbers above 200 were registered only in Bucharest City (279 people) and above 100 in Cluj (173), Hunedoara (114) and Bihor (101) counties. There are less than 25 Ukrainians in the counties of Alba, Covasna, Harghita, Neamţ, Vasului, Vrancea, Argeş, Buzău, Călăraşi, Dâmboviţa, Giurgiu, Ialomiţa, Prahova, Teleorman, Dolj, Gorj, Mehedinţi, Olt şi Vâlcea (table 2).

The Ukrainian population reached the Romanian territory in two stages and in two different areas. The first wave came in the 17th century from Galician Mountains and settled in Suceava County on the territory of the settlements Cârlibaba, Ostra, Gemenea and others, preserving up to now the specific features regarding their living, traditions, customs and language. The 18th and 19th centuries correspond to the second wave, which

came from Galicia and present Ukraine and settled in Maramureş County, where one finds the main Ukrainian core in Romania. Due to several factors, specific mainly for the 20th century, many Ukrainians left Maramureş and settled in Banat, where they form the second largest Ukrainian area in Romania.

In order to highlight the presence of Ukrainians on the Romanian territory, it is proper to mention their numbers across the geographical-historical provinces: Transylvania 550 Ukrainians, Moldavia 6,750, Dobrudja 1,177, Muntenia 166, Bucharest 279, Oltenia 72, Banat 9,694, Crişana 101 and Maramureş 32,126 Ukrainians.

***The German minority*** was brought on the present Romanian territory by the Hungarian medieval authorities and by the Habsburg authorities, in two different stages and in two different areas. *The Saxons* were settled during the 12th and 13th centuries in southern and eastern Transylvania while *the Swabians* were colonized during the 18th and 19th centuries in Banat, Crişana and Maramureş. They preserved their identity for a long time, up until recently. To support this, it is enoght to mention that in 1956 there were 384,708 Germans in Romania (2.19% of the population of 17,489,450) and their number decreased to 359,109 in 1977 (1.66% out of 21,559,910 inhabitants). After that, due to the social and economic evolution of Romania, the German minority significantly reduced its weight, after 1980 and especially in 1990 and 1991, when a high number of Germans emigrated to Germany (Gr. P. Pop, 1990). The consequences were reflected at the 1992 census, when the number of Germans in Romania represented only 119,462 people (0.52% of 22,810,035 inhabitants). Their number decreased also afterwards, so that in 2002 there were only 59,764 Germans (0.27% of 21,680,974) and in 2011 only 36,042 (0.18% of the population of Romania).

The few Germans who still live in Romania are located mainly in the same areas as the ones where their ancestors settled initially. So, in the ten counties of Transylvania there are 11,700 Germans (0.29% of the province population and 32.46% of the Germans in Romania). Among the Transylvanian counties, one notices the presence of Germans in Sibiu County (1.07%, 4,244 Germans), Braşov (0.53%, 2,923 Germans), Mureş (0.27%, 1,478), Hunedoara (0.23%, 971), Alba (0.21%, 728), Cluj (0.10%, 687) and Bistriţa-Năsăud (0.15%, 428 Germans), then in the counties of Covasna (114 Germans), Harghita (70) and Sălaj (57). In the geographical-historical province of *Banat* there are 14,310 Germans (1.02% of the province population of 1,409,748 inhabitants). The Germans, known as Swabians, are present in all three counties: Arad (2,909 Germans, representing 0.68% of the total population of 430,629 people), Caraş-Severin (2,897, 0.98%) and Timiş (8,504 Germans, 1.24% of the 683,540 inhabitants). In *Maramureş* there are 6,060 Germans, or 0.74% of the 823,019 inhabitants of this province. Most of them are in Satu Mare County, 5,006 Germans (Swabians) representing 1.45% of the county population, while in Maramureş County there are 1,054 Germans (mainly Zipsers), representing 0.22% of the county population. In *Crişana* (Bihor County), 735 Germans (Swabians) were registered in 2011, representing 0.13% of the total county population of 575,398.

The geographical-historical provinces located to the East and South of the Carpathians have together only 2,028 German nationals, representing 0.02% of their population of 11,438,966. In 2011 there were 1,089 Germans in Moldavia, 166 in Dobrudja, 466 in Muntenia and 307 in Oltenia. Only five counties had more than 100 Germans: Suceava (717), Constanţa (143), Ilfov (111), Prahova (149) and Mehedinţi (151). 1,209 Germans were registered in

Bucharest City, representing only 0.06% of the capital city population of 1,883,425 inhabitants. In 10 counties there were less than 25 Germans: Vaslui (13), Vrancea (10), Tulcea (23), Buzău (19), Călăraşi (13), Giurgiu (18), Ialomiţa (14), Teleorman (5), Gorj (22) and Olt (11).

Many scientific studies have been published regarding the German minority in Romania. The Germans are remarkable for their diligence and contribute to the development of the places where they settled. They also positively influenced the autochthonous population, especially concerning economic activities. As a result, there is a deep regret for the significant reduction of the German population in Romania during the latest decades, considering also the good relations that Germans and Romanians had throughout the times.

***The Turkish minority*** numbered 27,689 inhabitants at the 2011 census, when the Turks represented 0.14% of the total population of Romania. 81.12% of the Turks are concentrated in *Dobrudja*, of which 92.56% are in Constanţa County (20,826 people or 3.04% of the county population) and 7.44% in Tulcea County (0.79% of the county population). In all the other 39 counties and Bucharest City, there were only 5,196 Turks. The situation at the level of the seven geographical-historical provinces is the following: Transylvania 341 Turks, Moldavia 345, Muntenia 1756, Oltenia 166,Banat 194, Crişana 45, Maramureş 34 Turks, while 2,315 Turks have been recorded in Bucharest, representing 8.36% of all Turks in Romania. The higher weight of the Turkish population in Bucharest is a consequence of their recent settlement in the capital city, where they develop trading and food industry activities. More than 100 Turks are present in the counties of Ilfov (538 Turks), Călăraşi (513), Brăila (184) and Prahova (166), while in the counties of Bacău, Galaţi, Iaşi, Argeş, Buzău, Dâmboviţa, Giurgiu and Ialomiţa the number of the Turks is between 50 and 100. In several counties there are less than 20 Turkish nationals: Caraş-Severin (19), Vaslui (12), Gorj (11), Satu Mare (9) and the lowest number, in Sălaj (3 Turks).

***The Russian-Lipovan minority*****,** totaling 23,487 people in 2011, represented 0.12% of the population of Romania. It is characterized by an obvious concentration in three of the geographical-historical provinces as 21,965 people, or 93.52% of the Russians-Lipovans living in Romania, are located either in Dobrudja (13,910 people or 59.22%), Moldavia (5,484 people or 23.35%) and Muntenia (2,571 people or 10.95%). Except for Bucharest City (913 people, 3.89% of all the Russian-Lipovans), the presence of this minority in the other provinces is insignificant: Oltenia (47 Russian-Lipovans, 0.20%), Banat (179, 0.72%), Crişana (45, 0.14%) and Maramureş (24, 0.10%).

At the level of the counties, one remarks that this minority is located in two areas. The first one is made up by the counties of Tulcea (10,342 people, 44.03% of the Russian Lipovans in Romania), Constanţa (3,568, 15.19%) and Brăila (1,940, 8.26%). The second one includes the counties of Iaşi (2,841 Russians-Lipovans and 12.10%) and Suceava (1,721, 7.33%). More than 100 Russians-Lipovans are found in the counties of Botoşani (404 people), Ialomiţa (360), Neamţ (204), Galaţi (180), Timiş (109) and Bucharest City (913 Russians-Lipovans). One notices that in seven other counties the number of Russians-Lipovans was between 50 and 100, in 14 counties between 10 and 50, while less than 10 people belonging to this minority were recorded only in the counties of Vâlcea (8), Satu Mare (6), and less than 3 in Teleorman County (table 2). Regarding the origin of this national minority, one should point out that it reached the Romanian territory following the road on the lower Don River. The change of location was determined by political and religious reasons during the tsarist regime.

***The Tartar minority*** comprises 20,282 inhabitants (0.10% of the population of Romania). It is characterized by a strong concentration in Constanţa County, where there are 19,601 Tartars (96.64% of the total number of Tartars in Romania). There are 119 Tartars in Tulcea County (0.59% of the total Tartar population) and 30 in Ilfov County. In 17 counties there are between 3 and 10 Tartars, in 12 counties less than 3 while this minority is not present in 10 counties.

***The Serbian minority*** includes 18,076 people on Romanian territory (0.09% of the country population). Due to the proximity with Serbia, this minority is concentrated in Banat (15,987 people, or 88.50% of the total number of Serbs in Romania), Oltenia (1,124 people and 6.22%), Muntenia (528 Serbs, 2.92%) and Bucharest City (205 Serbs, 1.13%). In the other provinces, their number is very low: 115 Serbs in Transylvania, 38 in Moldavia, 20 in Dobrudja, 26 in Crişana and 21 in Maramureş. At the county level, the Serbs are mainly present in Timiş County (10,102 Serbs or 55.89% of the total number of Serbs), then in Caraş-Severin County (5,036 Serbs, 27.86%), Mehedinţi 996 (5.51%) and Arad 849 (4.70%), to which one may add the counties of Dâmboviţa - 466 Serbs (2.58%), Dolj 99 (0.54%) and Bucharest City with 205 Serbs (1.13% of the total number of Serbs). Except for Buzău County, where this minority is not present, there are 1 or 2 Serbs in 9 counties, 3 to 20 Serbs in other 20 counties and 20-30 Serbs in other five counties.

***The Slovak minority*** accounted for 13,654 people in 2011 (0.07% of the population of Romania). Almost 90% of the Slovaks live either in Crişana (Bihor County: 6,091 Slovaks, 44.66% of all the Slovaks in Romania) or in Banat (6,078 Slovaks, 44.56%). In Banat they are mostly located in Arad County – 4462 Slovaks or 73.41% of all Banat Slovaks, and in lower numbers in Timiş County – 1424 people (23.43%) and in Caraş-Severin County – 192 Slovaks (3.16% of all Banat Slovaks). A relatively high number of Slovaks is also found in Sălaj County (Transylvania) – 1,118 people (8.19% of all the Slovaks in Romania) and in Satu Mare County – 125 persons (0.92%). In two other counties, their number is over 50: Hunedoara (64) and Cluj (54), there are between 3 and 11 Slovaks in other 11 counties, 1-2 Slovaks in 13 counties and they are absent in 8 counties.

The Slovaks were colonized during the Habsburg period, especially during the 19th century. In Arad and Timiş counties they worked in agriculture. In this manner, for instance they helped the development of the small town of Nădlac, where there are 3,151 Slovaks (43.85% of 7,185 inhabitants). In Bihor and Sălaj counties, the Slovaks were settled in Plopiş and Meseş Mountains to work in the coal (lignite) mines and to prepare the charcoal which was transported to Budapest and Vienna to heat the dwellings.

The following 10 national minorities in Romania are represented by less than 10,000 inhabitants. In descending order, they are the following: Bulgarians (7,336), Croats (5,408), Greeks (3,668), Italians (3,203), Jews (3,271), Poles (2,543), Czechs (2,477), Chinese (2,017), Csangos (1,536), Armenians (1,361) and Macedonians (1,264 inhabitants) (table 2).

A general assessment of these minorities indicates that ***the Bulgarians***, 7,336 people in total (0.04% of the population of Romania), are mainly present in four counties. Thus, 94.18% of the Bulgarians live in the counties of Timiş (4,478 people, 61.04%), Ialomiţa (1,586 Bulgarians, 21.62%), Bucharest City (549 people, 4.03%) and Dolj County (65 Bulgarians). There are between 20 and 50 Bulgarians in other eight counties, 3-20 Bulgarians in other 21 counties and 1-2 Bulgarians in six counties. In three counties (Bistriţa-Năsăud, Harghita and Vrancea) they are absent.

***The Croatian minority*** is made up by 5,408 people on Romanian territory, representing 0.03% of the country population. They are present almost exclusively in *Banat*, when there are 5,336 Croats (98.66% of their total number in Romania). 5,049 Croats live in Caraş-Severin County (94.19%) and 242 in Timiş County (4.47%). 10 Croats are present in Arad County and Bucharest City, 3-5 Croats in other 11 counties, 1-2 Croats in other 11 counties and they are absent from 16 counties: Covasna, Harghita, Sălaj, Bacău, Botoşani, Galaţi, Iaşi, Suceava, Vrancea, Argeş, Brăila, Călăraşi, Giurgiu, Ialomiţa, Teleorman and Satu Mare.

***The Greek minority*** totalizes 3,668 people (0.02% of the total population of Romania). The Greeks are spread all over the country, but in different weights. Their highest number was recorded in 2011 in the counties of Tulcea (1,181 Greeks, 32.20% of all the Greeks in Romania), Bucharest City (707, 19.27%), Constanţa (226, 7.25%), Iaşi (193, 5.26%), Brăila (182, 4.96%) and Galaţi (156, 4.25%). In other 10 counties there were between 20 and 50 Greeks, in other 16 counties between 3 and 20 Greeks, while in four counties (Covasna, Harghita, Olt and Satu Mare) there were less than 3 Greeks. At the level of the geographical-historical provinces, their highest number was recorded in Dobrudja – 1,447 Greeks (39.45% of all the Greeks in Romania), Bucharest – 707 (19.27%), Muntenia 499 (13.60%), Moldavia 478 (13.03%), Transylvania 255 (7.06%), Oltenia 129 (3.52%), Banat 98 (2.67%), Crişana 47 (1.28%) and only 8 in Maramureş (0.22%).

***The Italian minority*** was represented by 3,203 people at the 2011 census (0.02% of the population of Romania). The Italians are present in all the counties of Romania. Their highest number is in Bucharest City (430 Italians) and the lowest number, only 5 people, in Teleorman County.

Regarding the territorial distribution of Italians across Romania, one may point out the following aspects:

- almost half the Italians, or 1,580 people (49.33%), are present in six counties: Hunedoara (115 Italians, 3.58%), Braşov (119, 3.72%), Cluj (154, 4.81%), Bihor (160, 5.00%), Arad (261, 8.15%), Timiş (341, 10.65%) and in Bucharest City (430 Italians, 13.42%); there are between 50 and 100 Italians in 16 counties, between 20 and 50 Italians in 11 counties, while there are less than 20 Italians in eight counties: Covasna (16 Italians), Harghita (3), Vaslui (18), Călăraşi (18), Giurgiu (8), Teleorman (5), Mehedinţi (16) and Olt (19 Italians);

- concerning the distribution of the Italians at the level of geographical-historical provinces of Romania, it comes out that Transylvania is ranked first with 682 Italians (21.29% of all the Italians in Romania), followed in descending order by Banat (669 Italians, 20.89%), Moldavia (459, 14.33%), Muntenia (432, 13.49%), Bucharest City (430, 13.42%), Oltenia (160, 5.00%), Crişana (160, 5.00%), Dobrudja (117, 3.65%) and Maramureş (94 italieni, 2.93% of all the Italians in Romania).

***The Jewish minority*** registered at the analysed a number of 3,271 people, representing about 0.02% of the population of Romania. Regarding their territorial repartition, this minority is characterized by a specific concentration due to their high number in the capital city of Bucharest, where there are 1,333 Jews, representing 40.75% of all the Jews recorded in Romania. At the level of geographical-historical provinces, in descending order, the situation is the following: Moldavia 15.32% (501 persons), Transylvania 14.67% (480), Banat 11.16% (365), Muntenia 6.42% (210), Crişana 5.38% (176), Maramureş 2.51% (82), Oltenia 2.48% (81) and Dobrudja 1.31% (43 Jews). The analysis of this national

minority at the county level indicates that, after Bucharest City, the highest number of Jews is found in the counties of Iaşi 6.76% (221 Jews), Timiş 6.73% (220), Cluj 5.66% (185), Bihor 5.38% (176), Arad 3.55% (116) and Ilfov 3.49% (114 Jews). There were between 51 and 100 Jews registered in six other counties: Braşov, Mureş, Botoşani, Galaţi, Suceava and Dolj, between 21 and 50 Jews in ten counties, between 3 and 20 in 15 counties, 1 or 2 Jews in Ialomiţa and Olt, while in Teleorman and Gorj they are completely absent.

***The Czech minority*** numbered 2477 people on Romanian territory in 2011 (0.01% of the total population), of which 2,421 people (97.74%) are concentrated in five counties: Caraş-Severin 1,556 Czechs (62.82% of all the Czechs), Mehedinţi 466 (18.81%), Timiş 185 (7.47%), Arad 118 (4.76%), Satu Mare 20 people (0.81%) and Bucharest City 40 (1.61%). There are between 3 and 20 Czechs in 11 counties, 1 or 2 Czechs in other 15 counties while this minority is not present at all in 11 counties. At the level of the geographical-historical provinces, it comes out that 94.25% of the Czechs in Romania (2,335 people) live in Banat (1,859 people) and Oltenia (476 Czechs).

***The Polish minority*** represented 0.01% of the total population of Romania, counting 2,543 people at the 2011 census. The Poles are characterized by a very high territorial concentration as 75.58% of them are located in Suceava County (1,922 Poles), followed by Bucharest City with 160 people (6.29% of all the Poles in Romania). Compared to this, there are lower numbers of Poles in other counties: between 31 and 70 in three counties, Timiş (65 Poles), Hunedoara (51) and Arad (32 Poles); between 11 and 30 Poles in ten counties (Braşov, Cluj, Mureş, Sibiu, Bacău, Iaşi, Constanţa, Ilfov, Prahova and Bihor); between 3 and 10 Poles in other 20 Romanian counties (table 2). In three counties (Brăila, Giurgiu and Ialomiţa) there are no Poles while in other four counties (Vaslui, Buzău, Teleorman and Gorj) there are less than 3 Poles.

At the level of the geographical-historical provinces, including Bucharest City, one remarks the same concentration of Poles in Moldavia – 1,977 people (77.74% of their total number in Romania), followed by 172 Poles (6.76%) in Transylvania, 160 (6.29%) in Bucharest City, 107 (4.21%) in Banat, then down to 13 Poles in Maramureş.

***The Chinese minority*** includes 2,017 people on the Romanian territory, representing only 0.01% of the population of Romania. It is characterized by a specific situation, because 84.93% (1,713 people) of the Chinese in Romania reside in Bucharest City (1,032 people, 51.17%) and Ilfov County (681 Chinese, 33.76%). In Hunedoara County (60 Chinese) and Buzău County (32 people) are between 31 and 60 Chinese, then there are between 11 and 30 Chinese in other six counties, between 3 and 10 in other 18 counties (from 3 Chinese in Dâmboviţa, Prahova, Gorj and Caraş-Severin counties to 10 Chinese in Iaşi County), less than 3 Chinese in the counties of Covasna, Harghita, Neamţ, Vrancea, Vâlcea and Maramureş while in the counties of Sălaj, Botoşani, Tulcea, Brăila, Ialomiţa, Teleorman, Dolj and Olt this minority is not present.

Regarding the distribution of the Chinese by geographical-historical provinces, Muntenia is ranked first with 36.96% (740 people of the total of 2,017 Chinese in Romania), followed by far by Transylvania (109 people, 5.50%), Banat (50, 2.48%) and down to Maramureş (only 8 Chinese).

***The Armenian minority*** is part of the category of national minorities in Romania with less than 1,500 inhabitants. At the 2011 census, there were 1,361 Armenians, representing 0.01% of the population of Romania. The analysis of their territorial

distribution indicates that their highest number was registered in Bucharest City (565 Armenians, 41.51% of the total number of Armenians), followed by the counties of Constanţa (19.32% and 263 persons), Cluj (4.85%, 66), Ilfov (4.56%, 62) and Tulcea (4.26%, 58 Armenians). Altogether, there were 1,014 Armenians recorded in all these administrative units, representing 74.50% of all the Armenians at national level. All the other 347 Armenians (25.50%) were scattered in the counties of Argeş (35), Timiş (30), Bacău (29), Galaţi (29) and Suceava (22), as well as in other 17 counties where their number was between 3 and 20 and in other 10 counties where there were less than 3 Armenians. This minority is absent in four counties (Braşov, Teleorman, Gorj and Caraş-Severin).

The analysis of the territorial distribution of Armenians by geographical-historical provinces indicates that, apart from the city of Bucharest, their highest number is in Dobrudja (321 people, 23.59% of the Armenians in Romania), followed by Muntenia (157, 11.54%), Moldavia (134, 9.85%), Transylvania (124, 9.11%), Banat (36, 2.65%), Maramureş (9, 0.66%), Oltenia (8, 0.59%) and Crişana (7, 0.51%).

***The Csango minority*** recorded different values from one census to another, depending on the manner of self-identification of this population. In 2002 there were only 1,266 Csangos, while in 2011 their number increased to 1,536 (0.01% of the total population of Romania). More than half of them are located in Bacău County, 829 people (53.97% of all the Csangos in Romania), then they are present in Timiş (151, 9.83%), Covasna (83, 5.40%) and Bucharest City (46, 2.99%). Except for the counties of Vaslui and Ialomiţa where there are no Csangos, they were registered in all the counties of Romania. There were between 21 and 50 Csangos in six counties (Braşov, Harghita, Prahova, Ilfov, Constanţa, Satu Mare) as well as in Bucharest City, between 3 and 20 Csangos in 23 counties and less than 3 Csangos in seven counties Bistriţa-Năsăud, Botoşani, Vrancea, Buzău, Călăraşi, Gorj and Vâlcea).

A synthetic view of the Csango presence on the Romanian territory at the level of geographical-historical provinces shows that Moldavia has a special position, as there were 858 Csangos registered there (55.86% of all the Csango nationals), followed by 235 Csangos (15.30%) in Transylvania, 177 (11.52%) in Banat, 93 (6.05%) in Muntenia, 52 (3.39%) in Dobrudja, 39 (2.54%) in Maramureş, 26 (1.69%) in Oltenia, 10 (0.65%) in Crişana and 46 (2.99%) in Bucharest City.

***The Macedonian minority*** comprised 1,264 people at the 2011 census, representing only 0.01% of the population of Romania. The analysis at the county level shows that a number of 1150 Macedonians (90.98%) reside in the counties of Constanţa (503 people, 39.79% of the total of 1,264), Dolj (134, 10.60%), Ilfov (64, 5.06%), Tulcea (59, 4.67%), Timiş (45, 3.56%), Brăila (35, 2.77%), Călăraşi (32, 2.53%) and in Bucharest City (278, 21.99%). There are 28 Macedonians in Ialomiţa County, between 3 and 20 in other 12 counties, while in 11 counties (Alba, Harghita, Sălaj, Botoşani, Neamţ, Teleorman, Gorj, Mehedinţi, Bihor and Maramureş) there are no Macedonians whatosever.

A general perspective at the level of geographical-historical provinces, taking into account also the city of Bucharest as a separate entity, points out the following ranking: Dobrudja (562 Macedonians, 44.46% of their total number of 1,264), Bucharest City (278, 21.99%), Muntenia (174, 13.77%), Oltenia (145, 11.47%), Banat (51, 4.03%), Transylvania (29, 2.29%), Moldavia (21,1.66 %), Crişana (2, 0.16%) and Maramureş (2 Macedonians, 0.16%).

***The category of other national minorities*** includes 18,524 people (0.09% of the 20,121,641 inhabitants of Romania). They present different values from one geographical-historical province to another and from one county to another. At the county level, more than 1,000 people in this category have been registered in the counties of Cluj (1,715 people, 9.26% of the total of 18,524), Timiş (1,404, 7.58%), Iaşi (1,300, 7.02%), Ilfov (1,015, 5.48%) and in the city of Bucharest (6,879, 37.14%). In these units altogether, the number of people belonging to this category amounted to 12,313 persons, or 66.47% of all those included in this category in Romania. In Constanţa, there were 654 people of other ethnicity (3.53%), in other 17 counties their number varied between 100 and 500, while less than 100 people of this category were recorded in other 18 counties.

Regarding the territorial distribution of the inhabitants belonging to other national minorities at the level of the capital city and the eight geographical-historical provinces, it comes out that more than one third were recorded in Bucharest, 6,879 people (37.14% of all the people in this category). In descending order, the situation in the geographical-historical provinces was the following: Transylvania (3,166 people, 17.09%), Moldavia (2,754, 14.87%), Banat (2,043, 11.03%), Muntenia (1,797, 9.70%), Dobrudja (786, 4.24%), Oltenia (433, 2.34%), Crişana (397, 2.14%) and Maramureş (269, 1.45%).

***Unavailable information.*** It is, to our "modest" understanding, an indicator which has no relevance in the assessment of the situation requested when pereforming a census of the population of any territory. In this case, one cannot evaluate the national structure of this population. Moreover, it should be underlined that this is the first time for a census in Romania when those responsible for this action come out with such a category, "unavailable information", and it is not the case of just a few people, but more than 1 million inhabitants. Without insisting more on this issue, it is our opinion that such a situation was possible for political reasons, due to the referendum of 2012, when the 2011 census data was released and the population of Romania needed to be larger in order to cancel the referendum results for the lack of minimum turnout.

Disregarding this unusual situation, at the end of the analysis, a few points should be made on the category "unavailable information" which concerns 1,236,810 people (6.15% of the 20,121,641 inhabitants of Romania).

At the level of the counties, more than 40,000 people have been listed in the category "unavailable information" in Constanţa (58,183 people, 4.70% of all people in this category), Iaşi (52,531, 4.25%), Timiş (49,390, 3.99%), Cluj (40,709, 3.29%) and the highest number was recorded in Bucharest City (220,064 people, 17.79%). In other 22 counties there were between 20,000 and 40,000 people ascribed to this category: five counties in Transylvania, five in Moldavia, six in Muntenia, two in Oltenia, two in Banat and one in Crişana and Maramureş. There were between 10,000 and 20,000 inhabitants for whom the information regarding their ethnicity was unavailable in other 12 counties: one in Transylvania, two in Moldavia, one in Dobrudja, two in Muntenia, three in Oltenia and one in Maramureş. The lowest number of such people, less than 10,000, was registered in only three counties: Sălaj (9,467, 0.77% of all the people in this category), Harghita (8,432, 0.68%) and Covasna (4,117, 0.33%), all of them in Transylvania. At the level of geographical-historical provinces, the descending order in terms of people belonging to this category is: Moldavia (234,435 people, 18.95% of the total of 1,236,810) Muntenia

(225,229, 18.21%), Transylvania (204,358, 16.52%), Oltenia (106,341, 8.60%), Banat (98,927, 8.00%), Dobrudja (72,488, 5.86%), Maramureş (46,618, 3.77%), Crişana (28,359, 2.29%), to which one should add Bucharest City (220,064, 17.79%).

## 3. CONCLUSIONS

The first author's very long teaching and research experience in the academic field of Human Geography of Romania, materialized in rich and relevant scientific studies including the detailed ones concerning the 1992 and 2002 censuses, allowed and even obliged us to assess also the results of the 20 October 2011 census.

The first aspect that needs to be highlighted is the obvious population decline between 1992 and 2011. The population of Romania decreased from 22,810,035 inhabitants in 1992 to 21,680,974 in 2002 and to only 20,121,641 in 2011, meaning a loss of 2,688,294 inhabitants or 11.79% in less than 20 years.

Concerning the national structure in 2011, it comes out that 83.45% (16,792,868 inhabitants) are *Romanians*, 6.10% (1,227,623) are *Hungarians* and 3.09% (621,573) are *Gypsies*. Apart from the Hungarians and Gypsies, other 19 national minorities were registered separately at this census which, together with the people included in the category "other national minorities", accounted only for 1.23% of the total population (242,767 persons). A more detailed look at these national minorities indicates that the highest number is that of the *Ukrainians* (50,920 people, 0.25%) and the lowest number is that of the Macedonians (1,264 people, 0.01%). The Germans, Turks, Russians-Lipovans and Tartars are between 20,000 and 50,000, the Serbs and the Slovaks between 10,000 and 20,000, while the Bulgarians, Croats, Greeks, Italians, Jews, Czechs, Poles, Chinese, Armenians and Csangos are less than 10,000. The people belonging to other national minorities than those mentioned are altogether 18,524 (0.09% of the population of Romania).

An attempt to compare the national structure of the population in 2002 and the one in 2011, considering also the general demographic decline, points to significant changes. For instance, the Romanian population declined from 89.48% (19,399,597 people) in 2002 to 83.45% (16,792,868) in 2011, meaning a loss of 6.03% (which may be compensated at least partly from the 6.15% people with "unaivable information"). The Hungarians also registered a decline by 0.5% from 6.60% (1,431,807 persons) in 2002 to 6.10% (1,227,623) in 2011. On the contrary, the Gypsies increased their weight and also their number by 86,433 people, from 2.45% (535,140 Gypsies) in 2002 to 3.09% (621,573 people) in 2011.

The other national minorities characterized by a lower and higher decline in weight and number between the two censuses. For instance, the *Ukrainians* represented 0.28% (61,098 people) in 2002 and only 0.25% (50,920 people) in 2011, the Germans declined from 0.28% (59,020) to 0.18% (36,042), the Turks from 0.15% (32,098) to 0.14% (27,698), the Russians-Lipovans from 0.17% (35,791) to 0.12% (23,487), the Tartars from 0.11% (23,935) to 0.10% (20,282), the Serbians from 0.10% (22,561) to 0.09% (18,076) and similar situations characterize the Slovaks, Bulgarians, Croats, Greeks, Italians, Jews, Czechs, Poles, Chinese, Armenians and Macedonians, with the exception of the Csangos who increased their number.

At the end of the conclusions, it is necessary to mention several shortcomings in the preparation of the study and the assessment of the results:

- the marking with an asterisk where the number of people was lower than three led to less precise calculations regarding the number of specific national minorities at the level of geographical-historical provinces and of the counties;

- in the final part of the table, the last column is that of "*Unavailable information*", which has no relevance because it brings nothing related to the national structure of the population. Moreover, the presence of this category determined lower weights of most nationalities and especially the representative ones;

- there is a certain need to raise the level and precision of the census data regarding the national structure of the population. Therefore, it is the first author's opinion that the ancestry may also be registered in the next census, apart from ethnicity or instead of it.

## REFERENCES


1. Bodocan, V. (2001), *Etnie, confesiune şi comportament electoral în Transilvania. Studiu Geografic*, Edit. Presa Universitară Clujeană, Cluj-Napoca.
2. Creţan, R. (1999), *Etnie, confesiune şi comportament electoral în Banat, Studiu Geografic (Sfîrşitul sec. al XIX-lea şi sec. al XX-lea),* Tipografia Universitatea de Vest, Timişoara.
3. Ilieş, Al. (1988), *Etnie, confesiune şi comportament electoral în Crişana şi Maramureş (Sfârşitul sec. XIX şi sec. XX),* Edit. Dacia, Cluj-Napoca.
4. Ipatiov, F. (2001), *Ruşii-lipoveni din România. Studiu de Geografie Umană*, Edit. Presa Universitară Clujeană, Cluj-Napoca.
5. Pop, Gr. (1972), *România. Geografie Economică, Partea I-a,* Institutul Pedagogic, Oradea.
6. Pop, Gr. (1986), *România. Geografie Economică, Partea I-a*, Ediţia a II-a, Universitatea din Cluj-Napoca.
7. Pop, P.Gr. (1990), *Unele probleme ale emigraţiei româneşti*, Studia UBB, Geographia, 2, Cluj-Napoca.
8. Pop, P.Gr. (1991), *The National Structure of Romania's Population*, Studia UBB, Geographia, 2, Cluj-Napoca.
9. Pop, P.Gr. (1993), *Ancestry of the Population in the United States (1990 Census),* Studia UBB, Geographia, 2, Cluj-Napoca.
10. Pop, P.Gr. (2004), *Structura etnică a populaţiei României*, *în anul 2002,* Revista Română de Geografie Politică, Anul VI, nr. 1-2, Edit. Universităţii din Oradea.
11. Pop, P.Gr. (2011), *The Geographical-Historical Provinces of Romania*, Studia UBB, Geographia, LVI, 1, Cluj-Napoca[1].
12. Pop, P.Gr. (2012), *Provinciile Geografico-Istorice ale României*, COLUMNA Revistă a Asociaţiei cultural-ştiinţifice „Dimitrie Ghika – Comăneşti", nr. 2/2012, Supliment al revistei Studii şi Comunicări/DIS a Diviziei de Istoria Ştiinţei a CRIFST al Academiei Române, p. 87-106, 20 p., Editura Mega, Cluj-Napoca.
13. Rusu, R. (2007), *Organizarea spaţiului geografic în Banat*, Edit. Mirton, Timişoara.


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# THE RUPESTRIAN PLACES OF ALUNIŞU – POSSIBLE TOURISM GEOMORPHOLOGICAL SITES

**I. A. IRIMUŞ[1], D. IRIMIA[1]**

**ABSTRACT.** – **The Rupestrian Places of Alunişu – Possible Tourism Geomorphological Sites.** The existence of sandstones on very large areas in this region, corroborated with the fact that it appears in daylight in many places, has allowed man to make it profitable. The Kliwa sandstones specific to this area have been used in two different ways: firstly in a traditional manner, where the rock is used as a construction material and secondly, shaping it in situ. The friability of the sandstone deposits and the moderate compaction degree has enabled man to mould it even in a rudimentary manner specific to the Paleolithic or the Neolithic era. During the Middle Ages, on the background of the religious and political strains, a rather religious use of these places is recorded, also sustained by the climate and the morphology of the region. The low erosion rate, the isolation and a very difficult access have allowed great preservation in time and their turning into historical sites of great value. The anthropogenic factor completes, by its presence and by the activities deployed in the perimeter of this archeological site, the matrix of interactions between the physical and the environment made human in this way; man has changed the structure and the function of some of these religious places (churches and others) from the sandstone deposits, and this fact enabled us to identify the evolution of this site by geomorphological criteria, a process simultaneous with the historical research. Due to the anthropogenic influence and the natural one, these geosites have gained a scientific, social, cultural, economic and tourism value as well as other additional values, which have turned them into geomorphosites.

***Keywords:*** *geomorphosite, the Kliwa tile, geomorphological characteristics, amenities, religion.*

## 1. INTRODUCTION

The region with the rupestrian places is located in the central-northern region of Buzău Subcarpathians. It may be taken as a quadrangle having Mount Ivăneţu as the northern side, the West side along the village of Alunişu, the eastern side passing through the villages of Găvanele and Fişici and the southern side including the villages of Văvălucile and Scăieni (fig. 1). Located on the territory of Buzău County, the studied area is known as the area of rupestrian places of Alunişu – Nucu – Fişici – Ruginoasa. From the administrative point of view, they are part of the territory of Colţi, Bozioru and Brăieşti communes (fig. 2). From the point of view of tourism, they are perhaps the most important

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objectives in Buzău County. There are churches carved in the blocks of sandstone, which appear on the surface as erosion witnesses, many of them being former cult locations and serving throughout the time as places of shelter and tabernacles.

Their number is impressive as they are around 30, having different sizes and meanings (fig. 3). The zone is remarkably wild and large, and most of the time markings and maps are useless in the absence of a local guide. They are located on the slopes of the hills or on the valley bottoms, rather far away from one another, in areas with variable accessibility.

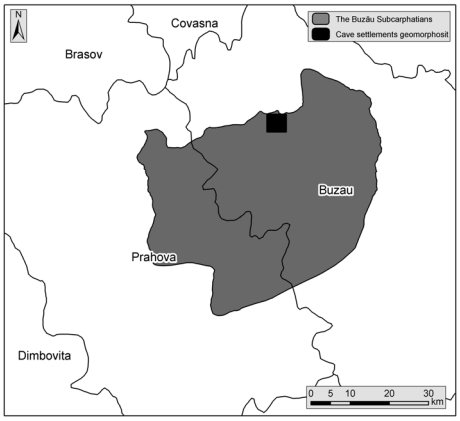


**Fig. 1.** Cave settlements – location in Buzău Subcarphatians.

**Fig. 2.** Piatra Îngăurită.

## 2. GEOLOGY OF THE AREA

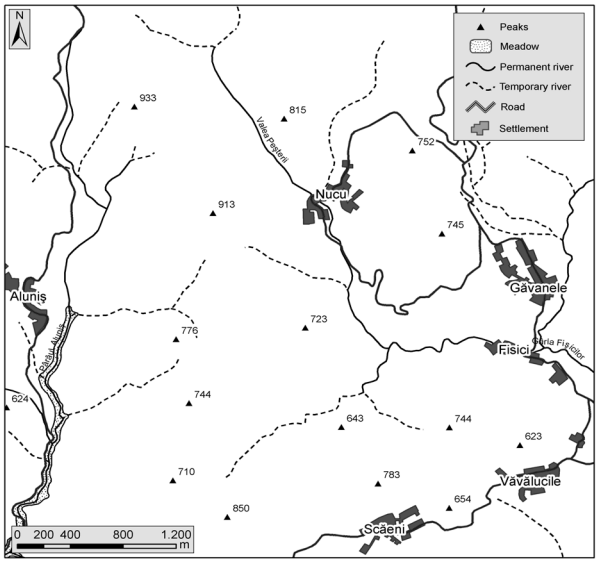


**Fig. 3.** Cave settlements – location.

The studied area is located at the contact with Ivăneţu Mountain. It consists mostly of Paleogene flysch, and the area of the spring basins contains strata of the lower Miocene. The structure of the zone, of complex sediments having different thicknesses and extensions and resistant to the external factors has favored the selective transformation of the slopes by different processes on small spaces (*Geografia României*, IV, page 293).

From the morpho-structural point of view, Buzău Subcarpathians are divided into three zones (L. Badea, Gh.Niculescu, 1964): the monoclinal Levantine-Quaternary zone (at the exterior); the morphostructural pliocene (in the central area); the strongly faulted mio-pliocene zone (on the interior). The studied area is part of the morphostructural mio-pliocene area. Studying the geological map (Ioana Pană, 1966, scale 1:100000), more precisely the structure of Buzău Subcarpathians, the following conclusions have been drawn with respect to the studied zone (fig. 4):

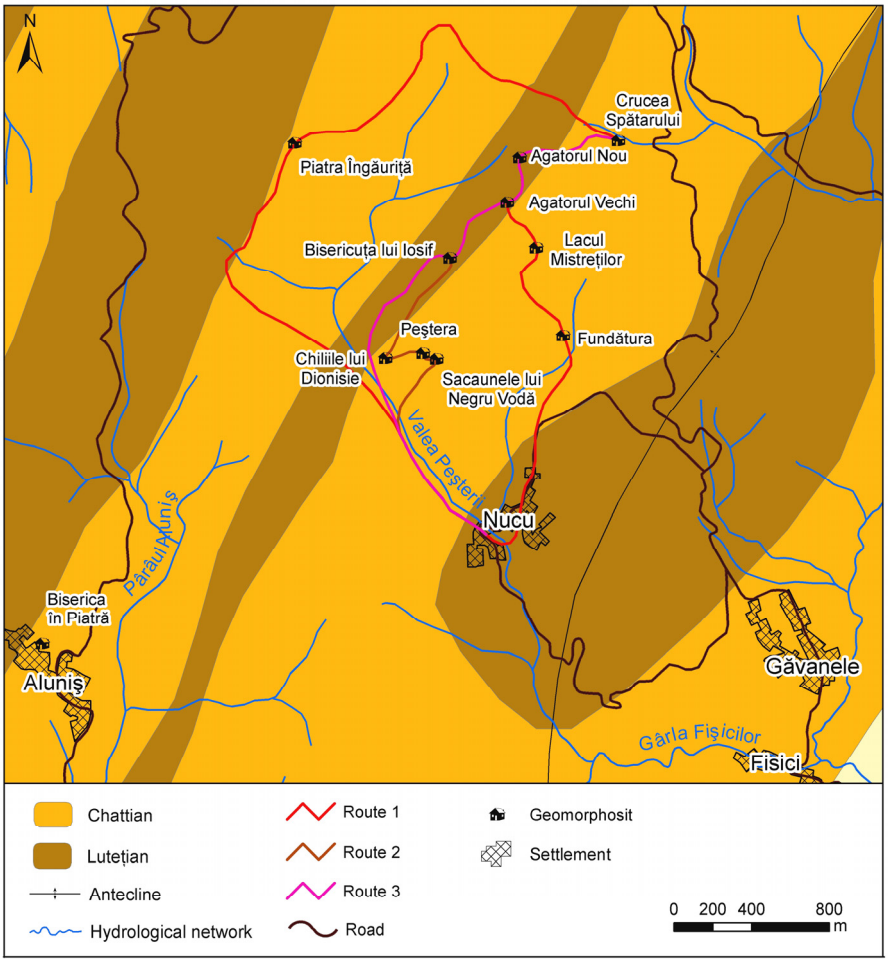


**Fig. 4.** Geological sketch - cave settlements.

- the oldest strata are composed of the Paleogene flysch, located in the Northern Subcarpathians, at the contact with the mountain area. They are represented by rough sandstones having Paleocene-Eocene age. In this area there are also Oligocene deposits composed of Kliwa sandstone, silicious, disodile and menilite sands. In the Burdusoaia peak there are diatomites and along the Văvălucile-Brăești depression there is a long discontinuous strip of saccharoid plaster stones, sandstones and clays of Aquitanian age;

- the Helvetian deposits are made of deciduous marl, argillaceous sands and sands;
- the Badenian deposits appear in the depression areas, influenced by the mass displacement processes. They are composed of tuffaceous marls, argillaceous marls and sand marls;
- the Sarmatian deposits are located in the area of high hills. The lower Sarmatian is made of concretion sandstones, weakly cemented raw sands, intercalated with clays; the Middle and Upper Sarmatian is represented by gritty sands altering with the packs of marls and clays.

## 3. GEOMORPHOLOGICAL CHARACTERISTICS

The region has been under constant raising and faulting movements of great amplitude and intensity. The erosion has taken place differently, revealing the structure of the landforms.

From the altitude point of view, the area is higher in the northern side, having a maximum of 933 m. In the South it reaches a height of over 620 m, while the minimum height is 405 m (fig. 5).

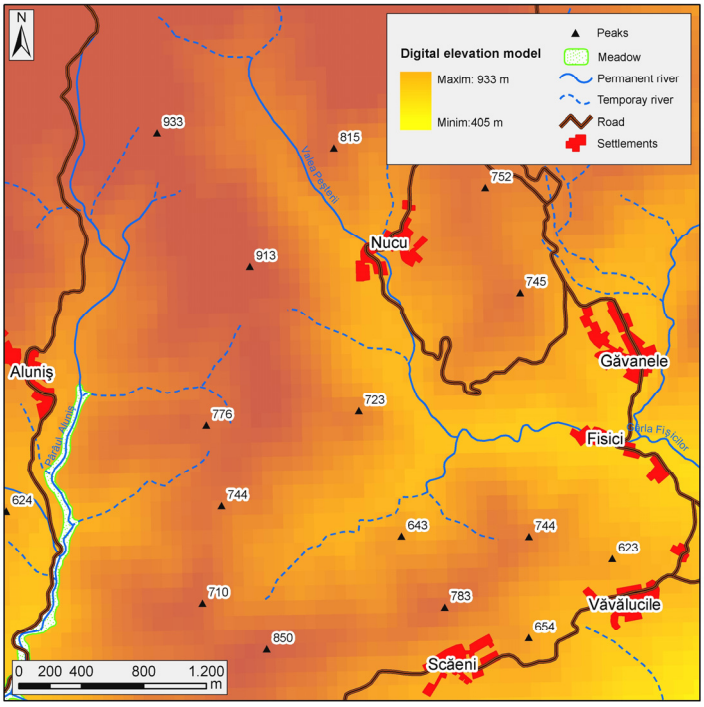


**Fig. 5.** Hypsometric map.

If the northern side of the Ivăneţu slope is fragmented, the Southern side of the contact with the studied area is marked by the presence of disolidic schists at the basis of Kliwa sandstones.

They have led to landslides, accelerating thus the evolution of the eroded slopes of the larger valleys into local depressions where human settlements have been built: Ruginoasa, Nucu, Aluniş, Fişici, Găvanele, Văvălucile and Scăeni.

The area is crossed by numerous brooks or temporary streams which have a strong impact on the landform transformation. The rupestrian sites are located in the area of the large rivers.

The prevalent rocks are sandstones and clayish marls. They form facieses oriented towards North-East – South-West.

**Fig. 6.** Schitul Fundătura.

The eocene sandstones are found in the area of Colţi - Alunişu, disposed in narrow layers (they are curvi-cortical sandstones and green sandstones). The layers of Oligocene rocks alternate with the Eocene ones. They cover a large area and have a complex lithology.

The Kliwa sandstones are characteristic for the area. Their presence on the upper part of the hills has contributed to the maintenance of the altitude and the emergence of the rupestrian places.

The sandstone intercalations have revealed the complex morphological structure. The southern part of the region belongs to Neogene (fig. 6).

The petrographic relief is remarkable due to both structural and lithological structures. In the studied perimeter there are petrographic facieses present that show local differences related to the thickness of layers, massiveness, homogeneity, permeability and solubility (fig. 7).

Two lithological types are dominant in the studied area:

- Landforms developed on clayish marl and Kliwa sandstones. The slopes have an active dynamics with processes of sliding and flowing;
- Landforms developed on weakly fortified sands and talus, in the South of the region where the concretions and the rolls are located.

From the point of view of the structure, the area is an anticline with numerous cuestas, structural basins and

**Fig. 7.** Agatonu Nou.

synclinal zones in the South. The deepening of the generation of rivers led to the formation of basins, secondary cuestas and to erosion.

The region is subject to some geomorphological processes of small intensity. The gravitational processes are extremely frequent in the studied area (fig. 8). The landslides are frequent both in the area of the large rivers and on the slopes.

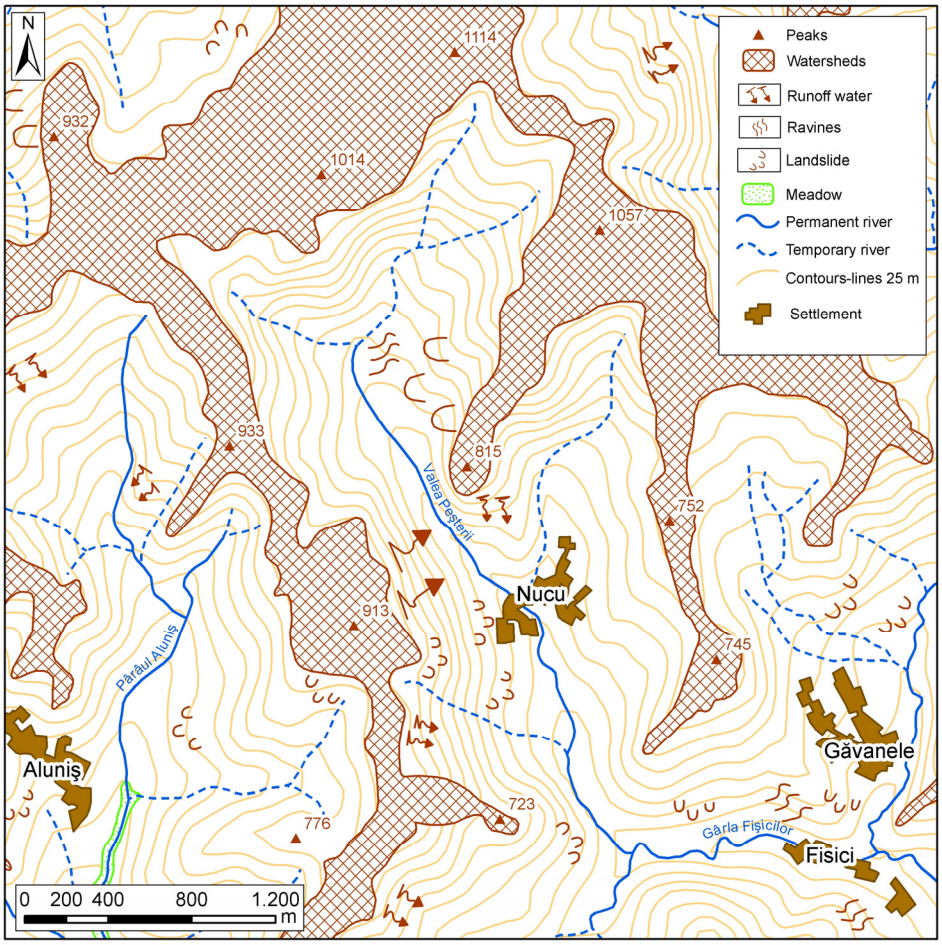


**Fig. 8.** Cave settlements – geomorphological sketch.

The superficial slides and the valley slides are predominant.

In the superficial slides the thickness of the sliding material reaches 1.5 m. They are the most frequent and are located in various conditions – on old sliding waves, in concave portions with excessive humidity or in the convex sectors of the slope with high inclination. They have small sizes, lengths of several tens of meters and widths from 5 to 15 meters.

The displaced material is arranged in beds and steps. By increasing the amount of water they may turn into superficial flowing slides and then into superficial mud flows.

*The middle and large depth slides* transport deposits having a thickness between 2 and 10 m or larger than 10 m. The valley slides (900 to 1500 m long and 40 to 50 m wide) are in this category. They are mostly fixed.

The most frequent are the flowing and the ravening processes. The flowing is a widespread process in the South of the region, favored by the presence of the clayish marl, clayish and clayish-sandy facies. Ravening takes place on smaller areas, especially in the contact zone with the brooks.

## 4. FROM GEOSITES TO GEOMORPHOSITES

The existence of sandstones on very large areas in this region, corroborated with the fact that it appears in daylight in many places, has allowed man to make it profitable. In this case, the Kliwa sandstones specific to this zone have been used in two different ways. Thus, firstly humans used it as a construction material (to build houses, fences, etc) and secondly, they shaped it in situ, building shelters or worship places. Thus, the geology of the area has offered people the real opportunity to use nature for their purposes.

**Fig. 9.** Bisericuţa lui Iosif.

The friability of the sandstone deposits and the moderate compaction degree has enabled man to transform it even in a rudimentary manner specific to the Paleolithic or Neolithic era. During the Middle Ages, on the background of the religious and political strains, a rather religious use of these places is recorded, also sustained by the climate and the morphology of the region. The low erosion rate, the isolation and a very difficult access have allowed great preservation in time and their turning into historical sites of great value.

The way these places have been created, their purpose and the utility throughout the time, as well as their considerable age have contributed to their listing in the category of geosites by geographers and historians. The anthropogenic factor completes, by its presence and by the activities deployed in the perimeter of these archeological sites, the matrix of interactions between the physical and the environment rendered human in this way; man has changed the structure and the func-

tion of some of these religious places (churches and others) from the sandstone deposits, a fact that allowed us to identify the evolution of these sites by geomorphological criteria, a process simultaneous to the historical research. Due to the anthropogenic influence and the natural one, these geosites have gained a scientific, social, cultural, economic and tourism value as well as other additional values, which have turned them into geomorphosites.

## 5. CONCLUSIONS

The best known of these geomorphosites are: Crucea Spătarului, Agatonul Nou and Vechi, Piatra Îngăurită, the Church of stone of Alunişu, Fundătura, Bisericuţa lui Iosif, the Cave or Scaunele lui Negru Vodă (fig. 9).

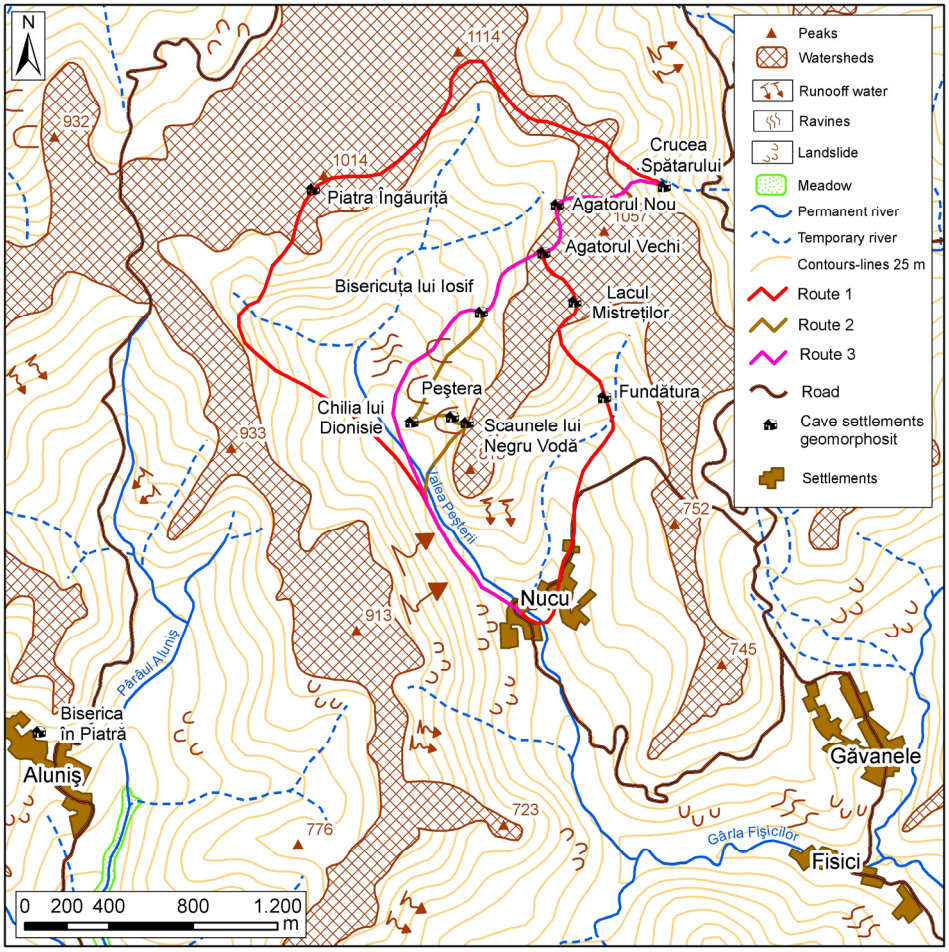


**Fig. 10.** Geo-tourism map of the cave settlements.

Their tourism capitalization may be done in a classical manner or by using methods appropriate to modern tourism. In the area of the rupestrian places some thematic trips may be organized such as: "The Road of Treasures", in which tourists must discover the rupestrian places with the aid of certain indexes, or the "Scouts Campaign", where the students, helped by guides and teachers may search the area of the places, the zone of "old ladies of Ulmet" and the round rocks of Ulmet.

Another thematic ride would be a religious and historical route in which a good guide could reveal their history and religious content. But, in the absence of a boarding facility, one may establish a camping place for tents at Ulmet, very useful for traveling around the area. One may also organize trips on bicycles or ATVs, as all the roads are paved with stone.

In the studied area we have simulated three tourism routes which may reveal the geomorphosites:

**-** *1st route: Nucu – Piatra Îngăurită – Crucea Spătarului –Agatoane – Lacul Mistreţilor – Fundătura – Nucu (5 h ½ - 6h);*

**-** *2nd route: Nucu - Scaunele lui Negru Vodă – The Cave (bottom of the cave) - Dionisie Torcătorul - Bisericuţa lui Iosif and back (2 h ½ – 3h);*

*- 3rd route: Nucu - Bisericuţa lui Iosif – Agatonul Vechi – Agatonul Nou – Crucea Spătatului and back (3 h ½ - 4 h).* In order to turn it into reality, a geotourism map of the rupestrian places has been made (fig. 10).

## REFERENCES


1. Bălteanu, D. (1983), *Experimentul de teren în geomorfologie. Aplicaţii în Subcarpaţii Buzăului,* Edit. Academiei, Bucureşti.
2. Bălteanu, D., Cheval, S., Şerban, Mihaela (2005), *Evaluarea şi cartografierea hazardelor naturale şi tehnologice la nivel local şi naţional. Studii de caz,* Institutul de Geografie al Academiei Române, Bucureşti.
3. Ciangă, N. (2006), *România. Geografia turismului*, Edit. Presa Universitară Clujeană, Cluj-Napoca.
4. Deşliu, Al. (2001), *Buzău. Ghid turistic.* Edit.Terra, Focşani.
5. Glăvan, V. (2000), *Turismul în România*, Edit. Economică, Bucureşti.
6. Ielenicz, M. (1978), *Observaţii geomorfologice în bazinul Slănicului de Buzău,* AUB-Geogr., XXVII, Bucureşti.
7. Ielenicz, M. (1985), *La région Berca-Arbănaşi. Observations géomorphologiques,* AUB-Geogr., XXXIV, Bucureşti.
8. Irimuş, I.A. (1996), *Cartografiere geomorfologică*, Edit. „Focul Viu", Cluj-Napoca.
9. Irimuş, I.A. (2003), *Geografia fizică a României*, Edit. Casa Cărţii de Ştiinţă, Cluj-Napoca.
10. Irimus, I.A. (2010), *Relieful-Potenţial şi valorificare turistică,* Editura Risoprint, Cluj-Napoca.
11. Mac, I. (1986*), Elemente de geomorfologie dinamică*, Edit. Academiei, Bucureşti.
12. Mac, I. (2008), *Geografie normativă*, Edit. Presa Universitară Clujeană, Cluj-Napoca.
13. Niculescu, Gh. (1974), *Subcarpaţii dintre Prahova şi Buzău. Caracterizare geomorfologică,* SCGGG-G; XXI, Bucureşti.
14. Niculescu, Gh. (1986), *Valea Chiojdului – observaţii geomorfologice,* Cercet. geogr. as. med. înconj. în judeţul Buzău, Institutul de Geografie, Bucureşti.

15. Petrescu–Burloiu, I. (1977*), Subcarpaţii Buzăului. Relaţii geografice. Om-mediu,* Edit. Litera, Bucureşti.
16. Popescu, Dida (1971), *Degradări de teren în Subcarpaţii Buzăului,* Geogr. jud. Buzău şi a împrejurimilor, Bucureşti.
17. Popescu, Dida (1971), *Observaţii geomorfologice în depresiunea Nişcovului,* Geogr. jud. Buzău şi a împrejurimilor, Bucureşti.
18. Popescu, Dida (1972), *Influenţa mişcărilor neotectonice asupra Subcarpaţilor Buzăului,* AUB-G, XXI, Bucureşti.
19. Posea, Gr., Ielenicz, M., Popescu, Dida, Popescu, C. (1971), *Judeţul Buzău,* Edit. Academiei, Bucureşti.
20. Rădoane, Maria, Rădoane, N. (2007), *Geomorfologie aplicată*, Edit. Universităţii din Suceava, Suceava.
21. *** (1992), *Geografia României, IV, Regiunile pericarpatice*, Edit. Academiei, Bucureşti.

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# VALIDATION OF SEVERAL ATMOSPHERIC STABILITY INDICES FOR THE STORMS GENERATING TORRENTIAL RAIN SHOWERS IN THE NORTH-WEST OF ROMANIA

**I. HAIDU[1], T. TUDOSE[1]**

**ABSTRACT. – Validation of Several Atmospheric Stability Indices for the Storms Generating Torrential Rain Showers in the North-West of Romania**. The present study deals with the atmospheric instability types that lead to torrential rain formation in the North-Western part of Romania and with the role that certain stability indices play in establishing the atmospheric instability potential. 35 years of warm season rainfall data from 14 meteorological stations in the North-West of Romania have been analysed in this respect. The Hellman criterion was employed in order to establish the torrential character of the rainfall events, having made use of 271 of such rainfall events in the analysed period (1975-2009). Considering that the synoptic context of the torrential rain occurrence differs according to the instability type existing at the moment of their apparition, the analysis of the stability indices has taken this feature into consideration as well. Hence, three types of instability have been identified (convective lifting, frontal lifting and that produced due to the "cut off" nuclei) their analysis underlining the highest frequency of torrential rains caused by the convective lifting (49.1%), followed by the frontal type (27.7%) and the 'cut off" type (23.2%), their highest percentage being registered in the summer. The values of 5 stability indices have been taken into account (KI, VT, CT, TTI and LI), determined on the basis of the aerologic survey at 00 GMT time, undertaken in Cluj-Napoca, plus two more modified indices ($K_{MOD}$ and $TT_{MOD}$). Having analysed them, it was possible to identify the most useful ones for determining the convective storms conditions generating torrential rains in the North-West region of Romania.

***Keywords:*** torrential rains, stability indices, frontal lifting, "cut off" nuclei, North-West of Romania.

## 1. INTRODUCTION

Torrential rain is an extreme pluviometric event with negative social and environmental effects. The registering of significant water quantities over shorter or longer time intervals can lead firstly, to flash-floods and secondly, to a soil suprasaturation and ponding of the water corresponding to the precipitation in excess. In time, there were attempts to build conceptual models that would easily identify the favourable conditions

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for several atmospheric processes. Consequently in Romania among the first baric structures' types classifications and the weather conditions associated to them have been made by a group of researchers in the Meteorological Institute of Bucharest who found 7 baric types (Clima R.P.R., 1962) of interest for the studied region. For the warm season nevertheless there remain only four types (I, V, VI and VII). Other approaches in this respect have been made by Topor N. (1964), and Topor N. and Stoica C. (1965). As technology developed, a series of programs have been implemented that made possible an objective weather type classification, according to several quantifiable criteria in some pre-established points. Hence the automatic classification of the atmospheric circulation types allows an objective analysis of the synoptic situations that determine certain atmospheric processes. The studies and the zonal or regional approaches from the last years have taken another looks into the matter, due to the easiness with which large amount of terrestrial atmospheric parameters data can be dealt with nowadays. As a consequence, at the European level, the automatic classification of weather types has been made, on the basis of an international collaboration (the COST Programme 733). The present study formulates the hypothesis that the atmospheric instability is the essential element for the torrential rain generation and seeks to validate several stability indices, in whose case the probability of torrential rain occurrence in the study area is high. The analysis doesn't refer to the spatial extent of the phenomenon. It just wants to establish its occurrence according to several values of the analysed indices.

## 2. DATA AND METHODOLOGY

Torrential rain data from 14 meteorological stations in the North-West of Romania has been used for the present study. The stations are set at altitudes ranging between 123 m and 1836 m, their altitude structure being as it follows: Satu Mare (123 m), Supuru de Jos (159 m), Baia Mare (216 m), Dej (232 m), Sighetu Marmaţiei (275 m), Zalău (295 m), Bistriţa (366 m), Cluj-Napoca (410 m), Turda (424 m), Ocna Şugatag (503 m), Huedin (560 m), Băişoara (1384 m), Iezer (1785 m) and Vlădeasa 1800 (1836 m). The spatial repartition of the observation points in the study unit can be seen in Fig. 1.

The rainfall data registered in the warm season (April-October) measured with the pluviograph at the mountainous stations situated above 1500 m (Băişoara, Iezer, Vlădeasa 1800) has been taken into account, the annual analysis interval being actually a bit shorter (namely June-September) due to the snow and mixt precipitations occurrence in the other months. The total length of the study period is of 35 years (1975-2009).

The first stage of the employed methodology consisted in the torrential rainfall events identification via the Hellman selection criteria. The thematic altitudinal and sea level maps archive (geopotential values, air temperature, relative humidity, atmospheric pressure) existing on the *www.wetterzentrale.de* archive and www.noaa.gov , have been identified for every torrential event, along with the type of the synoptic structure that they generated, hence leading to the type of atmospheric instability determined. Subsequently, on the basis of the atmospheric survey analysis from *http://weather.uwyo.edu* the following stability indices have been computed: K Index, Vertical Totals, Cross Totals, Total Totals Index and Lifted Index. The final stage consisted in the statistical analysis.

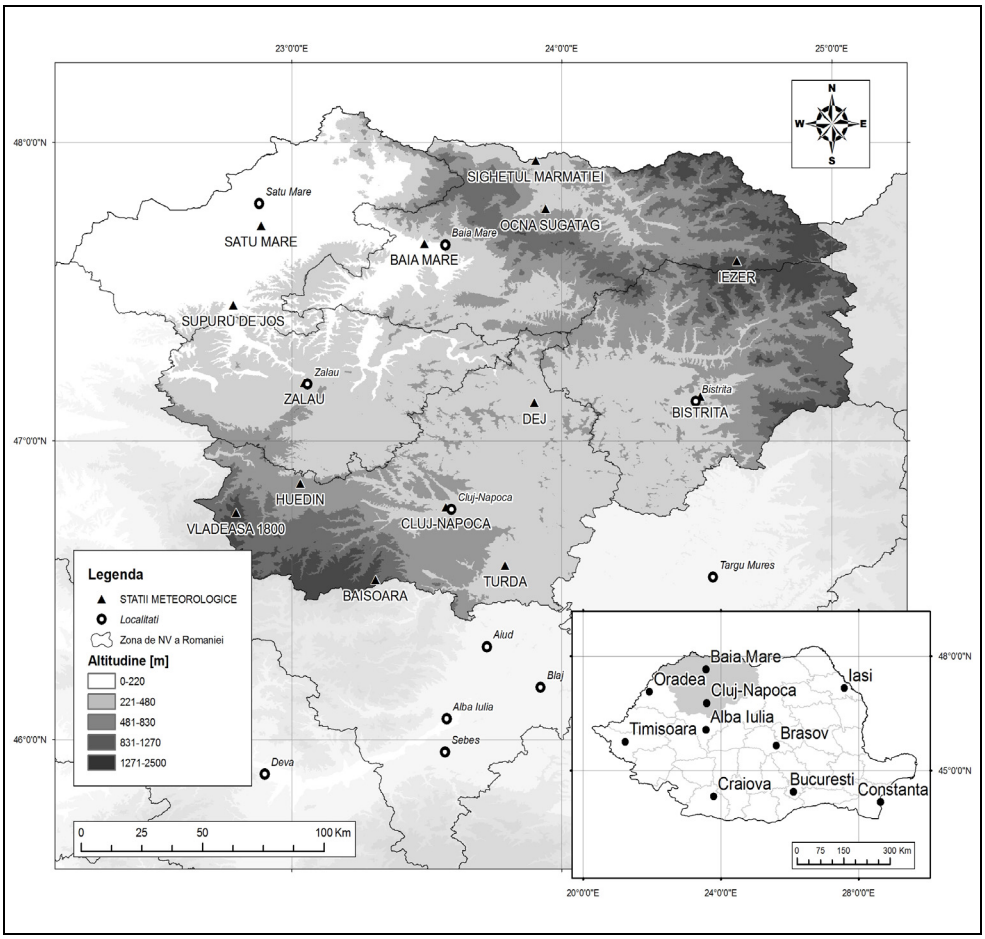


**Fig. 1.** The meteorological stations in the analysed region.

## 3. RESULTS

Having analysed the synoptic situations during which the torrential rains have occurred according to the criterion taken into account, the results underline the existence of 3 types of atmospheric instability: convection lifting, frontal lifting and instability associated to the cut off nuclei. The convection lifting is determined by the daily heating of the active surface and its propagation in the superior atmospheric strata due to convection, generating turbulent ascending currents; the frontal lifting occurs due to the forced ascendance of the air as a consequence of the dynamic processes existing at the terrestrial surface level, whereas the instability associated to the cut off nuclei, or the altitudinal nuclei, is produced due to the formation of certain cold nuclei in the medium and superior strata of the terrestrial atmosphere.

A number of 271 torrential rainfall events have been identified during the study period, the analysis of the synoptic materials for each rainfall event indicating the highest percentage for the rains generated by convective lifting (49.1%), followed by those of frontal lifting (27.7%) and last, by the ones due to the „cut off" type nuclei (23.2%).

At a monthly scale, the torrential rains generated by the convective lifting occur starting with May and last till September, having a high percentage in July (15.1%), June and August, summing up to a total of 90.2% of their corresponding class. It is obvious for the respective period that the heating during the day is the predominating type, as the air temperatures registered are the highest (Fig. 2).

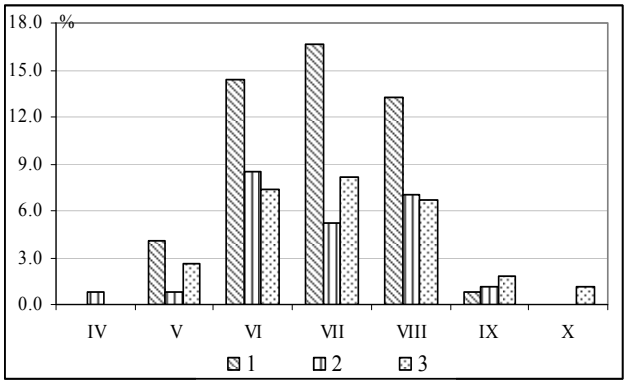


**Fig. 2.** Monthly frequency of torrential rains according to the instability type
(1- convective lifting; 2- instability associated to the cut off type nuclei; 3- frontal lifting)

A similar monthly structure characterises the frontal lifting torrential rains as well, the frequency in the summer months cumulating to 80% of the total in their class. As compared to the rainfall events generated by mass instability, the frontal ones occur at the beginning of fall as well, hence situations as these being specific to the frontal warm passages or occluded ones that are more frequent at that time.

With respect to the altitudinal nuclei, the highest frequency of rain events is registered all over summer, but their monthly occurrence is different, the highest frequency being in June (Fig. 2). The low percentage values at the middle of the summer are determined by the highly diminished frequency of the cut off nuclei in the analysed synoptic area, the synoptic structures being favourable to the mass induced instability type or the frontal one (in the case of thalwegs or short waves).

The math expressions of the analysed indices are:

$$\mathbf{KI = (T_{850}-T_{500}) + T_{d850} - (T_{700}-T_{d700})}, \text{ (George, 1960)} \quad (1)$$

$$\mathbf{K_{MOD} = (T-T_{500}) + T_d - (T_{700}-T_{d700})},$$

where $\mathbf{T = (T_{sfc}+T_{850})/2}$ and $\mathbf{T_d = (T_{dsfc}+T_{d850})/2}$, Charba (1984) (2)

$$\mathbf{VT = T_{850}-T_{500}}, \text{ (Miller, 1967)} \quad (3)$$

$$\mathbf{CT = T_{d850} - T_{500}}, \text{ (Miller, 1967)} \quad (4)$$

$$\mathbf{TTI = T_{850} + T_{d850} - 2T_{500}}, \text{ (Miller, 1967)} \quad (5)$$

$$\mathbf{TT_{MOD} = T + T_d - 2T_{500}},$$

where $\mathbf{T = (T_{sfc}+T_{850})/2}$ and $\mathbf{T_d = (T_{dsfc}+T_{d850})/2}$, Charba (1984) (6)

$$\mathbf{LI = T_{500}-T_{p500}}, \text{ (Sadowski and Rieck, 1977)} \quad (7)$$

where: - $T_{850}$, $T_{700}$, $T_{500}$ air temperature at the level of 850, 700 and 500 hPa;
- $T_{d850}$, $T_{d700}$ dew point temperature at the level of 850 and 700 hPa;
- $T_{sfc}$, $T_{dsfc}$ air temperature, namely dew point temperature at the soil level;
- $T_{p500}$ temperature of the moist-adiabatic particle risen from the earth's surface up to the 500 hPa level.

K Index combines the air temperatures at the 850, 700 and 500 hPa and the dew point temperature at the 850 and 700 hPa levels (1).

The index in the form it was conceived, has been used for air mass instability determination, namely for those air masses not affected by the frontal passages or cyclonic ones (George, 1960). On the basis of the analysis, the authors conclude that K values higher than 20 indicate an increase in frequency of the air mass instability. Other authors such as Hambrige (1967), note that values below 20 of this index can account for approximatively 20% of the frequency occurrence of convective lifting generated storms and those values above 40 indicate an almost 100% probability of their apparition. Even more so, Rodgers et all. (1984) uses the values above 30 for the prognosis at the basis of the Mesoscale Convective Complexes development. The threshold index values have been set by taking into account several appreciations regarding the occurrence probability of convective storms (www.theweatherprediction.com), namely: KI=15-20, 19% occurrence probability; KI=21-25, 20-39% occurrence probability; KI=26-30, 40-59% occurrence probability; KI=31-35, 60-79% occurrence probability; KI=36-40, 80-89% occurrence probability and KI= >40, above 90% occurrence probability.

Within the analysed unit, the K index values range between 5.4 and 40.0, existing a series of differences according to the analysed instability type. For the convective lifting it can be noticed that the frequency of the low index values (<25) is greater, and to some extent the same goes when it comes to the highest values, if compared to the situations for the other instability types (Fig. 3, left). Nevertheless no matter what type of instability we would consider, the highest percentage values correspond to the 31-35 threshold, followed by the 26-30 and the values above 35. Overall the KI values higher than 31 anticipate around 60 to 72% of the registered torrential rains in the study area and those values above 36 account for about 85 to 95% of them, constituting according to the author's point of view, a relatively useful index for the prognosis of the storms generating torrential rains, no matter their generating instability type. It can also be noticed that the use of the same index for the potential of occurrence determination of the storms generating torrential rains can be done for the two remaining types of instability, aside the one this index has been conceived for, given the good results.

Charba (1984) modifies the computation for the K ($K_{MOD}$) index, taking into account the air and dew point temperatures at the soil level (2). Once determined the K modified index in the analysed unit, the highest frequencies of the 36-40 (49.7%) and 31-35 (24.9%) can be seen, followed by the >40 threshold, these accumulating 91.4% of the total situations with torrential rains. The analysis of the $K_{MOD}$ index according to the instability generating type leads to a higher percentage of the 36-40 threshold, for the thermal and frontal lifting, the structure being identical for the two thresholds (31-35 and

>40) (Fig. 3, right). Taking into account the high frequency of the thresholds indicating a high occurrence probability of convective storms (above 80%), the $K_{MOD}$ index is more useful for the prognosis of these storm types, in comparison with the KI index.

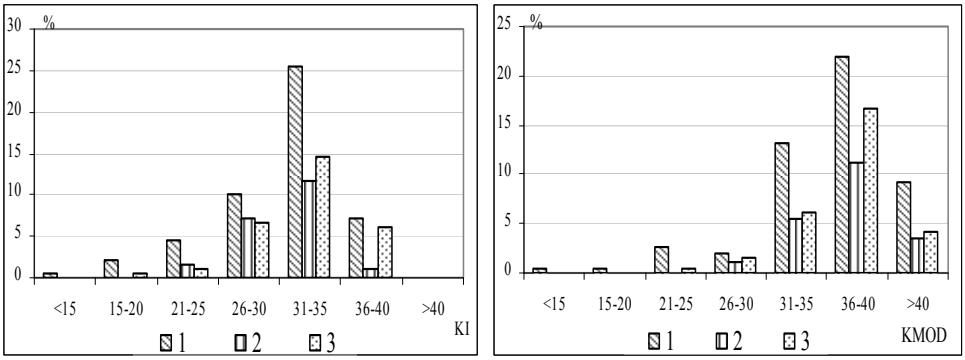


**Fig. 3.** KI index distribution (left) and $K_{MOD}$ (right) according to value classes, according to the generating instability type (1-convective lifting; 2- „cut off" nuclei; 3- frontal lifting).

Vertical Totals Index (VT) is established on the basis of the temperature difference between the 850 and 500 hPa levels, without taking into account the air humidity (3). The studies undertaken for the present index in the USA (Miller, 1967, 1972, 1975) establish as the lowest values for the convective storm occurrence the values above 26. Those values above 30 indicate moderate storms; VT <25 indicate no storms; VT=25-26 dispersed storms; VT=27-30, dispersed storms/ some are severe/ isolated tornadoes; VT=31-32 dispersed storms and numerous/ a few tornadoes; VT=33-34, numerous storms/ a few tornadoes; VT >34, numerous storms / dispersed and severe/ dispersed tornadoes.

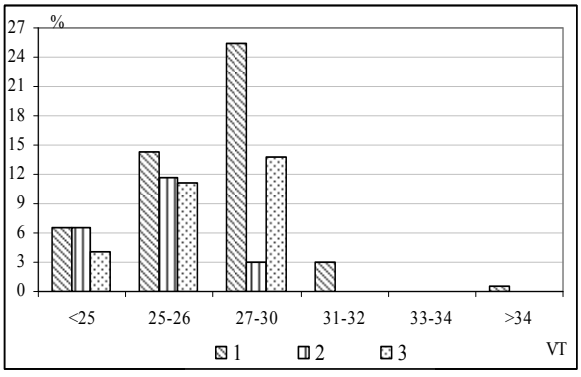


**Fig. 4.** VT index distribution on class values, according to the instability type (1-convective lifting; 2- "cut off" nuclei; 3- frontal lifting)

In the study area the VT index values range between 21.5 and 30.7, being noticeable the highest percent of the values under 30, a value representing the threshold for the moderate storms (Fig. 4). Regarding the convective and frontal lifting, the highest percent belongs to the 27-30 threshold values (25.4, namely 13.7%) and to the 25-26

threshold (14.2, namely 11.2%), and for the "cut off" nuclei, the one with values of 25-26 and below 25. The high percentage of the small threshold values of this index makes it very little usable for the prognosis of storms generating torrential rain events, especially when we think of the situations when the "cut off" nuclei exist.

The Cross Totals Index (CT), determined on the basis of air humidity in the 850 hPa stratum and of the temperature at the 500 hPa level (4), is characterised by a value of 18 as the bottom level for storm generation. For values under 18 the occurrence potential is lower, whereas the values above 30 indicate a higher probability of moderate storms in intensity and frequency (Miller, 1967, 1972, 1975). Regarding the mentioned extremes, when CT=18-19, there exists a moderate storm potential; CT=20-21, a strong storm potential; CT=22-23, a weak potential of severe storms; CT=24-25, a moderate potential of severe storms, and CT= >25, a high potential of severe storms. For the analysed area, the extreme values of the present index range between 16.3 and 26.6, major differences among the different types of atmospheric instability being inexistent. No matter what the instability type generating torrential rains is, the highest frequency of this index belongs to the 20-21 and 22-23. These thresholds cumulate together between 57.9% of the frontal rains and 73.8% of the ones produced on the background of the "cut off" nuclei generated instability, the superior thresholds of the index being registered at low frequencies (Fig. 5). Taking into account that the two mentioned thresholds do not indicate a high potential for severe storms (such as the ones generating torrential rains), the use of this index in the establishment of the occurrence potential of storms has to be done in correlation with other indices ($K_{MOD}$ or KI).

Total Totals Index (TTI) is determined on the basis of temperature values existing at the 850 and 500 hPa and that of the dew point at the 850 hPa level (5). The index is used in prognosis for the spatial localizing of the formation area of convective storms. Regarding the value corresponding to this index Miller (1967, 1972, 1975), on the basis of the studies made in the USA, established the inferior value at 44, whereas the values higher than 60 are characteristic to the severe convective storms. In practice the values of the TTI have been split in intervals corresponding to the convective storms intensity as it follows: TTI=44-46, low intensity storm; TTI=46-48, moderate storms; TTI=48-50, severe storms; TTI=50-52, severe storms; TTI=52-56, strong storms, possibly tornadoes; TTI= >56, tornadoes.

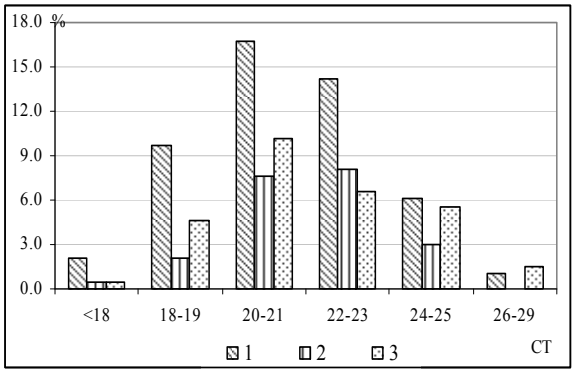


**Fig. 5.** CT Index distribution on different class values, according to the instability type (1- convective lifting; 2- "cut off" lifting; 3- frontal lifting)

Overall, for the TTI index the highest frequency corresponds to the 48-50 and 46-48 thresholds, values indicating the strong and moderate storms registered especially during the frontal instability type as well as the one produced on the background of the "cut off" type nuclei (Fig. 6, left). For the convective and frontal lifting, a high percentage can be seen in the values above 48, corresponding to the strong storms and tornadoes, the frequencies for each type of instability accumulating up to 60 - 65%, hence the analysed index can be considered a useful tool in the prognosis of torrential rain for the two types of instability cases mentioned.

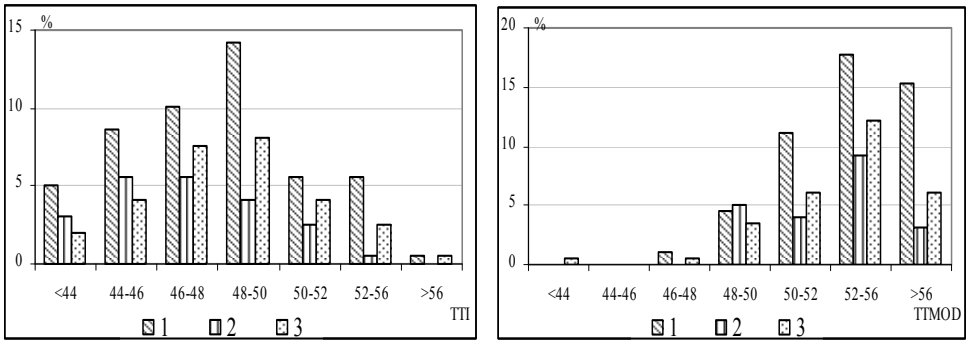


**Fig. 6.** TTI Index distribution (left) and $TT_{MOD}$ (right), on different class values, according to the instability type (1- convective lifting; 2- "cut off" lifting; 3- frontal lifting)

Charba (1984) proposes a slightly modified relation for the computation of the TTI index, one that takes into account, similarly to the $K_{MOD}$ expression, the temperature and the air humidity at the earth's surface level ($TT_{MOD}$, expression 6). The structures of the frequency values of the $TT_{MOD}$ index differ from the one of the TT index, high percentage values being noticeable in the cases of the high existing thresholds (figure 6, right). In general the highest frequencies characterise the 52-56 threshold (39.1%) and >56 (24.1%), following the 50-52 threshold (a bit above 20%), being noticeable the fact that the strong storms (with $TT_{MOD}$ >50) accumulate up to 84.8% of the total. During instable conditions the predominance of the 52-56 and >56 thresholds can be seen, when convective lifting and frontal lifting occur, and that of the 52-56 and 50-52 thresholds, for the "cut off" nuclei (Fig. 6, right). Regarding the absolute values, the highest frequency of the $TT_{MOD}$ values, higher than 52 belongs to the convective lifting (about two thirds), followed by the frontal lifting.

The Lifted Index (LI) indicates stability and it is used for the determination of the atmospheric potential of producing severe storms, rain showers. It has been introduced in the prognosis of the convective storms in the USA as an additional predictor of latent instability. The determining of the index is done using values of the air temperature and of the humid adiabatic risen particle from the earth's surface up to the 500 hPa level (7).

The index offers information about the air stability, the higher negative values indicating a supplementary energy for the ascending particle. Hence when LI= >2, no atmospheric instability is foreseen; LI=2...1, isolated convective storms are possible; LI=1...-2, storms and rain showers are possible to occur; LI=-5...-2, storms and rain showers; LI= <-5, severe storms, and rain showers are forecast as well as wind intensifications.

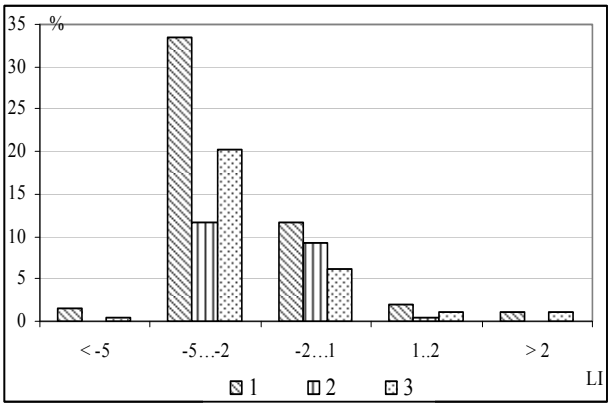


**Fig. 7.** LI Index distribution on different class values, according to the instability type (1- convective lifting; 2- "cut off" lifting; 3- frontal lifting)

The class structures of the L1 index indicate that no matter what the type of the stability is, the negative values of this index are predominant (between 80 and 88% of the total of each instability type), with the highest percentages in the case of the -5...-2 class (Fig. 7). According to the instability type, the highest frequencies of the lowest values of the index, the one that indicate storms and rainfalls (LI = <-2), are characteristic for the convective and frontal lifting with percent values of 70, namely 72%. These aspects lead to the conclusion that this indicator is a good one for signalling the convective storms formation that generate torrential rains in the study areas during the cases of convective lifting and frontal lifting.

## 4. CONCLUSIONS

KI is a useful index for the forecast of convective storms generating torrential rainfall events in the study area for all the instability types analysed and especially for the frontal lifting and convective lifting. The VT and CT Index are less used taking into account the high frequency of their low values, but the TTI (which is a combination of the two) is useful, especially for the instability forecast produced on the background of the convective lifting and frontal lifting.

LI is an efficient index for the prognosis of high instability areas especially in the case of convective lifting and frontal lifting. Plus, the $K_{MOD}$ and $TT_{MOD}$ indices come to complete the more or less instable potential of the terrestrial atmosphere in its lower strata, contributing to the establishment of areas with atmospheric instability.

It also has to be mentioned that for a more exact localization of the areas with significant atmospheric instability, these indices have to be correlated with other information regarding the dynamics in the medium and inferior atmospheric strata.

The present analysis shows that the instability produced due to the "cut off" type nuclei is quite difficult to forecast through the atmospheric stability indices, hence supplementary methods are necessary.

Another highlighted aspect is that the stability indices analysed, which take into account the humidity of several atmospheric strata, are the best for identifying the instability potential of the atmosphere (KI, $K_{MOD}$, TTI, $TT_{MOD}$, LI).

## REFERENCES


1. Charba, J.P. (1984), *Two-to-six hour probabilities of thunderstorms and severe local storms*. NOAA NWS TPB-342, 14 pp.
2. George, J.J. (1960), *Weather Forecasting for Aeronautics*. New York, Academic Press, 407-415.
3. Hambridge, R.E. (1967), *'K' chart application to thunderstorm forecasts over the western United States*. ESSA Tech. Memo. WRTM-23, 9 pp.
4. Miller, R.C. (1967), *Notes on analysis and severe storm forecasting procedures of the Military Weather Warning Center*. Tech. Report 200, AWS, USAF. [Headquarters, AWS, Scott AFB, 1L 62225]
5. Miller, R.C., Bidner, A., and Maddox, R.A. (1972), *The use of computer products in severe weather forecasting (the SWEAT index)*. Air Weather Service Aerospace Sciences Review. AWS RP 105-2, No. 72-1, 2-9.
6. Miller, R.C., Maddox, R.A. (1975), *Use of the SWEAT and SPOT indices in operational severe storm forecasting*. Preprints. Ninth Conf. Severe Local Storms. Norman, Amer. Meteor. Soc, 1-6.
7. Peppler, Randy (1988), *A review of static stability indicer and related thermodynamic parameters*. The Illinois State Water Survey Division. Departament of Energy and Natural Resources. 2-6.
8. Rodgers, D.M., Bartels, D.L., Menard, R.D. and Arns, J.H. (1984), *Experiments in forecasting mesoscale convective weather systems*. Preprints. Tenth Conf. Weather Forecasting and Analysis. Clearwater Beach, Amer. Meteor. Soc, 486-491.
9. Sadowski, A.F., Rieck, R.E. (1977), *Stability indices*. NOAA NWS TPB-207, 8 pp.
10. Topor, N. (1964), *Ani ploioşi şi secetoşi în R.P.R.*, C.S.A., Bucureşti.
11. Topor, N., Stoica, C. (1965), *Tipuri de circulaţie şi centrii de acţiune atmosferică deasupra Europei*, C.S.A., Bucureşti.
12. *** 1962, *Clima R.P.R.*, vol I, C.S.A., I.M., Bucureşti
13. *** (2014), www.wetterzentrale.de
14. *** (2014), http://weather.uwyo.edu
15. *** (2014), www.noaa.gov
16. *** (2014), www.theweatherprediction.com

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# ECONOMIC AND TOURISM IMPACT OF SMALL EVENTS: THE CASE OF SMALL-SCALE FESTIVALS IN ISTANBUL, TURKEY

**I. EGRESI[1], F. KARA[2]**

**ABSTRACT. – Economic and Tourism Impact of Small Events: the Case of Small-Scale Festivals in Istanbul, Turkey.** More and more festivals are organized every year around the world, in big cities and villages alike, due to the numerous benefits they are perceived to bring at local and national levels. While the economic and tourism impact of mega events and of hallmark events is better documented there are very few studies dealing with the economic impact of small events. Consequently, to close this gap, our study investigated the importance of small events and festivals for local economic development and as tourism attractions in Istanbul, Turkey. We used a questionnaire to interview non-local participants at three different small festivals taking place in April and May 2013. We found that, although tourists attending these festivals spend money in the local economy, the economic impact of these events is limited due to the fact that very few tourists were found to participate. The role of these small festivals as primary motivators for tourism is therefore being questioned; however, small festivals could play more important roles as secondary attractions.

***Keywords:*** *event tourism, festival, economic impact, Istanbul, Turkey.*

## 1. INTRODUCTION

Festivals and events have proliferated in recent decades mainly due to their role in local and regional economic development (Moscardo, 2007; Tohmo, 2005; Gelan, 2003; Chhabra et al., 2003; Kim et al., 2003; Dwyer et al., 2005 ) as well as due to their potential to help with economic restructuring and revitalization, place marketing, investment, and tourism revenue generation especially during off-peak season (Quinn, 2009; Gursoy et al., 2004; Prentice and Andersen, 2003; Formica and Uysal, 1998; Getz 2005; Getz, 2008; Felsenstein and Fleischer 2003;Çulha, 2008).

Special events are defined as one-time or infrequently occurring events of limited duration that provide participants with leisure and social opportunities they do not experience every day (Pasanen et al., 2009). They include different types of events based on their scale from mega events and hallmark events to festivals and other small, local events (Quinn, 2009).

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"Hallmark events" are defined by Ritchie (1984, p. 84) as "major one time or recurring events of limited duration developed primarily to enhance awareness, appeal and profitability of a tourism destination …". They play an important role at regional or national level. On the other hand, mega-events are major one-time events on an international scale (Jago and Shaw, 1998).

Getz (2005) distinguished eight major types of planned events, each with several subtypes: cultural celebrations (which includes festivals, carnivals, commemorations and religious events), political and state events (summits, royal occasions, political events and VIP visits), arts and entertainment (concerts and award ceremonies), business and trade (meetings, conventions, consumer and trade shows, fairs and markets), educational and scientific (conferences, seminars, clinics), sport competitions (amateur/professional, spectator/participant), recreational (sports or games for fun) and private events (weddings, parties and socials).

Most tourism studies have examined large-scale events (Lockstone and Baum, 2008; Funk et al., 2009; Gursoy et al., 2011; Hiller, 1998; Li and McCabe, 2012; Gursoy and Kendall, 2006; Fourie and Santana-Gallego, 2011; Lamberti et al., 2011; Waitt, 2003; O'Brien, 2006) because these are the ones that attract many tourists whereas small-scale events are known to rely more on local participants (Quinn, 2009). On the other hand, tourism can promote festival growth and expansion (Quinn 2006). Still, the emphasis so far has been on the study of events as tourism phenomena and only recently could be documented an interest to study events from a leisure perspective (Quinn, 2009).

This study will attempt to evaluate the potential of small-scale events to attract tourists and will examine the economic impact tourists attending these events have on the local economy.

### *1.1. Literature Review*

The four main themes that dominate the literature on special events are (Moscardo, 2007: 1) Economic impacts on the host community; 2) analysis of participants, especially studies related to motivation and satisfaction; 3) management of events; 4) broader event impacts as perceived by the residents.

The organization of special events and festivals will have a range of economic impacts (Hodur et al., 2006; Chhabra et al., 2003) as well as cultural and social (Small et al., 2005; Pasanen et al., 2009; Robertson et al., 2009), political (Pasanen et al., 2009) and physical and environmental (Yüksek et al. 2008) impacts and these impacts could be both positive and negative (Raj, 2004; Olds, 1998).

Some of the possible negative social and cultural effects of festivals and events are: community displacement, commodification of culture and increased crime rates (Presbury and Edwards, 2005; Barker et al., 2002).

While a few studies examine the non-economic impacts most focus on the economic impacts for two main reasons: firstly, many studies are commissioned by local officials who need to justify their sponsorship of certain events by demonstrating that they are economically sound; secondly, the economic impact is more easily assessed than other types of impact (Dwyer et al., 2000; Moscardo, 2007).

The literature on event impact suggests that large scale events create both positive and negative effects on the host community, some of them being visible in the short term while others only in the long term (Quinn, 2009). For example, the study by Fourie and Santana-Gallego (2011) demonstrated that mega-sport events in general promote tourism; however, results depend on a number of factors among which we could mention the participating countries and whether the event is held during the peak season or off-season.

Few studies examined small local or short festivals (Baptista Alves et al., 2010; McKercher et al., 2006; Small et al., 2005; Nurse, 2001). Researching a number of small festivals in the Caribbean, Nurse (2001) concluded that these festivals have made a significant impact on the tourism sector in this region. He found that festival tourists tend to stay longer and spend more on local goods and services than conventional (mass) tourists. These festivals do not generate many jobs but have a great impact on generating increased government taxes. Nurse (2001) has shown that the perceived economic advantages of these festivals are such that Barbados and St. Lucia have developed a strategy for festival tourism. Similarly, Kim et al. (1998) found that the economic impact of a small birding festival in Texas was quite significant. On the other hand, Baptista Alves et al. (2010), examining the social and economic impact of a small festival in a rural area in Portugal concluded that, while the economic effects of the festival are not negligible, the social effects are even more important.

Some scholars are unsure about the economic value of special events (Gursoy et al., 2004; Prentice and Andersen, 2003). McKercher et al (2006) examined three small festivals held in Hong Kong. They found that very few tourists attended the festivals and most of them learned about the festivals only after arriving in Hong Kong; therefore, their economic contribution to the event was minimal. The article also debated whether or not small festivals could be considered examples of sustainable tourism practice. The authors concluded that, while these festivals clearly satisfy the sustainability criterion because the events are organized by and for the benefit of the local community, they fail to be tourism attractions because they do not appeal to tourists (McKercher et al., 2006).

Indeed, most events (especially small local ones) will be attended mainly by local people (Getz, 2007). For example, McHone and Rungeling (2000) measuring the impact of a cultural tourist event in Orlando found that 57% of participants were local residents. 29% came from other places in the state (Florida) and only 14% were from outside of Florida. However, the viability of these festivals in the future will be decided by (high levels of) outside visitation (Crompton and McKay, 1997).

De Bres and Davis (2007) argued that festivals organized in smaller towns could attract larger crowds than festivals organized in larger towns or in cities. Also, Mitchell and Wall (1986) have shown that smaller festivals produced more economic benefits (relative to size and spending) and as the festivals got bigger their economic impact became less significant.

### *1.2. Event management in Turkey as reflected by international and Turkish tourism literature*

Although Turkey occupies an important position in the global tourism literature, studies on event or festival tourism in Turkey are rather scarce.

Çakır (2009) counted 1323 events and festivals that were organized across Turkey in 2008, with the International Istanbul Music Festival, Ankara Music Festival, and Akbank Jazz Festival being the largest and most important ones nationwide. The Ministry of Culture and Tourism (*http://www.kultur.gov.tr*) has advanced a very similar figure in 2009 (1350 festivals and events). Basically each city in Turkey, even small towns and some villages, has its own events (Yolal et al., 2009). For all the reasons discussed above, and especially to protect the rich local culture, the government encourages municipalities to develop and organize their own festival (Yolal et al., 2009; Çakır, 2009).

Kızılırmak (2006) investigated how to use local events as a touristic attraction in Turkey. He defined Turkey's events as local, small scoped and regional organizations. He studied 1188 local events and concluded that local festivals are more developed and more famous where summer tourism is not developed very well.

Bilgili et al. (2012) investigated efficiency of festivals as a touristic event in Erzurum and suggested that Turkey has a very great potential for cultural tourism but this potential is not being used very well. The authors claimed that acceptance of festivals by local people is the hardest part in the organization of a festival and programming, advertising and inviting government officials and famous people to attend are very important for the success of the event. Moreover before thinking to organize such an event, the place needs to already have the proper infrastructure in place (such as accommodation).

Küçük (2013) investigated effects of a festival on local economic development in Beyşehir (Konya Province) and tried to determine how much local shops gain from the organization of the Beyşehir Lake Festival. She found that businesses coming from outside of the city for the festival are profiting more from the festival than local shops and suggested that this situation should be changed if the aim of the festival is to benefit the local economy. However, she also admitted that there is a shortage of accommodation and eating places in the town.

Several studies have dealt with the Camel Wrestling Festival held annually in Selçuk (near the historical vestiges of Ephesus). Çulha (2008) investigated camel wrestling festivals as a cultural tourism activity in some small cities of the Aegean Region and pointed out the importance of these events in the local economy. He argued that these events are particularly important for the economy of the place because they are organized in winter time. The economy of the region is based on mass tourism with a peak season during summer time and, especially small cities in the Aegean Region, are having a hard time finding other economic opportunities during the winter time. Furthermore, camel wrestling festivals are attended primarily by local people as very few tourists know about these events. Local organizers need governmental support for investment and advertisement.

In a subsequent study, Özdemir and Çulha (2009) analyzed whether or not there was an association between event performance and visitors' satisfaction and loyalty. The study has confirmed that the festival area has a direct positive effect on visitor satisfaction and loyalty. Moreover, the study has shown that other variables of the festival, such as souvenirs, food, convenience and staff could have an indirect effect on visitor satisfaction.Taking the same festival as a case study, Çalişkan (2010) attempted to evaluate the impacts of tourism and tourists on the festival. He advocated for a sustainable tourism approach that will benefit local residents.

Özbalcı and Var (2013) examined the economic impact of the Mesir Festival on local economic development. The Mesir Festival is an old festival celebrated in Manisa since 1540 and attended by more than 180,000 of which 56,000 were tourists. The authors use a simplified input-output analysis to discuss the benefits versus the costs of organizing the festival. Other studies that attempted to measure how festival attendees perceive socio-economic impacts were those by Yolal et al. (2009) and Yolal et al. (2012), with reference to the Eskişehir International Festival.

Yolal and collaborators (Yolal et al., 2012; Yolal et al., 2009) have attempted to understand how festival attendees perceive socio-economic impacts of an international festival in Eskişehir. Their studies confirmed that building social cohesion in the community is one of the great benefits of festivals. A study by Gül et al. (2013) on a carpet festival found that most important in the perception of visitors are the general benefits (for the entire community) that may result from the organization of festivals and events and only then the individual benefits.

Yüksek et al. (2008) evaluated the environmental effects of festival activities in the Artvin Kafkasör area and concluded that, due to high participation rates, at times, the carrying capacity is passed and important environmental damage could be observed in the festival area. Other interesting studies that may be worth mentioning in this context are the one by Atman (2013) on congress tourism in Istanbul and the study by Özdemir and Kozak (2009) on the 2005 Universiade Summer Games held in Izmir.

### *1.3. Measuring the economic impact*

That special events generate income in the local economy is without a doubt; understanding the exact economic impact on the local community is, however, more difficult (O'Sullivan and Jackson, 2002). A range of methods have been used in the literature to assess economic impact, the choice depending mainly on the size of the event and on the location (Dwyer et al., 2006). Three traditional models have been preferred for forecasting and evaluating economic impacts of tourism (Jackson et al., 2005): the input-output analysis, the computable general analysis and the cost-benefit analysis.

1. The input-output analysis (I-O) or some variant of it (Fletcher, 1989; Daniels, 2004; Chhabra et al., 2003; Tohmo, 2005) is the most widely used method particularly to assess economic impact of a festival at a regional or community level. The model is used to estimate the increase in economic activity (increased employment and tourist expenditure). Input-output analysis has remained a very popular method for impact assessment because of its comprehensiveness and flexibility (Briassoulis, 1991). However, the model was criticized for ignoring the negative impacts and for working on too many assumptions (Pasanen et al. 2009; Briassoulis, 1991).
2. The computable general equilibrium (CGE) method takes into account the whole economy as an integrated system; therefore, it is considered a more comprehensive method than the I-O analysis method overcoming many of the limitations of the latter method (Dwyer et al., 2006; Dwyer et al., 2005). The CGE analysis is more suitable for modeling economic impacts at national level. In the case of small, short-term regional festivals the model could prove too cumbersome to use as it does not take into account availability of excess capacity within organizations or casual labor (Jackson et al., 2005; Dwyer et al., 2006).

3. The cost- benefit analysis is also very complex as it takes into account all costs and benefits derived from organizing a festival. The model is very suitable wherever recording social and environmental impacts is particularly important. However, exact data related to social and environmental impact are difficult to obtain especially in the case of small, regional festivals which could make the model too complex to apply (Jackson et al., 2005).

Although the methods discussed above seem highly scientific, Crompton and collaborators (Crompton et al, 2001; Crompton, 2006) have subsequently criticized the mischievous way these methods were sometimes used. Traditionally there has been a tendency in these impact reports to exaggerate the benefits a projected festival could bring to the community and to minimize the costs (van Aalst and van Melik, 2012). This is done to gain support from local communities and to attract sponsors (Jackson et al., 2005; Crompton et al., 2006). Crompton (Crompton et al., 2001; Crompton, 2006) has documented the numerous erroneous procedures these economic impact studies have used in order to serve the interest of those who commission the study, such as: inclusion of local residents (although only tourists should be counted), inclusion of time-switchers and casuals (although these tourists would visit the place regardless of the festival), exaggeration of visitation numbers and ignoring the costs borne by the community.

Prentice and Andersen (2003) also argued that we should not assume that everyone found at a destination during a festival is actually a participant. They may just happen to be there. Moreover, some may have traveled to the destination specifically to attend the event; others may have come for a completely different reason and participation at the festival is just a secondary activity. Moreover, events could also generate intangible benefits (additional trade and business developments, tourism promotion, increased property values) and costs (resident exodus and interruption of normal business) that could not be easily quantified and are often disregarded when assessing the general economic impacts of certain events on the community (Dwyer et al., 2000).

In the end, Crompton et al. (2001, p. 80) conclude, although the economic impact assessment using these methods looks scientific due to the complex models used that produce quantifiable, precise outcomes, the results are not as objective and unequivocal as many, especially those not familiar with the technique, would believe. On the contrary, "economic impact analysis is an inexact process and output numbers would be regarded as 'best guess' rather than as being inviolably accurate" (Crompton et al, 2001, p. 80).

In conclusion, no single method can be used to investigate economic impact of events in all possible situations (Madden, 2001; Baptista Alves et al., 2010). Each method could be useful in certain situation and provide erroneous results in other situations.

Therefore, depending on the purpose of the study, estimating the exact overall economic impact made by visitor expenditures is not always necessary (Thrane, 2002). Raj (2004) examined the impact of two local festivals (the Edinburgh Festival and the Leeds Caribbean Festival) on the development of local cultural tourism. The findings have suggested that cultural tourism has been increased through development of local festivals and provided greater economic and cultural benefits to the local area.

A number of studies have used qualitative methods to assess the economic impact of special events (Wood, 2005; Perles, 2006). Gursoy et al. (2011) attempted to measure the impact of a major event (the 2008 Beijing Olympic Games) by investigating the perception of the residents. Similar studies have been done by Kim and Petrick (2005) in the case of residents' perceptions on the impact of the 2002 FIFA World Cup on Seoul as a host city and by Lorde et al. (2011) for the residents' perceptions of the impact of the 2007 Cricket World Cup on Barbados.

O'Sullivan and Jackson (2002) investigated the contribution of festival tourism to sustainable local economic development. They concluded that although such festivals can make a contribution towards sustainable local development this is actually rarely happening. They argue that income generation is not the only advantage event tourism could bring to localities and community development and environmental enhancement should also be considered. Quinn (2006) has also discussed about festival tourism as an engine for sustainable tourism development. She suggested that the benefits of festivals go beyond the increased revenue flow as it sustains increased arts activity and an improved venue infrastructure.

## 2. RESEARCH QUESTIONS AND METHODS

Our focus was on small events which have so far been less investigated in the literature. In order to gather relevant data on the impact small events could have on local economies we selected three relatively small events, each addressing a different demographic: an international film festival, an international jazz day and a concert by an international pop star (Justin Bieber). These events took place in Istanbul in April and May 2013.

Our main purpose was to analyze the popularity of these festivals with tourists and to learn whether or not (and to what extent) non-local participants at the three selected events spend money in the local economy. Our study does not intend to advance an exact figure of the economic impact these events have on the local economy as the literature did not provide us with an infallible method to assess this. Moreover, calculating the exact figure impact may be even more difficult when dealing with small-scale festivals in one of the biggest cities in the world in which hundreds of events are organized every year.

This is also the reason why our questionnaires did not ask participants to provide exact figures of their spending. We believe that these figures would be only gross estimates (especially when asked at the beginning of their stay in Istanbul, before the money is actually spent), and the factors that need to be considered are so many that the attempt to quantify everything would be just an unnecessary complication since our research questions are very simple:

1. Are these small-scale festivals important for tourism in Istanbul?
2. Do tourists attending these festivals spend money in the community besides buying a ticket to attend the festival?
3. Could these small-scale festivals be used as primary motivators for traveling to Istanbul?
4. Could these events be used to diversify the attractions the city offers to the tourists?

A number of five research assistants were selected and trained to conduct the field work. The international film festival lasted for a full week. The assistants were distributed to cover the event all days, at different times of the day (morning, afternoon and evening) and at the different locations of the festival. In the case of the two short-term events all five assistants worked together. The timing was particularly important for the pop concert where the time frame to distribute and collect the questionnaires was only a few hours before the concert started.

The assistants were instructed to approach each "n" participant. The "n" was left at the latitude of each assistant and differed for each event. If the attendee selected declined to participate or turned out to be a local resident the assistant moved on to the next person. One issue that emerged very soon was that participants from outside the province were extremely rare. Therefore, assistants were instructed to consider all attendees residing more than 50 km from Istanbul city center. The decision was taken after very careful consideration. Attendees living within Istanbul municipality or even within Istanbul Province are very unlikely to accommodate in a hotel. Yet, the same could be true for attendees living in Kocaeli, Sakarya, Tekirdağ and even Bursa provinces which are within easy driving distance from Istanbul.

In the end, between the three events we collected a number of 209 questionnaires. Of these 88 were from the international film festival, 25 from the jazz event and 96 from the pop music concert.

## 3. RESULTS AND DISCUSSIONS

### *3.1. Place of origin*

Most of our respondents attending the film festival (FF) were from Turkey with only 17% visiting from abroad (table 1). However, over 77% traveled from more than 100 km while 22.7% arrived from localities situated between 50 and 100 km from the center of Istanbul (table 1). When analyzing the place of origin for the attendees of the other events, the situation cannot be more different. Almost half of all participants at the jazz day (JD) came from abroad whereas for the Justin Bieber (JB) only 1% of the participants came from abroad and more than half arrived from places situated less than 100 km from the center of Istanbul (table 1).

**Table 1.**

**Place of origin for festival attendees**

| Place of origin | Film Festival | | Jazz Day | | Justin Bieber | |
|---|---|---|---|---|---|---|
| | Freq. | % | Freq. | % | Freq. | % |
| Abroad | 15 | 17.0 | 12 | 48.0 | 1 | 1.0 |
| Turkey, over 100 km from Istanbul city center | 53 | 60.2 | 4 | 16.0 | 46 | 48.0 |
| Turkey, between 50 and 100 km from Istanbul city center | 20 | 22.7 | 9 | 36.0 | 49 | 51.0 |
| Total | 88 | 100 | 25 | 100.0 | 96 | 100.0 |

### *3.2. Demographic split*

Analyzing the group of attendees at the international film festival, there is an almost equal split between males and females with the dominant age group being 25 to 44 years (54.5%) followed by the 45-64 category (37.5%). There were relatively few very young people attending the festival (8%) and no person 65 or older among our respondents (table 2). The group of people attending the jazz day is quite similar in terms of demographics; however, important changes are visible in the group attending the pop music concert, this being clearly dominated by very young (85%) females (also 85%) (table 2). Most people attending the film festival and the jazz day were highly educated, with 81.6% and 88% respectively having a university degree or higher (table 2). Attendees of the pop music concert, being much younger, have achieved much lower education levels (table 2). In terms of occupation, the majority of our respondents tended to be from categories of professions that needed a higher education, such as "management/administration" and "education". Significant proportions of respondents were also students and retirees (table 2). However, pop music concert participants present a very different demographic, the population being dominated by students (83.2%) (table 2). Most participants at the film festival and the jazz day have rated their income as satisfactory or good. When looking at the Justin Bieber concert participants, however, the situation seems to be more complex as these are mainly students who do not work for a living (table 2). Some may come from wealthier families and receive generous allowances from them while others may have to be content with much less.

**Table 2.**

**Demographic characteristics of festival attendees**

| Attribute | Frequency | | | Percent | | | Valid Percent | | |
|---|---|---|---|---|---|---|---|---|---|
| | F.F. | J.D. | J.B. | F.F. | J.D. | J.B. | F.F. | J.D. | J.B. |
| **Total number of respondents** | 88 | 25 | 96 | | | | | | |
| **Gender** | | | | | | | | | |
| Male | 44 | 13 | 14 | 50.0 | 52.0 | 14.6 | 50.6 | | 14.7 |
| Female | 43 | 12 | 81 | 48.9 | 48.0 | 84.4 | 49.4 | | 85.3 |
| Valid | 87 | 25 | 95 | 98.9 | 100.0 | 99.0 | 100.0 | | 100.0 |
| Missing value | 1 | 0 | 1 | 1.1 | | 1.00 | | | |
| **Age** | | | | | | | | | |
| Younger than 25 years | 7 | 4 | 81 | 8.0 | 16.0 | 84.4 | | | |
| 25-44 years | 48 | 10 | 13 | 54.5 | 40.0 | 13.5 | | | |
| 45-64 years | 33 | 11 | 2 | 37.5 | 44.0 | 2.1 | | | |
| 65 and older | 0 | 0 | 0 | 0 | 0 | 0 | | | |
| **Education** | | | | | | | | | |
| Post-graduate | 12 | 1 | 1 | 13.6 | 4.0 | 1.0 | 13.8 | | |
| University | 59 | 21 | 10 | 67.0 | 84.0 | 10.4 | 67.8 | | |
| High school | 16 | 3 | 52 | 18.2 | 12.0 | 54.2 | 18.4 | | |
| Less than high school | 0 | 0 | 33 | 0 | 0 | 34.4 | 0 | | |
| Valid | 87 | 25 | 96 | 98.9 | 100.0 | 100.0 | 100.0 | | |
| Missing | 1 | 0 | 0 | 1.1 | | | | | |

| Attribute | Frequency | | | Percent | | | Valid Percent | | |
|---|---|---|---|---|---|---|---|---|---|
| | F.F. | J.D. | J.B. | F.F. | J.D. | J.B. | F.F. | J.D. | J.B. |
| **Occupation** | | | | | | | | | |
| Factory worker | 5 | 0 | 2 | 5.7 | 0 | 2.1 | | 0 | 2.1 |
| Education | 14 | 2 | 3 | 15.9 | 8.0 | 3.1 | | 8.0 | 3.2 |
| Health care | 5 | 2 | 1 | 5.7 | 8.0 | 1.0 | | 8.0 | 1.0 |
| Management/ administration | 20 | 4 | 3 | 22.8 | 16.0 | 3.1 | | 16.0 | 3.2 |
| Service job | 5 | 3 | 0 | 5.7 | 12.0 | 0 | | 12.0 | 0 |
| Technical/ engineer | 7 | 3 | 2 | 8.0 | 12.0 | 2.1 | | 12.0 | 2.1 |
| Retired | 10 | 1 | 2 | 11.4 | 4.0 | 2.1 | | 4.0 | 2.1 |
| Student | 12 | 5 | 79 | 13.6 | 20.0 | 82.3 | | 20.0 | 83.2 |
| Other | 10 | 5 | 3 | 11.4 | 20.0 | 3.1 | | 20.0 | 3.2 |
| Valid | 88 | 25 | 95 | 100.0 | 100.0 | 99.0 | | 100.0 | 100.0 |
| Missing | 0 | 0 | 1 | | 0 | 1.0 | | | |
| **Income** | | | | | | | | | |
| Excellent | 1 | 0 | 5 | 1.1 | 0 | 5.2 | | 0 | 5.4 |
| Very good | 5 | 2 | 16 | 5.7 | 8.0 | 16.7 | | 8.0 | 17.4 |
| Good | 24 | 14 | 24 | 27.3 | 56.0 | 25.0 | | 56.0 | 26.1 |
| Satisfactory | 41 | 7 | 34 | 46.6 | 28.0 | 35.4 | | 28.0 | 37.0 |
| Not satisfactory | 17 | 2 | 13 | 19.3 | 8.0 | 13.5 | | 8.0 | 14.1 |
| Valid | 88 | 25 | 92 | 100.0 | 100.0 | 95.8 | | 100.0 | 100.0 |
| Missing | 0 | 0 | 4 | | | 4.2 | | | |

When attempting to identify the main motivation for our survey participants to travel to Istanbul, we discovered that our three case studies present three different situations. Almost 60% of the participants to the pop star concert came to Istanbul specifically for this reason whereas only one-third of the film festival attendees traveled to Istanbul for this specific event (tables 3). In terms of the means of transportation there are important similarities between the attendees of the festival and attendees of the jazz day. Most have arrived to Istanbul by air (44%); the rest have used other means of transportation, mainly bus (31% and 24% respectively) and private cars (22% and 32%). On the other hand, most participants at the Justin Bieber concert arrived to Istanbul by bus (43.7%) and by private cars (36.6%) (table 4).

**Table 3.**

**Primary motivation for visiting Istanbul**

| Reason for coming to Istanbul | Frequency | | | Percent | | | Valid Percent | | |
|---|---|---|---|---|---|---|---|---|---|
| | F.F. | J.D. | J.B. | F.F. | J.D. | J.B. | F.F. | J.D. | J.B. |
| Specifically for this event | 24 | 10 | 46 | 27.3 | 40.0 | 47.9 | 33.3 | 45.5 | 58.2 |
| For another reason | 48 | 12 | 33 | 54.5 | 48.0 | 34.4 | 66.7 | 54.5 | 41.8 |
| Valid total | 72 | 22 | 79 | 81.8 | 88.0 | 82.3 | 100.0 | 100.0 | 100.0 |
| Missing | 16 | 3 | 17 | 18.2 | 12.0 | 17.7 | | | |
| Total | 88 | 25 | 96 | 100.0 | 100.0 | 100.0 | | | |

**Table 4.**

**Means of transportation to Istanbul**

| Transport to Istanbul | Film Festival | | Jazz Day | | Justin Bieber Concert | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Freq. | Valid % | Freq. | Valid % | Freq. | Valid % | Freq. | Valid % |
| By air | 30 | 44.1 | 11 | 44.0 | 12 | 16.9 | 53 | 32.3 |
| By train | 2 | 2.9 | 0 | 0 | 2 | 2.8 | 4 | 2.3 |
| By bus | 21 | 30.9 | 6 | 24.0 | 31 | 43.7 | 58 | 35.4 |
| By car | 15 | 22.1 | 8 | 32.0 | 26 | 36.6 | 49 | 29.9 |
| Total | 68 | 100.0 | 25 | 100.0 | 71 | 100 | 164 | 100.0 |
| Missing | 20 | | 0 | | 21 | | 41 | |
| Total | 88 | | 25 | | 92 | | 205 | |

### *3.3. Sleeping and eating*

Our results have revealed important differences between the three groups also in terms of sleeping and eating establishments. When looking at the attendees of the film festival, more than 70% have chosen to accommodate in hotels or in other forms of tourist accommodation (table 5). Many tourists attending the jazz day were not staying overnight (28%), although an important percentage had also stayed in tourist accommodation (44%) (table 5). Finally, participants at the Justin Bieber concert preferred to stay with family and friends while in Istanbul (almost 56%) (table 5). In terms of the duration of visit, the situation is also different. Most attendees of the film festival came to Istanbul for a longer term, with over 22% of them staying for more than a week. More than 91% planned to actually stay for at least 2-3 nights or for the weekend (table 5). Those who came for the jazz day tended to have shorter sojourns (28% will not stay overnight) whereas in the case of the pop music concert attendees the situation is more complex (table 5). Also at least 62% of our respondents have planned to eat in restaurants at least once during their stay in Istanbul, the most among the Jazz Day attendees (92%) and the fewest among the attendees of the Justin Bieber concerts (table 5). Of the few respondents who were not intending to spend money in restaurants most still intended to buy from local supermarkets or eat food at family and friends that was bought from local supermarkets (table 5).

**Table 5.**

**Time and expenses in Istanbul**

| Attribute | Frequency | | | Percent | | | Valid Percent | | |
|---|---|---|---|---|---|---|---|---|---|
| | F.F. | J.D. | J.B. | F.F. | J.D. | J.B. | F.F. | J.D. | J.B. |
| **Total number of respondents** | 88 | 25 | 96 | | | | | | |
| **Accommodation in Istanbul** | | | | | | | | | |
| 4-5 star hotel | 20 | 8 | 11 | 22.7 | 32.0 | 11.5 | 29.4 | 32.0 | 15.7 |
| 1-3 star hotel | 20 | 3 | 7 | 22.7 | 12.0 | 7.3 | 29.4 | 12.0 | 10.0 |
| Other tourist accommodation | 8 | 0 | 5 | 9.1 | 0 | 5.2 | 11.8 | 0 | 7.1 |
| With relative and friends | 16 | 7 | 39 | 18.2 | 28.0 | 40.6 | 23.5 | 28.0 | 55.7 |

| Attribute | Frequency | | | Percent | | | Valid Percent | | |
|---|---|---|---|---|---|---|---|---|---|
| | F.F. | J.D. | J.B. | F.F. | J.D. | J.B. | F.F. | J.D. | J.B. |
| Will not stay overnight | 4 | 7 | 13 | 4,5 | 28.0 | 13.5 | 5.9 | 28.0 | 18.5 |
| Valid responses | 68 | 25 | 70 | 77.3 | 100.0 | 72.9 | 100.0 | 100.0 | 100.0 |
| Missing | 20 | 0 | 26 | 22.7 | 0 | 27.1 | | | |
| **Time spent in Istanbul** | | | | | | | | | |
| More than a week | 15 | 2 | 26 | 17.0 | 8.0 | 27.1 | 22.1 | 8.0 | 38.2 |
| Between 4 nights and a week | 24 | 7 | 5 | 27.3 | 28.0 | 5.2 | 35.3 | 28.0 | 7.4 |
| 2-3 nights | 23 | 6 | 14 | 26.1 | 24.0 | 14.6 | 33.8 | 24.0 | 20.6 |
| One night | 2 | 3 | 4 | 2.3 | 12.0 | 4.2 | 2.9 | 12.0 | 5.9 |
| Will not stay overnight | 4 | 7 | 19 | 4.5 | 28.0 | 19.8 | 5.9 | 28.0 | 28.0 |
| Valid responses | 68 | 25 | 68 | 77.3 | 100.0 | 70.8 | 100.0 | 100.0 | 100.0 |
| Missing | 20 | 0 | 28 | 22.7 | 0 | 29.2 | | | |
| **Eat in restaurants** | | | | | | | | | |
| Eat every day | 33 | 10 | 22 | 37.5 | 40.0 | 22.9 | 41.3 | 40.0 | 29.7 |
| Eat at least once during stay | 35 | 13 | 24 | 39.8 | 52.0 | 25.0 | 43.8 | 52.0 | 32.4 |
| Will not eat | 12 | 2 | 28 | 13.6 | 8.0 | 29.2 | 15.0 | 8.0 | 37.8 |
| Valid responses | 80 | 25 | 74 | 90.9 | 100.0 | 77.1 | 100.0 | 100.0 | 100.0 |
| Missing | 8 | 0 | 22 | 9.1 | 0 | 22.9 | | | |
| **Reasons for not eating in restaurants** | | | | | | | | | |
| Brought food and beverages from home | 2 | 0 | 4 | 2.3 | 0 | 4.2 | 2.5 | | 5.4 |
| Bought food and beverages from local supermarkets | 0 | 0 | 5 | 0 | 0 | 5.2 | 0 | | 6.8 |
| Eat at friends and relatives | 9 | 2 | 16 | 10.2 | 8.0 | 16.7 | 11.4 | | 21.6 |
| Other | 1 | 0 | 3 | 1.1 | 0 | 3.1 | 1.3 | | 4.0 |
| Not applicable | 67 | 23 | 46 | 76.1 | 92.0 | 47.9 | 84.8 | | 62.2 |
| Valid responses | 79 | 25 | 74 | 89.8 | 100.0 | 77.1 | 100.0 | | 100.0 |
| Missing | 9 | 0 | 22 | 10.2 | | 22.9 | | | |

### *3.4 Participation and tickets bought*

Almost three quarters of our respondents bought more than one ticket showing that they were not interested in one particular film but in the festival itself (table 41). The situation is very similar at the Justin Bieber concert; at the jazz day, however, 92% of our survey participants bought multiple tickets (tables 6).

**Table 6.**

**Number of tickets purchased**

| Number of tickets bought | Frequency | | | Percent | | | Valid Percent | | |
|---|---|---|---|---|---|---|---|---|---|
| | F.F. | J.D. | J.B. | F.F. | J.D. | J.B. | F.F. | J.D. | J.B. |
| One | 22 | 1 | 23 | 25.0 | 4.0 | 24.0 | 27.5 | 4.0 | 28.4 |
| 2-3 | 48 | 23 | 42 | 54.5 | 92.0 | 43.4 | 60.0 | 92.0 | 51.9 |
| 4-5 | 7 | 1 | 12 | 8.0 | 4.0 | 12.5 | 8.8 | 4.0 | 14.8 |
| More than 5 | 3 | 0 | 4 | 3.4 | 0 | 4.2 | 3.8 | 0 | 4.9 |
| Valid responses | 80 | 25 | 81 | 90.9 | 100.0 | 84.4 | 100.0 | 100.0 | 100.0 |
| Missing | 8 | 0 | 15 | 9.1 | 0 | 15.6 | | | |
| Total | 88 | 25 | 96 | 100.0 | 100.0 | 100.0 | | | |

### *3.5. Other activities*

Many of the tourists we interviewed did not come to Istanbul exclusively for the event. Over 85% of them had plans to engage in other types of activity (tables 12 and 13).

**Table 7.**

**Other activities while in Istanbul (Participants at the International Film Festival)**

| Other activities while in Istanbul | Frequency | Percent |
|---|---|---|
| Yes | 75 | 85.2 |
| No | 2 | 2.3 |
| Missing | 11 | 12.5 |
| Visit historical places | 36 | 48 |
| Bosphorus tour | 64 | 85.3 |
| Shop | 52 | 69.3 |
| Other | 20 | 26.7 |

**Table 8.**

**Other activities while in Istanbul**
**(Participants at the Jazz Day and at the Justin Bieber Concert)**

| Other activities while in Istanbul (n = 75) | Frequency | Percent |
|---|---|---|
| Visit historical and cultural objectives | 39 | 52 |
| Take a tour of the Bosphorus | 38 | 50.7 |
| Shop | 38 | 50.7 |
| Other | 13 | 17.3 |

## 4. CONCLUSION

Our study has found that small events organized in big cities with many cultural and historical attractions for tourists are not very successful in attracting tourists although they could still be important for the local community. This is in contradiction with the findings of Baptista Alves et al. (2010), Kim et al. (1998), Mitchell (1993), and Nurse (2001) that

local, small-scale festivals could have strong impacts on the local economy. The results of our study are, however, in agreement with the tourism attraction theory which states that greater attractions will be able to attract tourists to a destination and/or retain them whereas lesser attractions will not be so successful; they will at most offer secondary activities to tourists while visiting (McIntosh and Goeldner, 1990). Our findings also support the conclusion of McKercher's (McKercher et al., 2006) investigation on small festivals in Hong Kong. They argued that very few tourists visited the festivals and consequently these festivals cannot be considered tourism attractions.

Our study has shown that tourists visiting small festivals invest money in the community. Besides buying (sometimes multiple) tickets to the shows, the great majority of our respondents have accommodated in hotels and other tourist accommodations, have eaten in restaurants and shopped in local stores. However, due to the small number of tourists, we agree with McKercher et al. (2006) that their economic contribution was minimal.

How can we explain the lack of interest that tourists display towards these small festivals? We can think of several explanations:

1. These festivals lack appeal, they are uninteresting for tourists. This is a possibility considering that the three festivals are addressing people with special interests. Not all tourists like jazz or Justin Bieber. Also, while a lot more people are consumers of movies, they may not be so fanatic to travel to Istanbul for them, especially since these types of film festivals (and jazz festivals) are organized in many cities around the world. Same goes for most artists who tour the world to promote their albums. For example, between September 29, 2012 and December 8, 2013, Justin Bieber had 162 concerts ("Believe Tour"), of which 85 in North America, 47 in Europe, 10 in Asia, 2 in Africa, 8 in South America and 10 in Australasia[3]. These festivals may be very important for locals and tourists from Turkey because they can see representatives of the global popular culture performing in their community, but, because they do not promote local culture, they are less appealing to international tourists.
2. Perhaps tourists lack information about the festivals. Our study has shown that while almost half of those attending the Justin Bieber concert came to Istanbul specifically for the event, only 27% of those surveyed at the film festival came to Istanbul specifically for this event. This confirms the results of McKercher et al.'s (2006) study that the majority of tourists attending small events learn about the event at the destination. Better advertising and marketing both abroad and in Istanbul are needed in order to increase the number of tourists attending the many small festivals and events Istanbul offers throughout the year.
3. Possibly the marketing failure of these festivals is due to the fact that Istanbul hosts a great number of such festivals and events. Some festivals and events are perhaps prioritized by those who are in charge of marketing the city to tourists while others receive very little or no advertising. This explains why small-scale festivals are more successful in smaller towns than in big cities (confirming the findings of de Bres and Davis, 2007, and Mitchell and Wall, 1986).

[3] *http://en.wikipedia.org/wiki/Believe_Tour*

4. The city has many attractions and tourists have a limited time to visit; therefore, they must prioritize and, under this condition, very few would probably want to attend a local-scale festival which promotes universal culture rather than local culture.

However, the economic impact of a festival is not limited to the event itself. Many tourists who came for the event may also want (or could be persuaded) to visit other venues not initially planned. Also tourists visiting Istanbul for other motives could be lured to participate in such a small event if interested. Any such combination of tourist attractions could have a positive effect on the urban economy (van Aalst and van Melik, 2012). In conclusion, small festivals could play more important roles as secondary attractions rather than primary attractions.

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## REFERENCES

1. Atman, V. (2013), *Congress tourists spend three times more than the others* (Ö. Çebi, interviewer, 18 March).
2. Baptista Alves, H.M., Campon Cerro, A.M., Ferreira Martins, A.V. (2010), *Impacts of small tourism events on rural places*, Journal of Place Management and Development, 3, 1, pp. 22-37.
3. Barker, M., Page, S.J., Meyer, D. (2002), *Modeling tourism crime – the 2000 America's cup*, Annals of Tourism Research, 29, 3, pp. 762-782.
4. Bilgili, B., Yağmur, Ö., Yazarkan, H. (2012), *Turisitik ürün olarak festivallerin etkinlik ve verimliliği üzerine bir araştırma: Erzurum – Oltu Kırdağ festival örneği (A research on the efficiency and productivity of festivals as a touristic product: sample of Erzurum – Oltu Kırdağ festival)*, International Journal of Social and Economic Sciences, 2, pp. 117-124.
5. Briassoulis, H. (1991), *Methodological issues: tourism input-output analysis*, Annals of Tourism Research, 18, pp. 485-495.
6. Chhabra, D., Sills, E., Cubbage, F.W. (2003), *The significance of festivals to rural economies: estimating the economic impacts of Scottish highland games in North Carolina*, Journal of Travel Research, 41, 4, pp. 421-427.
7. Crompton, J.L. (2006), *Economic impact studies: instruments for political shenanigans?*, Journal of Travel Research, 45, pp. 67-82.
8. Crompton, J.L., McKay, S.L. (1997), *Motives of visitors attending festival events*, Annals of Tourism Research, 24, 2, pp. 425-439.
9. Crompton, J.L., Lee, S., Shuster, T.J. (2001), *A guide for undertaking economic impact studies: the Springfest example*, Journal of Travel Research, 40, pp. 79-87.
10. Çakır, M. (2009), Festival turizmi (Festival tourism), *http://m-cakir.blogspot.com/2009/02/festival-turizmi_04.html.*

11. Çalışkan, V. (2010), *Examining cultural tourism attractions for foreign visitors: the case of camel wrestling in Selçuk (Ephesus*), Turizam, 14, 1, pp. 22-40.
12. Çulha, O. (2008), *Kültür turizmi kapsamında destekleyici turistik ürün olarak deve güreşi festivalleri üzerine bir alan çalışması*, Journal of Yaşar University, 3, pp. 1827-1852.
13. Daniels, M. (2004), *Beyond input-output analysis: using occupation-based modeling to estimate wages generated by a sport tourism event*, Journal of Travel Research, 43, 1, pp. 75-82.
14. De Bres, K., Davis, J. (2001), *Celebrating group and place identity: a case study of a new regional festival*, Tourism Geographies, 3, 3, pp. 326-337.
15. Dwyer, L., Forsyth, P., Spurr, R. (2006), *Assessing the economic impacts of events: a computable general equilibrium approach*, Journal of Travel Research, 45, 1, pp. 59-66.
16. Dwyer, L., Forsyth, P., Spurr, R. (2005), *Estimating the impacts of special events on an economy*, Journal of Travel Research, 43, pp. 351-359.
17. Dwyer, L., Mellor, R., Mistilis, N., Mules, T. (2000), A framework for assessing "tangible" and "intangible" impacts of events and conventions, Event Management, 6, 3, pp. 175-189.
18. Felsenstein, D., Fleischer, A. (2003), *Local festivals and tourism promotion: the ride of public assistance and visitor expenditure*, Journal of Travel Research, 41, 4, pp. 385-392.
19. Fletcher, J.E. (1989), *Input-output analysis and tourism impact studies*, Annals of Tourism Research, 16, 4, pp. 514-529.
20. Formica, S., Uysal, M. (1998), *Market segmentation on an international cultural-historical event in Italy*, Journal of Travel Research, 36, 4, pp. 16-24.
21. Fourie, J., Santana-Gallego, M. (2011), *The impact of mega-sport events on tourist arrivals*, Tourism Management, 32, pp. 1364-1370.
22. Funk, D.C., Alexandris, K., Ping, Y. (2009), *To go or stay home and watch: exploring the balance between motives and perceived constraints for major events: a case study of the 2008 Beijing Olympic Games*, International Journal of Tourism Research, 11, 1, pp. 41-53.
23. Gelan, A. (2003), *Local economic impacts: the British Open*, Annals of Tourism Research, 30, 2, pp. 406-425.
24. Getz, D. (2005), *Event management and event tourism (2nd edition)*. New York: Cognizant.
25. Getz, D. (2007), *Event studies: theory, research and policy for planned events*. Oxford: Butterworth-Heinemann.
26. Getz, D. (2008), *Event tourism: definition, evolution, and research*, Tourism Management, 29, pp. 403-428.
27. Gursoy, D., Chi, C.G., Ai, J., Chen, B.T. (2011), *Temporal change in resident perceptions of a mega-event: the Beijing 2008 Olympic Games*, Tourism Geographies, 13, 2, pp. 299-324.
28. Gursoy, D., Kim, K., Uysal, M. (2004), *Perceived impacts of festivals and events by organizers: an extension validation*, Tourism Management, 25, 2, pp. 171-181.
29. Gursoy, D., Kendall, K.W. (2006), *Hosting mega events: modeling locals' support*, Annals of Tourism Research, 33, 3, pp. 603-623.
30. Gül, K., Erdem, B., Gül, M. (2013), *Yerel festivallerin etkinliğine bağlı ziyaretçi kazanımları: Sındırgı Yağcıbedir festivali örneği (Benefits of visitors based on the effectiveness of local festivals: the case of Sındırgı Yağcıbedir Festival*, (Süleyman Demirel Üniversitesi) İktisadi ve İdari Bilimler Fakültesi Dergisi, 18, 2, pp. 213-239.
31. Hiller, H.H. (1998), *Assessing the impact of mega-events: a linkage model*, Current Issues in Tourism, 1, 1, pp. 47-57.
32. Hodur, N.M., Leistritz, F.L. (2006), *Estimating the economic impact of event tourism*, Journal of Convention and Event Tourism, 8, 4, pp. 63-79.
33. Jackson, J., Houghton, M., Russel, R., Triandos, P. (2005), *Innovations in measuring economic impacts of regional festivals: a do-it-yourself kit*, 43, pp. 360-367.
34. Jago, L.K., Shaw, R.N. (1998), Special events: a conceptual and definitional framework, Festival Management and Event Tourism, 5, 1, pp. 21-32.

35. Kim, C., Scott, D., Thigpen, J.F., Kim, S.S. (1998), *Economic impact of birding festival*, Festival Management and Event Tourism, 5, 1-2, pp. 51-58.
36. Kim, S.S., Petrick, J.F. (2005), *Residents' perceptions on impacts of the FIFA 2002 World Cup: the case of Seoul as a host city*, Tourism Management, 26, pp. 25-38.
37. Kim, S.S., Chou, K., Chung, K.Y. (2003), *Convention industry in South Korea: an economic impact analysis,* Tourism Management, 24, 5, pp. 533-541.
38. Kızılırmak, İ. (2006), *Türkiye'de düzenlenen yerel etkinliklerin turistik çekicilik olarak kullanılmasına yönelik bir inceleme*, Sosyal Bilimler Dergisi, 15, pp. 181-196.
39. Küçük, M. (2013), *Kültür turizmi kapsamında yer alan festival etkinliklerinin yerel kalkınmaya katkısı: Uluslarası Beyşehir Göl Festivali üzerine bir araştırma*, Kop Bölgesel Kalkınma Dergisi, 4, pp. 1-13.
40. Lamberti, L., Noci, G., Guo, J., Zhu, S. (2011), *Mega-events as drivers of community participation in developing countries: the case of Shanghai World Expo*, Tourism Management, 32, pp. 1474-1483.
41. Li, S., McCabe, S. (2012), *Measuring the socio-economic legacies of mega-events: concepts, propositions and indicators*, International Journal of Tourism Research, 15, 4, pp. 388-402.
42. Lockstone, L., Baum, T. (2008), *Fun in the family: tourism and the Commonwealth Games*, International Journal of Tourism Research, 10, pp. 497-509.
43. Lorde, T., Greenidge, D., Devonish, D. (2011), *Local residents' perceptions of the impacts of the ICC Cricket World Cup 2007 on Barbados: comparisons of pre- and post-games,* Tourism Management, 32, pp. 349-356.
44. Madden, C. (2001), *Using "economic" impact studies in arts and cultural advocacy: a cautionary note*, Media International Australia Incorporating Culture and Policy, 98, pp.161-178.
45. McHone, W.W., Rungeling, B. (2000), *Practical issues in measuring the impact of a cultural tourist event in a major tourist destination*, Journal of Travel Research, 38, pp. 300-303.
46. McIntosh, R.W., Goeldner, C.R. (1990), Tourism *principles, practices and philosophies (6th edition),* New York: Wiley.
47. McKercher, B., Mei, W.S., Tse, T.S.M. (2006), *Are short duration cultural festivals tourist attractions?* Journal of Sustainable Tourism, 14, 1, pp. 55-66.
48. Mitchell, C.J.A. (1993), *Economic impact of the arts: theater festivals in small Ontario communities*, Journal of Cultural Economics, 17, 2, pp. 55-67.
49. Mitchell, C., Wall, G. (1986), *Impacts of cultural festivals on Ontario communities*, Recreation Research Review, 13, 1, pp. 28-37.
50. Moscardo, G. (2007), *Analyzing the role of festivals and events in regional development*, Event Management, 11, 1-2, pp. 23-32.
51. Nurse, K. (2001), *Festival tourism in the Caribbean: an economic impact assessment,* Washington, D.C.: Inter-American Development Bank, *http://www.acpcultures.eu/_upload/ocr_document/IADB-Nurse_FestivalTourismCaribbean_2001.pdf*
52. Olds, K. (1998), *Urban mega events, evictions and housing rights: the Canadian case*, Current Issues in Tourism, 1, 1, pp. 2-46.
53. Özbalcı, S., Var, T. (2013), *Mesir Festival with an economic perspective*, CBÜ Sosyal Bilimler Dergisi, 11, 3, pp. 488-497.
54. Özdemir, G., Çulha, O. (2009), *Satisfaction and loyalty of festival visitors*, Anatolia: An International Journal of Tourism and Hospitality Research, 20, 2, pp. 359-373.
55. Özdemir, G., Kozak, M. (2009), *Event and network management: application of EFQM for tourist destinations*, International Journal of Tourism Policy, 2, 4, pp. 262-273.
56. O'Brien, D. (2006), *Event business leveraging: the Sydney 2000 Olympic Games*, Annals of Tourism Research, 33, 1, pp. 240-261.
57. O'Sullivan, D., Jackson, M.J. (2002), *Festival tourism: a contributor to sustainable local economic development?* Journal of Sustainable Tourism, 10, 4, pp. 325-342.

58. Quinn, B. (2009), *Festivals, events and tourism*, Dublin Institute of Technology, School of Hospitality Management and Tourism.
59. Quinn, B. (2006), *Problematising "festival tourism": arts festivals and sustainable development in Ireland*, Journal of Sustainable Tourism, 14, 3, pp. 288-306.
60. Pasanen, K., Taskinen, H., Mikkonen, J. (2009), *Impacts of cultural events in Eastern Finland – development of a Finnish event evaluation tool*, Scandinavian Journal of Hospitality and Tourism, 9, 3, pp. 112-129.
61. Perlés, J. (2006), *Analysis del impacto economico de eventos: una aplicacion a fiestas populares de proyeccion turistica*, Cuadernos de Turismo, 17, pp. 147-166.
62. Prentice, R., Andersen, V. (2003), *Festivals as creative destination*, Annals of Tourism Research, 30, 1, 7-30.
63. Presbury, R., Edwards, D. (2005), *Incorporating sustainability in meetings and event management education*, International Journal of Event Management and Research, 1, pp. 30-45.
64. Raj, R. (2004), *The impact of Cultural Festivals on Tourism*, Tourism Today, 4, pp. 66-77.
65. Ritchie, J.R.B. (1984), *Assessing the impacts of hallmark events: conceptual and research issues,* Journal of Travel Research, 23, 1, pp. 2-11.
66. Robertson, M., Rogers, P., Leask, A. (2009), *Progressing socio-cultural impact evaluation for festivals*, Journal of Policy Research in Tourism, Leisure and Events, 1, 2, pp. 156-169.
67. Small, K., Edwards, D., Sheridan, L. (2005), *A flexible framework for evaluating the socio-cultural impacts of a (small) festival*, International Journal of Event Management Research, 1, 1, pp. 66-77.
68. Thrane, C. (2002), *Jazz festival visitors and their expenditures: linking spending patterns to musical interests*, Journal of Travel Research, 40, pp. 281-286.
69. Tohmo, T. (2005), *Economic impacts of cultural events on local economies: an input-output analysis of the Kaustinen Folk Music Festival*, Tourism Economies, 11, 3, pp. 431-451.
70. Van Aalst, I., van Melik, R. (2012), *City festivals and urban development: does place matter?*, European Urban and Regional Studies, 19, 2, pp. 195-206.
71. Waitt, G. (2003), *Social impacts of the Sydney Olympics*, Annals of Tourism Research, 30, 1, pp. 194-215.
72. Wood, E. (2005), *Measuring the economic and social impacts of local authority events*, The International Journal of Public Sector Management, 1, 1, pp. 37-53.
73. Yolal, M., Woo, E., Çetinel, F., Uysal, M. (2012), *Comparative research of motivations across different festival products*, International Journal of Event and Festival Management, 3, 1, pp. 66-80.
74. Yolal, M., Çetinel, F., Uysal, M. (2009), *An examination of festival motivation and perceived benefits relationship: Eskişehir international festival*, Journal of Convention and Exhibition Management, 10, 4, pp. 276-291.
75. Yüksek, T., Cenghiz, T., Yüksek, F. (2008), *Doğal festival etkinliklerinin koruma-kullanma açısından değerlen-dirilmesi: Kafkasör kültür, sanat ve turizm festivali örneği (The evaluation of festival activities in terms of conservation and usage in natural areas: Kafkasör culture, art and tourism festival*), Ekoloji, 17, 67, pp. 37-45.

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# USING LANDSAT IMAGES AND GIS TO ASSESS THE CHANGES OF MER DE GLACE AND MARMOLADA GLACIERS, IN THE LAST THREE DECADES

**M. M. NISTOR**[1]

**ABSTRACT. - Using Landsat Images and GIS to Assess the Changes of Mer de Glace and Marmolada Glaciers, in the Last Three Decades.** We have demonstrated that Mer de Glace Glacier (GL) and Marmolada GL are in continuous retreat. The changes in size and status of terminus points were estimated in various time intervals by satellite images (SIs) and Geographic Information Systems (GIS) techniques, during the last three decades. The aim of the research was to found the value of the ice melting areas of Mer de Glace GL and Marmolada GL and to calculate the decline rate for both GLs. A large number of GLs have lost ice mass all over the world. Often glaciologists monitor the GLs movements under climate changes and they express their opinions about the ocean level rise, ecosystem challenges and the future implications of GLs decline. The analysed information to quantify the Mer de Glace GL and Marmolada GL areas derived from SIs. By manual vectorization we obtained the outlines of GLs in different years. For 1984, 1999, 2013 we defined the limits for Mer de Glace GL and for 1986, 1999, 2013 we defined the limits for Marmolada GL. These vector layers were compared in order to observe the melting area and to establish the withdrawal rate. The first results indicate that Mer de Glace GL area declined by 2.365 $km^2$ between 1984 and 2013 and a mean melting rate of 0.082 $km^2$/year was obtained. Marmolada GL decreased by 1.035 $km^2$ between 1986 and 2013 and a mean melting rate of 0.038 $km^2$/year was calculated. We believe that these results represent significant quantitative data about GLs movements regarding two different areas in the Alps Range and may provide knowledge for hydrology, geomorphology and environmental sciences.

***Keywords:*** *satellite images, GIS, climate change, glacier, Mer de Glace, Marmolada.*

## 1. INTRODUCTION

The climate change may be easily noticed through measurements of GLs, which are the most sensitive indicators of climate warming (Dong et al., 2013; Kargel et al., 2005; Haeberli et al., 1999). The melting of GLs creates a glacierized face of alpine landscape (O'Neel et al., 2014; Theurillat and Guisan, 2001). In general, the GLs are affected by global warming (Oerlemans, 2005) and many studies demonstrated that GLs from the entire world diminished in mass due to global warming (Painter at al., 2013; Kennedy at al., 2006; Shahgedanova et al., 2005).

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The assessment of areas covered by GLs gives substantial information about how the climate evolves. Remote sensing with Landsat images and GIS techniques have been used to assess the changes of Mer de Glace and Marmolada GLs in the Alps.

The objective of this work is to calculate the square area in various time intervals for Mer de Glace and Marmolada GLs, between 1984/1986 and 2013. The research was made on Mer de Glace and Marmolada GLs, for two reasons: first, because both GLs are located in tourism areas and human activities can accelerate the melting of ice. Secondly, each one represents an important GL for two different sectors of Alps – Mer de Glace GL for the Western Alps and Marmolada GL for the Southern Alps – and we wanted to see where there is a bigger retreat of GLs.

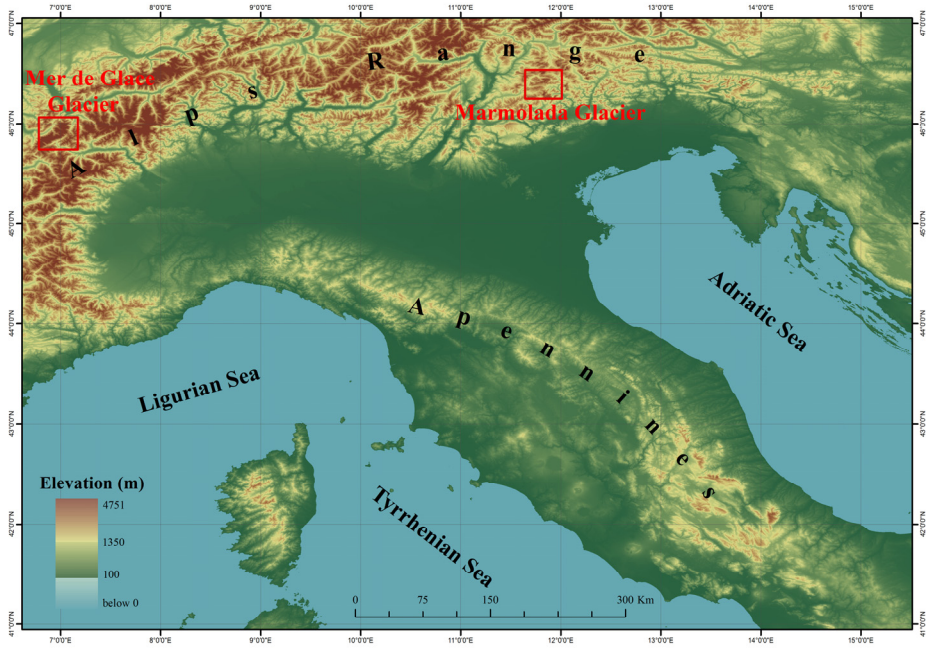


**Fig. 1.** Location of the Mer de Glace and Marmolada Glaciers on the Northern Italy map

The characteristics of current climate at worldwide level show a continuous increase of temperatures and a reduction of precipitation by 10% for the next five decades (Stavig et al., 2005). These scenarios are alarming for the melting of ice mass, rise in sea level and advancement of shorelines (Khalsa et al., 2004). An increase of mean temperatures by 1.0–3.5° Celsius is predicted for the 21st century (Houghton et al. 1995). The increase of $CO_2$ and greenhouse gas emissions has direct effects on global warming and on the ecosystems (Cox et al., 2000; Shaver et al. 2000). In this context of climate change, the first results indicate a greater retreat of Mer de Glace GL during 1984-2013, in comparison with Marmolada GL. Thus, the decrease of both GLs brings forward modifications of landscape (Nistor, 2013) and changes in the hydrologic balance. Our findings related to Mer de Glace and Marmolada GLs provide additional support to previous studies and may be useful for environmental sciences.

The paper is structured in five sections which approach the studied GLs in the current climate change situation. The first section of the work relates the impact of global warming on GLs. Section 2 provides information about the study area and its surroundings. Section 3 outlines our methods for assessing GLs challenges. In Section 4 the results obtained from applied methodology are presented and the possible effects of GLs retreat on natural systems are discussed. Our conclusions are provided in the final section.

## 2. STUDY AREA

The investigated GLs are positioned in the south-central part of Europe, in the Alps (fig. 1). Due to their geographical position and arched shape, the Alps have territories with "oceanic, continental, polar, Mediterranean and, on occasion, Saharan influences" (Beniston, 2006). A rise in temperatures by 2° C during 20$^{th}$ century in the Alps was provided by Haeberli and Beniston (1998). Mer de Glace and Marmolada GLs are located over 1000 m above sea level (asl) and are classified as mountain GLs. Both GLs register a decline in ice mass area and volume, too.

### *2.1. Geographical setting of Mer de Glace GL*

Mer de Glace (fig. 2) is the largest GL from Western Alps and is a compound valley GL. The GL is located in Savoy Alps in the East of France and has the coordinates 6°56' E – 45°53' N. It has a significant impact on tourism, alpinism and research in the north-western part of Mont Blanc. For its size, Mer de Glace is one of the most popular GL in the entire Chamonix Valley. Mer de Glace GL resulted as the confluence of Tacul GL and Léschaux GL. Some decades ago, the Telèfre GL was tributary of Mer de Glace GL, and together with Tacul GL and Léschaux GL, all four GLs cover around 32 km$^2$ (Kuhn, 2007). The tongue of Mer de Glace GL registers about 5 km in length. The maximum thickness is 400 m and was found at Tacul GL (Vivian, 2001). The lowest altitude of this GL is around 1832 m asl and is in the ablation zone, near Montenvers railway station (fig. 2). The accumulation area extends over 3500 m asl. Mer de Glace GL has the direction of flow to N-NW. The oldest data about the extension of GL dates from 1645s, when the tongue advanced to the Chamonix Valley, near the village, until 1720s (Mougin, 1912, mentioned by Kuhn, 2007). In 2001 the terminus of Mer de Glace ended at about 1467 m asl (Kuhn, 2007). According to the Köppen-Geiger climate classification, the GL is positioned in an area with microthermal climates (Dfc), characterized as fully humid (Kottek et al., 2006).

### *2.2. Geographical setting of Marmolada GL*

Marmolada (fig. 3) is the largest GL in Dolomites Mountains and is a hanging GL. The GL is located on the northern flank of Marmolada Massif in Belluno Province, Italy, and has the coordinates 11°51' E – 46°26' N. The Dolomites were included in UNESCO World Heritage List in 2009 and represent an important tourist attraction.

Marmolada GL is approximately 3 km wide and about 1 km long in maximal sector. It is a small GL, with an area of 1.665 km$^2$. At Marmolada GL the tongue is missing. The GL lies between 2635 - 2935 m asl. In 2009 the maximum thickness was 52 m (Crepaz et al. 2010). Marmolada GL has the flow direction to the N.

**Fig. 2.** View of Mer de Glace Glacier from Montenvers Station at 1913 m, South-looking ground photograph

**Fig. 3.** View of Marmolada Glacier from Sella Pass 2240 m, South-East-looking ground photograph

The studies about GLs in the Dolomites provide the oldest data about the extension of Marmolada GL dating from 1888, belonging to Richter and later to Marinelli. As mentioned by Crepaz et al. (2010), Richter calculated in 1888 an area of 4.95 $km^2$ for Marmolada GL and in 1910, Marinelli reported an area of 3.35 $km^2$ for Main Marmolada and 0.57 $km^2$ for Western Marmolada. According to the data collected by Crepaz et al. (2010), in 1982 the Main Marmolada and Western Marmolada GLs had an extension of 2.98 $km^2$. Considering the Köppen-Geiger climate classification, the GL is positioned in an area with alpine climate (ET), characterized by a climate similar to tundra, where the warmest month has an average temperature between between 0 – 10° Celsius (Kottek et al., 2006).

## 3. Methods

### *3.1. General approach*

To highlight the advantages of the used procedures, fig. 4 shows the steps and combination of remote sensing and GIS techniques carried out for the results of the present work. The methods are based on SIs and GIS, and this methodology was chosen because it is fast and easy to integrate for GLs study. Apart from these reasons, the applied methods enable us to acquire the best results at local scale. In order to validate the results, we appealed at field research and interpretation of the references about Mer de Glace and Marmolada GLs.

First of all, we collected the SIs and created a GIS database with the outlines of studied GLs, for 1984, 1999 and 2013. It was then possible to obtain the square area of each GL, in three years, with an appropriate interval of time: 13 – 15 years. The data collection by remote sensing for GLs was characterized by Gao and Liu (2001) as an efficient method. The field research was essential to check the limits of the GLs. Mer de Glace is covered at terminus by terminal moraines while medial and lateral moraines are present along the tongue. For a higher accuracy, we have taken the GLs limits using field data and SIs.

### *3.2. Remote sensing*

We used remote sensing backed by field investigation to obtain the outlines of GLs and their size. Remote sensing was used to collect data from SIs courtesy by United States Geological Survey's Earth Resources Observation website (2014). The SIs belong to Landsat 4 and are images in visible spectrum. SIs from 1984 (TM sensor), 1999 (ETM sensor), and 2013 (OLI sensor) were used for observations regarding the fluctuations of Mer de Glace GL. SIs from 1986 (TM sensor), 1999 (ETM sensor), and 2013 (OLI sensor) were used for Marmolada GL. Remote sensing was applied only for images taken in autumn (Northern Hemisphere) to avoid the influence of snow. We used Landsat images because they are georeferenced and have full resolution. Another reason is that these images are easy to integrate in GIS (Holobâcă 2013). Thus, the implementation data were made in WGS 1984 Web Mercator.

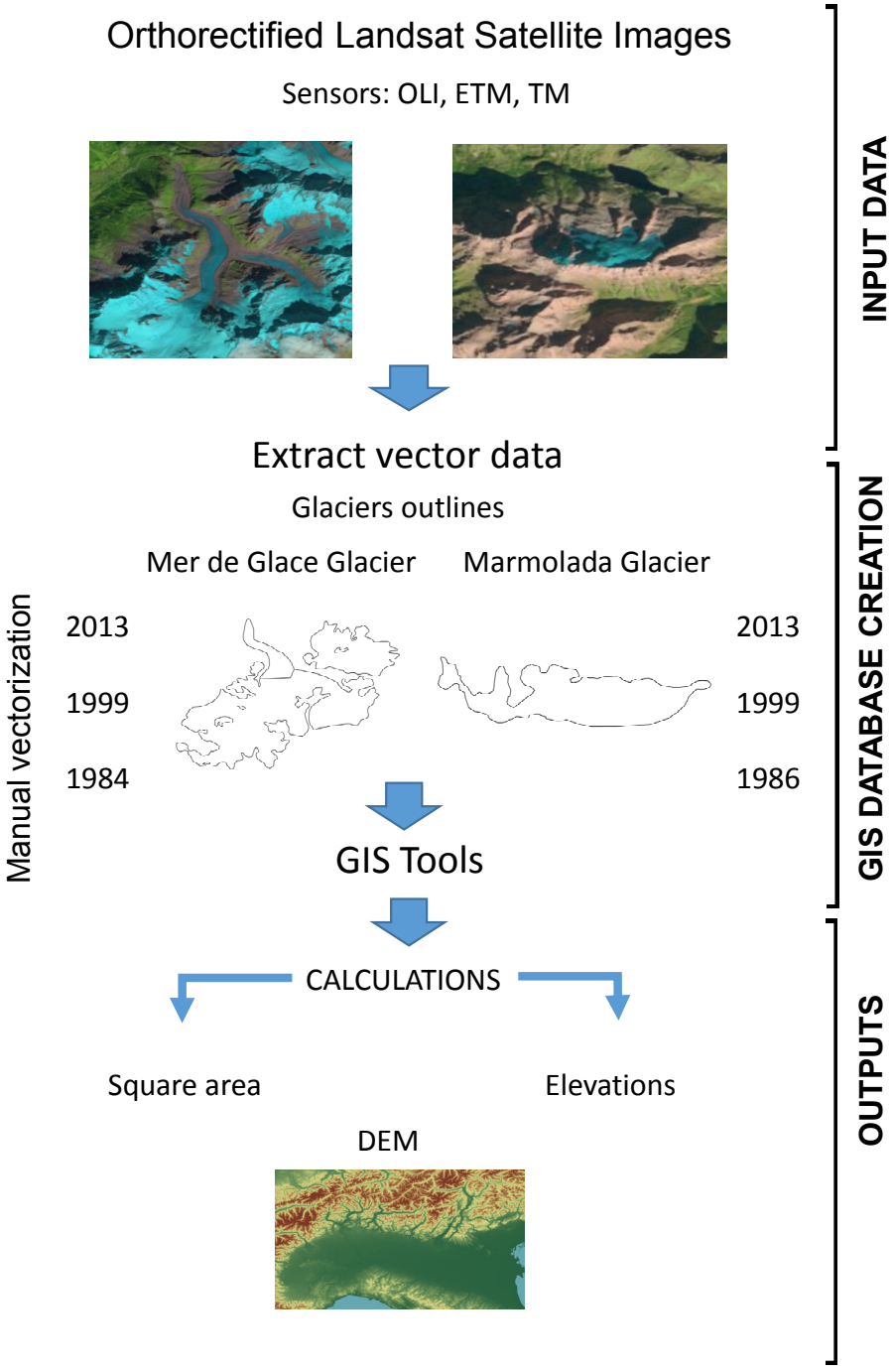


**Fig. 4.** General framework of the applied methodology

### *3.3. Vector data extraction*

We extracted vector data by manual vectorization using GIS software. The manual vectorization is used by many experts in different fields of study (Elshehaby and Taha 2009; Fuller and Aboudarham, 2004; Wilson et al., 1999), even if is tedious (Hadeel et al. 2010). Raup et al. (2007) appreciate this procedure as a highly accurate method to extract the outlines of GLs. The vector data resulted after digitization of GLs in various years were compared to assess the changes.

In attempt to estimate the area of GLs, we used 'Calculate Geometry' tool from GIS Attribute Table applied for the polygons created in chosen years and then the average retreat rates were calculated. The advantage of this method is that through manual vectorization one can more precisely estimate areas with data analysis, than raster analysis.

## 4. RESULTS AND DISCUSSION

A total of 2.365 $km^2$ in area of Mer de Glace GL and 1.035 $km^2$ in area of Marmolada GL (table 1) were lost between 1984 and 2013 and between 1986 and 2013 respectively. As a response to increasing temperatures due to recent climate changes, both studied GLs diminished significantly (fig. 5, 6). The changes in covered area by Mer de Glace and Marmolada GLs were identified using remote sensing with SIs. Making the difference between the initial area (1984 at Mer de Glace GL and 1986 at Marmolada GL) and their area in 2013, it was possible to assess the decrease of each GL. Using GIS tools, the terminus position was checked at Mer de Glace and the part with major retreat was detected in the case of Marmolada GL.

**Table 1.**

**Assessment area of glaciers**

| Year | Mer de Glace Glacier area* ($km^2$) | Year | Marmolada Glacier area ($km^2$) |
|---|---|---|---|
| 1984 | 6.861 | 1986 | 2.699 |
| 1999 | 5.944 | 1999 | 2.233 |
| 2013 | 4.495 | 2013 | 1.665 |
| Total | 2.365 | Total | 1.035 |

*The values represent only Mer de Glace size, without tributaries

Fluctuation in area and length were identified at Mer de Glace GL from the analysis of the vector data obtained by manual vectorization. Between 1984 and 1999 this GL decreased by 0.917 $km^2$ and recorded a 881.73 m of retreat at terminus. In the second half period of data observations, Mer de Glace GL diminished by 1.449 $km^2$ in area and retreated at terminus by 996.8 m. The comparison of the changes of Mer de Glace GL in the two periods showed that the decrease was higher (fig. 7) between 1999 and 2013. Thus, in the first period a withdrawal rate of 0.061 $km^2$/year was obtained while in the second period the withdrawal rate was 0.104 $km^2$/year.

Marmolada GL diminished by 0.466 km$^2$ between 1986 and 1999 and the largest decline was noticed in its western part. For the same period a mean annual withdrawal rate of 0.036 km$^2$/year was obtained. It is interesting to note that Marmolada GL in this period decreased in area but some ice-lobes advanced, probably due to more water in the ice mass. Between 1999 and 2013 Marmolada GL reduced its area by 0.568 km$^2$ and a ratio of 0.041 km$^2$/year was found (fig. 8).

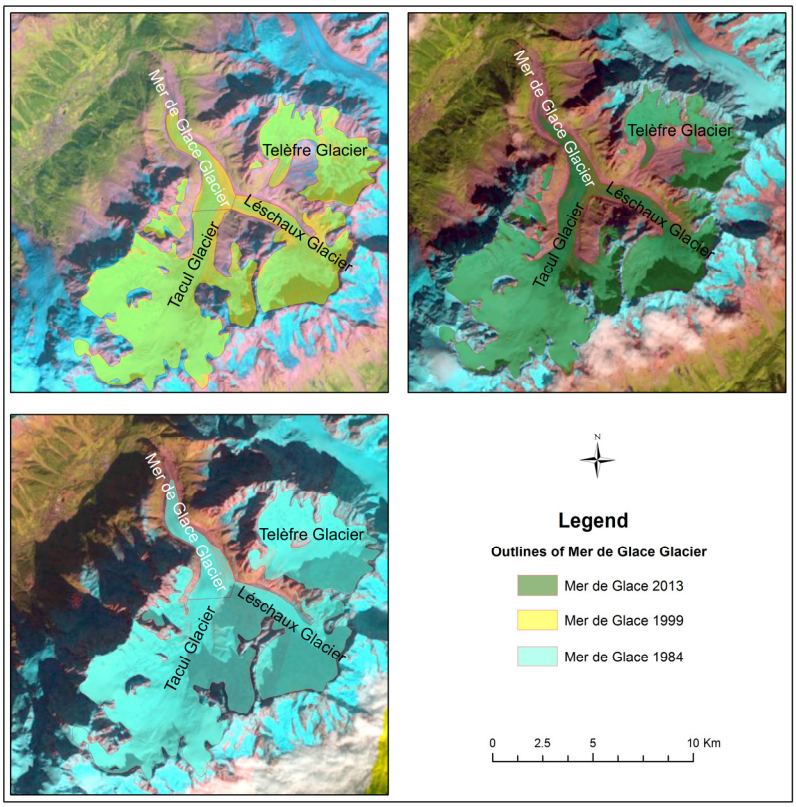


**Fig. 5.** Landsat full resolution mosaic images of Mer de Glace Glacier, outlines in 1984, 1999, 2013. Landsat images courtesy of the U.S. Geological Survey

Results for Mer de Glace GL were expected, because the tongue of the GL is spread at lower altitude compared to Marmolada GL. Unexpectedly, between 1986 and 2013, Marmolada GL decreased to half and in some portions of the western part of the GL the slip plane was uncovered.

Our findings would seem to suggest that Mer de Glace and Marmolada GLs decreased in area under recent global warming. At the same time, tourism in Chamonix-Mont Blanc area and in Marmolada Mountains contributes to the melting of both GLs. We are aware that our research may have some limitations. In this paper we analysed only the area and length, without computing the volume of melting ice and we did not indicate where the lowest thickness points are. Other limitation is that field surveys were not performed in the 1980s and 1990s, but only in the last three years.

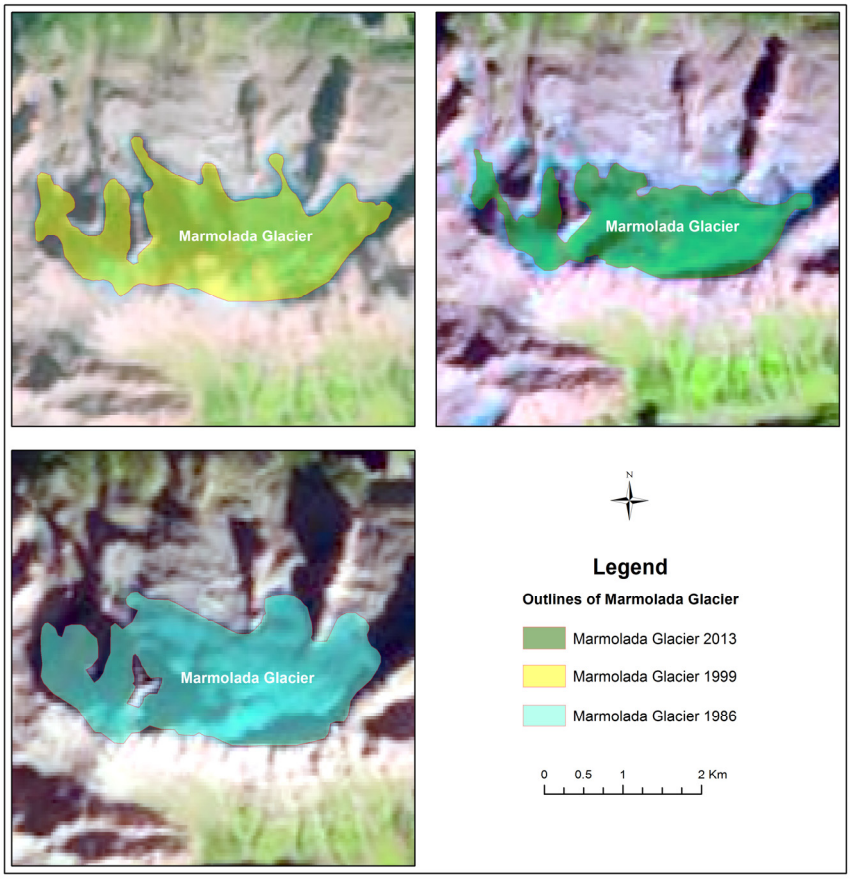


**Fig. 6.** Landsat full resolution mosaic images of Marmolada Glacier, outlines in 1986, 1999, 2013. Landsat images courtesy of the U.S. Geological Survey

One of the main goals of this research was to assess the GLs changes using SIs and GIS, during the last three decades. The overall direction of results showed trends that could be helpful to understand how climate influences the retreat of two GLs located in different sites of Alps, but at close latitude. The retreat of Mer de Glace and Marmolada GLs does not affect directly the human settlements and the sea level, but together with climate warming, the melting of GLs could induce changes in the natural systems (Campos et al., 2013). Thus, the reducing of Mer de Glace GL contributes to the increased flow discharge of Torrent del Drus and L'Arveyron Creeks. With the withdrawal of the GL, the lateral walls are exposed at rock falls and this could be problematic for tourism activities.

Kuhn (2007) illustrated in his work the fluctuations of Mer de Glace for more than 400 years including historical data for the reconstruction the GL situation, before the Little Ice Age. Kuhn offered information about population complaints from

Chamonix that suggest a great advancement of Mer de Glace GL before 1500. In 1932, mentioned by Kuhn (2007), Kinzl stated that in 1605 the GL created destructions as a result of floods. He found documents and archives from the 18th century belonging to De Saussure and Bourrit and other studies focused on glaciology dating from the 19th century. Studying the moraines material and historical documents, Kuhn (2007) discovered that during the 1820s and 1850s the Mer De Glace GL had a considerable extension for the 19th century. The large decrease in volume was demonstrated by Kuhn (2007) for the 1939 – 2001 period. For the same period, he estimated a retreat ratio of 30 cm/year.

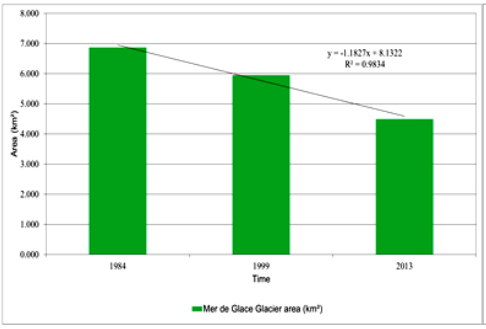


**Fig. 7.** The area coverage of Mer de Glace GL evaluated by analysis of satellite images and GIS (1984-2013)

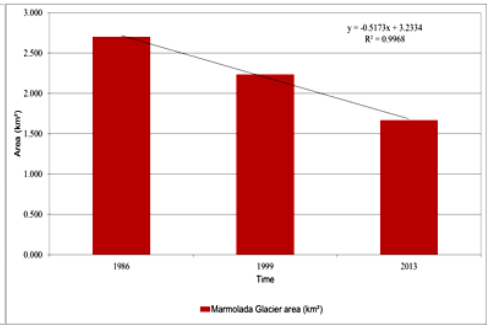


**Fig. 8.** The area coverage of Marmolada GL evaluated by analysis of satellite images and GIS (1986-2013)

Looking at the fluctuations of GLs in the Dolomites Mountains, Crepaz et al. (2010) confirmed a decrease of GLs by more than 50% during the last century. The largest ice mass melted during the last 30 years. In their investigation on Marmolada GL, Crepaz et al. (2010) showed that the volume of the GL reduced by 9337741 $m^3$ between 2004 and 2009. He noted that Marmolada GL reduced its area by 52%, in the last three decades. Our results bear a close resemblance to the findings of Crepaz et al. (2010). On the other hand, Marmolada is the largest GL in the Dolomites Mountains of the Southern Alps and its melting represents an important loss. For this reason it was monitored and in 2013 the geologist Dr. Mirco Poletto underlined that the reduction of Marmolada GL was stopped: "This year the weather has brought snow layers that have prevented it from melting." (Ice Age Now website, 2013).

## 5. CONCLUSIONS

This paper provides an account of two GLs situated in different locations in the European Alps. The evidence of this study implies that Landsat images and GIS have a major importance for the studies concerning area covered by GLs. The results suggest that Mer de Glace and Marmolada GLs reduced their area, above all in the last two decades. We have been able to estimate the area of each inventoried GL in various intervals of time and we succeeded in calculating the retreat ratio of set periods.

Consequently, we observed that the Mer de Glace diminished much more than Marmolada GL, due to its extension at lower elevations. In addition we believe that our findings could be useful for glaciology, climatology, geomorphology, hydrology and other Earth Sciences. We hope that our findings may influence policy planning of the territory flooded with tourists near Mer de Glace and Marmolada GLs, to reduce the negative impact of human activities on these GLs. Future work will entail the refinement of these results and the usage of data from other satellites sensors. At the same time, the adopted methods could be applied to other GLs.

## REFERENCES


1. Beniston, M. (2006), *Mountain weather and climate: A general overview and a focus on climatic change in the Alps*, Hydrobiologia, Vol. 562, Issue 1, pp. 3-16.
2. Campos, G.E.P., Moran, M.S., Huete, A., Zhang, Y., Bresloff, C., Huxman, T.E., Eamus, D., Bosch, D.D., Buda, A.R., Gunter, S.A., Scalley, T.H., Kitchen, S.G., McClaran, M.P., McNab, W.H., Montoya, D.S., Morgan, J.A., Peters, D.P.C., Sadler, E.J., Seyfried, M.S., Starks, P.J. (2013), *Ecosystem resilience despite large-scale altered hydroclimatic conditions*, Macmillan Publishers, Nature, Vol. 494, pp. 349-353.
3. Cox, P.M., Betts, R.A., Jones, C.D., Spall, S.A., Totterdell, I.J. (2000), *Acceleration of global warming due to carbon-cycle feedbacks in a coupled climate model*, Macmillan Magazines, Nature, Vol. 408, pp. 184-187.
4. Crepaz, A., Cagnati, A., De Luca, G. (2010), *Evoluzione dei ghiacciai delle Dolomiti negli ultimi cento anni e recenti bilanci di massa in tre apparati glaciali*, Aineva Rivista 4.
5. Dong, P., Wang, C., Ding, J. (2013), *Estimating glacier volume loss used remotely sensed images, digital elevation data, and GIS modelling,* International Journal of Remote Sensing 34(24), pp. 8881-8892.
6. Elshehaby, A.R., Taha, L.G.E. (2009), *A new expert system module for building detection in urban areas using spectral information and LIDAR data*, Appl. Geomat., 1, pp. 97–110.
7. Fuller, N., Aboudarham, J. (2004), *Automatic Detection of Solar Filaments versus Manual Digitization*, Knowledge-Based Intelligent Information and Engineering Systems Lecture Notes in Computer Science, Vol. 3215, pp. 467-475.
8. Gao, J., Liu, Y. (2001), *Applications of remote sensing, GIS and GPS in glaciology, pp. a review*, Progress in Physical Geography 25, 4, pp. 520–540.
9. Hadeel, A.S., Jabbar, M.T., Chen, X. (2010), *Application of remote sensing and GIS in the study of environmental sensitivity to desertification, pp. a case study in Basrah Province, southern part of Iraq*, Appl. Geomat., 2, pp. 101–112.
10. Haeberli, W.R., Frauenfelder, R., Hoelzle, M., Maisch, M. (1999), *On rates and acceleration trends of global glacier mass changes*, Geografiska Annaler, Series A, Physical Geography, 81A, pp. 585– 595.
11. Haeberli, W., Beniston, M. (1998), *Climate Change and Its Impacts on Glaciers and permafrost in the Alps*, Ambio, Research for Mountain Area Development: Europe, Vol. 27, No. 4, pp. 258-265.
12. Holobâcă, I.H. (2013), *Glacier Mapper – a new method designed to assess change in mountain glaciers*, International Journal of Remote Sensing, Vol. 34, Issue 23, pp. 8475-8490.
13. Houghton, J.T., Meira, F.L.G., Callander, B.A., Harris, N., Kattenberg, A., Maskell, K. (1996), *Climate Change 1995: The Science of Climate Change. Contribution of WG1 to the Second Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge (UK), Cambridge University Press.

14. Ice Age Now, *Largest glacier in the Dolomites stops retreating*, URL: *http://iceagenow.info/2013/07/largest-glacier-dolomites-stops-retreating/#comments*. Accesed on 26 May 2014.
15. Kargel, J.S., Abrams, M.J., Bishop, M.P., Bush, A., Hamilton, G., Jiskoot, H., Kääb, A., Kieffer, H. H., Lee, E. M., Paul, F., Rau, F., Raup, B., Shroder, J.F., Soltesz, D., Stainforth, S., Stearns, L., Wessels, R. (2005), *Multispectral imaging contributions to global land ice measurements from space,* Remote Sensing of Environment, Vol. 99, Issues 1–2, pp. 187–219.
16. Khalsa, S.J.S., Dyurgerov, M.B., Khromova, T., Raup, B.H., Barry, R.G. (2004), *Space-Based Mapping of Glacier Changes Using ASTER and GIS Tools*, IEEE Transactions of Geoscience and Remote Sensing, Vol. 42, No. 10, pp. 2177-2183.
17. Kennedy, B.W., Trabant, D.C., Mayo, L.R. (2006), *A Century of Retreat at Portage Glacier, South-Central Alaska*, U.S. Geological Survey, Anchorage.
18. Kottek, M., Grieser, J., Beck, C., Rudolf, B., Rubel, F. (2006), *World Map of the Köppen-Geiger climate classification updated,* Meteorol. Z 15(3), pp. 259–263.
19. Kinzl, H. (1932), *Die grössten nacheiszeitlichen Gletschervorstösse in den Schweizer Alpen und in der Mont Blanc-Gruppe,* Zeitschrift für Gletscherkunde und Glazialgeologie, 20 (4–5), pp. 269–397.
20. Kuhn, M. (2007), *Fluctuations of the "Mer de Glace" (Mont Blanc area, France) AD 1500–2050: an interdisciplinary approach using new historical data and neural network Simulations*, Universitätsverlag Wagner, Innsbruck.
21. Mougin, P. (1912), *Etudes glaciologiques. Savoie – Pyrénées*, Tome III, Imprimerie Nationale, Paris.
22. Nistor, M. M. (2013), *Geological and Geomorphological Features of Kenai and Chugach Mountains in Whittier Area*, *Alaska*, Studia UBB, Geographia, Vol. 58, pp. 27-34, Cluj-Napoca.
23. Oerlemans, J. (2005), *Extracting a Climate Signal from 169 Glacier Records*, Science, 308, pp. 675-677.
24. O'Neel, S., Hood, E., Arendt, A., Sass, L. (2014), *Assessing streamflow sensitivity to variations in glacier mass balance*, Climatic Change, 123, pp. 329–341.
25. Painter, T.H., Flanner, M.G., Kaser, G., Marzeion, B., Van Curen, R.A., Abdalati, W. (2013), *End of the Little Ice Age in the Alps forced by industrial black carbon*, Edited by Susan Solomon, Massachusetts Institute of Technology, Cambridge.
26. Raup, B., Kääb, A., Kargel, J.S., Bishop, M.P., Hamilton, G., Lee, E., Paul, F., Rau, F., Soltesz, D., Khalsa, S.J.S., Beedle, M., Helm, C. (2007), *Remote sensing and GIS technology in the Global Land Ice Measurements from Space (GLIMS) Project*, Computers & Geosciences, 33, pp. 104–125.
27. Shahgedanova, M., Stokes, C. R., Gurney, S. D., Popovnin, V. (2005), *Interactions between mass balance, atmospheric circulation, and recent climate change on the Djankuat Glacier, Caucasus Mountains, Russia*, Journal of Geophysical Research, 110 (D4).
28. Shaver, G.R., Canadell, J., Chapin III, F.S., Gurevitch, J., Harte, J., Henry, G., Ineson, P., Jonasson, S., Melillo, J., Pitelka, L., Rustad, L. (2000), *Global Warming and Terrestrial Ecosystems: A Conceptual Framework for Analysis*, Oxford Journals, BioScience Vol. 50, Issue 10, pp. 871-882.
29. Stavig, L., Collins, L., Hager, C., Herring, M., Brown, E., Locklar, E. (2005), *The Effects of Climate Change on Cordova, Alaska on the Prince William Sound*, Alaska Tsunami Papers.
30. Theurillat, J.P., Guisan, A. (2001), *Potential impact of climate change on vegetation in the European Alps: a review*, Climatic Change, 50, pp. 77–109.
31. Vivian, R. (2001), *Des glacier du Faucigny aux glacier du Mont Blanc*, La Fontaine de Siloé, Montmélian.
32. United States Geological Survey, *LandsatLook Images*, URL: *http://landsatlook.usgs.gov/.* Accesed on 15 May 2014.
33. Wilson, D.J., Smith, B.K., Gibson, J.K., Choe, B.K., Gaba, B.C., Voelz, J.T. (1999), *Accuracy of digitization using automated and manual methods*, Journal of the American Physical Therapy Association, Vol. 79 (6), pp. 558-566.

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# VOCATIONAL EDUCATION AND TRAINING FOR TOURISM. SPECIFIC ASPECTS WHICH INFLUENCE THE STUDENTS' PERCEPTION OF THE QUALITY OF THEIR LEARNING EXPERIENCE

**SILVIA IRIMIEA[1], ADRIANA ŞERBAN[2]**

**ABSTRACT. – Vocational Education and Training for Tourism. Specific Aspects which Influence the Students' Perception of the Quality of Their Learning Experience**. Quality in education has been defined in various ways, each definition representing a different approach. Karl Popper defines human rationality by the adequacy of one's action to a specific situation. Furthermore, the French sociologist Pierre Bourdieu argues that the actions that people undertake are based on their previous life experiences and on their social and professional status. Vocational Education and Training (VET) addresses young people and adults whose social status can influence their level of satisfaction with the quality of the educational process. The present article seeks to present the results of a questionnaire-based survey applied to the students who have attended the *travel agent* and *tourism manager* courses at the Centre for Tourism Training of the Babeş-Bolyai University, Cluj-Napoca. The data illustrate the strong influence of the variable *age* and *previous educational experience* on the subjects' satisfaction regarding some aspects of the training activities.

***Keywords:*** *VET, quality assurance, EQUARF, Pierre Bourdieu, Karl Popper, previous life-experience.*

## 1. INTRODUCTION

A brief history of *quality assurance* and *evaluation* in education reveals that the notion of quality has proven to be a complex one, which can be approached from multiple angles and perspectives (Harvey and Green, 1993, Nica, 2004, Ilieş, 2003).

The documents of the European Council and the European Commission define the process of quality assurance as a generic term which refers to a continuous process and comprises: evaluating, monitoring, assuring, maintaining and improving the level of quality of a system, program, or institution (European Association for Quality Assurance in Higher Education, 2005).

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Addressing young and adults, the importance of vocational education and training (VET) has been on the rise in the present dynamic social-economic society, especially starting with 2002. A proper quality assurance system for vocational education proved to be a challenging task (Şerban, 2013). The European Parliament and The European Council created a number tools for VET (Irimiea, 2011a) and established, in June 2009, a *European Quality Assurance Reference Framework for Vocational Education and Training* (EQARF), which proposes a reference set of selected quality indicators for quality assessment in VET.

The scientist Karl Popper (1998) defines human rationality by the adequacy of one's action to a specific situation as he perceives it. Expressing another point of view, the sociologist Pierre Bourdieu (2007, 1984) argues that the actions that people undertake - the *positions taken,* as the author puts it - are based on their *dispositions*, which result from the accumulation of their previous life experiences, their social and professional status.

The article presents the results of a questionnaire-based inquiry targeting the students who attended the *travel agent* and *tourism manager* courses at the Centre for Tourism Training of the Babeş-Bolyai University, Cluj-Napoca, Romania. The investigation seeks to evaluate the level of students' satisfaction with the quality of their learning experience, while taking into account the provision of the second quality indicator recommended by the EQARF: *Investment in training of teachers and trainers.*

The resulting data illustrate a strong influence of the variable *age* and *previous life experience* on the subjects' satisfaction regarding some aspects of their training activities.

## 2. APPROACHES TO QUALITY ASSURANCE IN EDUCATION

Quality is a moving target, whose content depends on the used perspective and which gives rise to a wide spectrum of concepts, definitions and approaches. Thus, quality is regarded as: exceptional or as excellence (Harvey and Green, 1993; Biggs, 2004), as perfection to consistency ("zero errors" as Harvey and Green called it), fitness to purpose (Harvey and Green, 1993, Doherty, 2008), value for money, as transformation (Harvey and Green, 1993; Clark, 2000, 2004), meeting standards (Harvey, 1999; Rocki, 2005), organisational culture (Harvey, 1999), meeting the students' expectation (Harvey, 1999; Tsinidou, Georgiannis and Fitsilis, 2010) and meeting the stakeholders' expectations (Harvey 1999, Middlehurst, 1992).

The European Association for Quality Assurance in Higher Education (ENQA) asserts that providing a definition for quality assurance is a cumbersome task, on the one hand, because the term covers a number of complex elements and, on the other hand, because each national education system has adopted its own views and definitions of these elements (Standards and Guidelines…, 2005). Harmonising the systems for quality evaluation, both with the existent reality and among themselves, is a real challenge and a great opportunity for the global education system (Kohler, 2009), including VET.

According to Cedefop (European Centre for the Development of Vocational Training), quality in VET has become a key priority at EU level to 'promote mutual trust, transparency and recognition of competences and qualifications, thereby establishing a basis for increasing mobility and facilitating access to lifelong learning' *(www.cedefop.europa.eu/EN/about-cedefop/projects/quality-assurance-in-vet,* visited 21.04.2014).

The concerns about quality at EU level go back to the year 2001 when the European forum on quality in VET (jointly set up by the Commission and Cedefop) was organised and the technical working group on quality in VET (TWG) which functioned until mid 2005 was established. Subsequent to these achievements, the European cooperation sought to define the common principles, guidelines and tools for quality development. In 2004, these resulted in 'the establishment of a *common quality assurance framework for VET (CQAF)*'. Following this, 'In October 2005, the TWG was replaced by ENQA VET, the European platform financed through the Leonardo da Vinci programme to ease exchange of experiences, common learning, consensus building and support to further developing the CQAF model in 2008 and 2009'. *(www.cedefop.europa.eu/EN/about-cedefop/projects/quality-assurance-in-vet,* visited 21.04.2014). In April 2008, the European Commission presented a draft recommendation on the establishment of a European quality assurance reference framework for VET (EQARF) adopted by the European Parliament and the Council in June 2009.

The Recommendation of the European Parliament and of the Council of 18 June 2009 on the establishment of a *European Quality Assurance Reference Framework for Vocational Education and Training (EQUARF)* proposes a comprehensive set of 10 selected quality indicators which can be used to support the evaluation and quality improvement of VET systems and/or VET providers. The document also specifies the type of the indicator in terms of context, input, process, output, or outcome indicator and the purpose of the educational policy to which the indicator is responding.

The second indicator is focused on *investment in training of teachers and trainers: (a) share of teachers and trainers participating in further training, (b) amount of funds invested* which can be used both as an *input indicator* and also as a *process indicator*, depending on the level type and aim of the analysis. The purposes of the educational policy to which this indicator responds are:

- Promote ownership of teachers and trainers in the process of quality development in VET
- Improve the responsiveness of VET to changing demands of labour market
- Increase individual learning capacity building
- Improve learners' achievement.

Students play an active part in the educational process holding various key-roles (Popescu and Brătianu, 2004) simultaneously: both as internal and external clients, both as inputs and outputs of the educational process, both as former and future stakeholders.

Furthermore, since the strong connection between theory and practice represents a major priority (Bradea, 2011) in VET, the trainers need to be trained accordingly (Irimiea, 2011b).

Given these learners' prerequisites, their opinion on the quality of their learning experience is very important and therefore necessary for meeting the four objectives mentioned above.

The French sociologist Pierre Bourdieu, a representative of critical structuralism, uses the term *capital* in close relation to the that used by Karl Marx. He states that the *positions* occupied by various social agents (groups, individuals, or institutions) in a social field are determined by the characteristics of the *capital* which they possess and by the

actions that they undertake –both those overtly manifested and the ones only thought of or intentional - (*position taken,* as Bourdieu calls them). The author identified three forms of capital a social agent can possess: economic capital (the material goods that he possesses), cultural capital (all his knowledge and all his own cultural goods), social capital (all the relationships that bring or can bring mutual recognition). According to Bourdieu, *position taking* (1984, 2007) is based on the agents' *dispositions*, i.e. the accumulation of their previous life experiences, the social and professional status. From another perspective, the physicist and sociologist Karl Popper (1998) defines human rationality as consisting in the individuals' appropriate reaction to a problem situation, as they perceive it. This further means that the rational actions taken are based on the individuals' dispositions.

According to the above mentioned assumption, the *positions* of the students in an educational environment (class, faculty, university, or training centre) are determined by their economic, cultural and social assets and their opinion regarding the quality of the learning process – so, their *positions* - become rational reactions based on their *dispositions.* Since this seems to be the case, it follows that socio-demographic variables such as *gender* or *age*, intersecting the previous educational experience of the learners, could influence their level of satisfaction regarding the quality of the training process.

The results of the research we present are gathered trough an opinion survey based on questionnaires applied to students who have attended the *travel agent* and *tourism manager* training programmes at the Centre for Tourism Training of the Babeş-Bolyai University, Cluj-Napoca, Romania.

## 3. THE CENTER FOR TOURISM TRAINING

**The Center for Tourism Training** operates as a Vocational Education and Training (VET) centre of the Faculty of Geography, the Babes-Bolyai University of Cluj-Napoca. It was established in 2004 and since then it has released to the labour market an impressive number of qualified tourism professionals. The curricula of the courses have been set up within the framework of a European Leonardo da Vinci pilot project (LdV/2004-2006/175050) and have been harmonised with the occupational standards provided by the National Authority for Qualifications (previously called the *National Council for Adult Vocational Education*). The latter works under the Ministry of Education and performs the following roles: it establishes the national professional profiles/jobs available in the *Romanian Occupational Code*, identifies and recommends national learning and performance standards as *learning outcomes* for all professional profiles, which build the skeleton for curriculum design, suggests teaching methods, establishes forms of assessment/evaluation- thereby creating a relatively unitary vocational education and training system.

The teaching and the research activity carried out at the CTT has been informed by the strategies and policies outlined in the Copenhagen process as well as by the project partner institutions' teaching traditions and practices in the area of Vocational Education and Training (VET) for tourism. The paradigms that the CTT training programme is based on are: *adult education, continuing education and learning outcomes-oriented teaching,* all associated with the European VET tools, particularly with the *European Qualifications*

*Framework (EQF)* and *EQARF(European Quality Assurance Reference Framework for VET*). The management of the CTT is sustained by a strong leadership, a traditional culture and a rigorous system which generates high expectations of both staff and learners and provides a supportive teaching and learning environment. The focus of the CTT management on pedagogical leadership is aimed at the improvement of student outcomes and relies on four elements:

1) remodelling/reforming the curriculum –the main instrument of educational policy used by authorities- in terms of: time allotment (no of hours/ discipline), ensuring an adequate balance between theory and practice, teacher recruitment and appointment, assigning teaching responsibilities to teachers;
2) expanding curriculum opportunities
3) improving teaching and learning
4) harnessing learners voice.

Given the present global recession, the economic and labour market pressures which affect the Romanian VET providers (decreased interest in education and fewer young people capable of paying for their professional qualification), less interest on the behalf of organisations to support further training of their staff- the nature of the CTT management and its focus –is subject to both moderate and considerable changes since education planning must be anchored in a market or opportunity-driven management.

The Centre hosts six training modules accredited by the former National Council of Vocational Adult Education of the Ministry of Education(NCVAE) which include the following profiles: *tourism manager, travel agent-guide, national tourism guide, receptionist-concierge, guest house administrator* and *trainer*. The awarded diplomas and certificates are issued by 2 ministries: the Ministry Education and the Ministry of Labour and Social Affairs. The Centre for Tourism Training awards qualification diplomas, which, due to the Hague Apostille, are recognized in Europe.

The centre targets all those who want to obtain a qualification in the field of tourism and those who already work in this field. It also offers practical placements at training institutions in the country and abroad. In this respect the CTT collaborates with 30 local hotels and travel agencies on the basis of contracts which offer tuition-based practical placement opportunities.

## 4. METHODOLOGY

The research was conducted as part of the European Lifelong Learning Programme Leonardo da Vinci (RO/2012/PAR/103) whose aim is to establish a common framework for quality assurance for VET in tourism.

The target population was composed by the 57 participants in tourism training (32 in *travel agent* training and 25 in tourism manager training) at CTT, all having finished or pursuing higher education studies. The reduced number of the subjects led us to the adoption of an exhaustive sampling technique. The questionnaires were applied in June 2013, immediately after the final exams.

The number of completed questionnaires was 39 (27 by participants taking travel agent courses and 12 by participants taking tourism manager courses), whereby all respondents were aged between 20 and 48 years, with an age average of 28 years. For the travel agent students, the average age was 25 years and 10 month, the median 24 and the mode 23, with a distribution between 20 years (two persons) and 47 years (one person); 5 subjects did not communicate their age. For the tourism manager students, the age average was 32 years and 3 month, both the median and the mode being 31, with a distribution between 23 years (one person) and 48 years (one person).

The gender distribution was: 26 female students (16 attending travel agent courses) and 10 male students (8 attending tourism manager courses); 3 non-answers in the travel agent sample.

The questionnaire contained 8 issues concerning the satisfaction of the subjects with the experience of the learning process. The considered dimensions were: (1) the contents of the courses; (2) their usefulness; (3) the trainers' performance; (4) the evaluation of the students' performances; (5) the educational support material used by the trainers/instructors; (6) the teacher-student relationship; (7) the students' general satisfaction with the entire learning experience.

The data were gathered with a Lickert scale in five steps: 5 - absolutely satisfied; 4 - very satisfied; 3 - moderately satisfied; 2 - slightly satisfied; 1 - not at all satisfied.

The items for the first dimension - the contents of the courses – were:

- Coverage rate for the *students' learning needs* on the completion of the theoretical course
- Adequacy of time allotment for individual topics
- Completeness of scientific coverage for the objectives of the programme
- Progressive succession of the topics
- Presentation of new knowledge, methods, views, approaches
- Keeping to the original design of the scientific programme content
- Improvements made to the proposals
- Responsiveness of the programme content to the students' expectations
- Contribution of the accompanying services during the implementation of the programme.

## 5. RESEARCH RESULTS

The results show that about 80% of the students were absolutely satisfied or very satisfied with all the issues, except one. The obtained averages were between 3.82 (for the contribution of the accompanying services during the implementation of the programme) and 4.37 (for the presentation of new knowledge, methods, views and approaches). The subjects were moderately satisfied with the improvements made to the proposals put forward (average 3.32). Comparing the data of the two samples, the results show that the students of the tourism manager training programme are more satisfied with the mentioned issues, given that the resulting values of their average are higher with 0.38 – 1.03 than those of the attendees of the travel agent training programme. This aspect is confirmed by the values of the Pearson coefficient ($r$).

The *r* values also reveal a low and medium direct association between the age of students and their declared *appreciation* degree. For the entire sample, the highest *r* value was obtained for the relation between variable *age* and *presentation of new knowledge, methods, views and approaches* (r = 0.40). It follows that this was the most valued issue by the older persons as compared with the younger ones. This situation is similar for each of the two subpopulations.

To convey more reliability to the entire experience, besides the Lickert scale, a closed question with multiple answer options was introduced:

Do you think this experience will be useful to:
 find a job
 learn new things
 acquire and develop new personal skills
 acquire autonomy and responsibility
 other, specify_____

The great majority of the students (77%) declared that pursuing this training module was very useful (average 4.58), and 46% indicated that the acquired knowledge and skills are very much or more prone to transference to other work situations (sample average 3.84, 'agents' – 3.55; 'managers' – 4.50). The most important aspect for which training proved helpful was the acquisition and development of new personal skills (67%, with no difference between 'agents' and 'managers'). In addition, the respondents declared that the experience has also been useful for the acquisition of new knowledge (58% of the 'tourism managers' and 48% of the 'travel agents') and for finding a new job (42% of the 'managers' and 56% of the 'agents').

The items used for the evaluation of the *trainers' performance* during the teaching-learning process were: (1) the level of academic expertise/competence; (2) the level of technical preparation / expertise in the field; (3) the method(s) used by the trainer; (4) the efficiency in transmitting knowledge; (5) the attention given to the individual needs of training or information.

The data gathered for these five items and for other three issues - the educational material used by the instructor, the teacher–student relationship and evaluation – show a high level of the students' satisfaction (average over 4.00), except for the teachers' attention devoted to the students' information needs (average 3.51) and the forms of evaluation of the students' activity (average 3.68). The most valued aspects were the relationship between trainers and trainees (average 4.46 for the travel agent profile and 4.75 for the manager profile) and the level of the trainers' technical expertise in the field (4.35 for the travel agent profile and 4.67 for the manager profile).

On the one hand, the data lead again to the conclusion that the manager profile students are more satisfied with the quality of their teaching-learning experience (their averages are constantly higher, with values between 0.23 – 0.47). On the other hand, the values of the Pearson coefficient reveal a low and medium association (0.25 – 0.49) between variable *age* and all eight variables (not only for the entire sample but also for both the travel agent profile and the manager profile samples) with no or low association between the attended courses and these variables (0.10 – 0.28). The highest values of the Pearson coefficient are 0.49 for the exposure manner, 0.46 for the forms of evaluation and

0.44 for the efficiency of the knowledge transfer. The declared general level of the participants' satisfaction with the quality of the courses has been: absolutely satisfied for 18%, very satisfied for 38%, moderately satisfied for 28% and slightly satisfied for 13% (Figure 1). The data indicate that the trainees who attended the tourism manager training module were more satisfied with the quality of the courses (average 4.09) than those of the travel agent training profile (average 3.44).

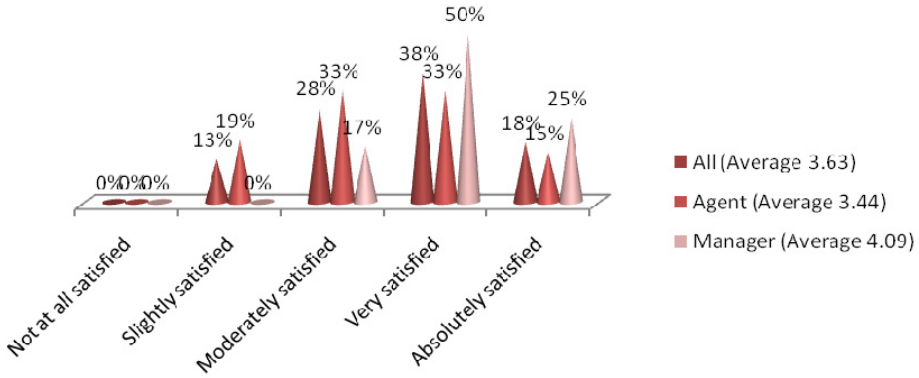


**Fig. 1.** The level of the general satisfaction of the participants with the entire learning experience

The value of r = 0.32 shows a medium association between variable *courses* and variable *quality*. Also, there is a medium to strong association between variables *age* and *quality* for all the participants (r = 0.43) and for both samples - travel agent profile (r = 0.32) and managers profile (r = 0.48).

The presented results prompted us the decision to conduct a *focus group*, whose main issues were the relationship between the students' age and their declared *satisfaction* with the quality of the training module they had attended. The sample of eight participants was designed according to two variables: (1) the *attended module* (both for the travel agent and for the tourism manager profiles) and (2) the *age* of participants. The sample was composed of four students of the travel agent profile aged 22, 23, 34, and 36 years, and four students of the tourism manager profile aged 24, 26, 44 and 47.

It goes without saying that the contents of the 11 travel agent courses and the 14 tourism manager courses were different because their goals were different as a result of the differences in the training needs, i.e. each profile targets the acquisition of different knowledge and competences. However, given that 10 of the subjects are taught separately but by common instructors, the teaching methods, the forms of evaluation and the trainer-trainees relationship were not at all different.

All subjects agreed that they were pleasantly surprised by many aspects of the teaching-learning experience, mainly by those concerning the following issues: (1) the presentation of new knowledge, teaching methods, perspectives and approaches; (2) the way in which the information was presented; (3) the form(s) of evaluation; (4) the efficiency regarding the transmittal of knowledge.

The discussions showed that the 'managers' were slightly more satisfied than the 'agents'. The older subjects (aged 34 and over) were more impressed than their younger colleges especially by the *interactive nature* of both the exposure/presentation of information and the *forms of evaluation*. In addition, they were very pleased by the *teaching support materials*.

The discussions led to the idea that the participants' previous experiences with various study programmes they had attended were different because the training process has changed over time. The participants who have completed their studies over ten years ago appreciated that their past learning experiences were very theoretical, the evaluation was memory-based, and the teacher-student relationship was more rigid. Referring to the training module attended at CTT, the subjects declared that they were very satisfied with both the teaching-learning methods and the forms of evaluation, which were more interactive and focused on the theory–practice relationship. Furthermore, they underlined that the more modern technical equipment and the updated teaching support materials were very helpful.

The *focus group* allowed us to interpret the data collected through the questionnaire and draw up a picture of the two conjugated and overlapping aspects. The 12 manager-trainees (age average: 32 years and 3 month) were slightly more satisfied with the content of the courses than the 27 agent-trainees (age average: 25 years and 10 month), especially with the presentation of new knowledge, the training methods used and the approaches to tourism. At the same time, for the entire sample and also for both the travel agent profile and the manager profile samples, the older participants were more content with the interactive nature of the teaching-learning methods and the forms of evaluation, with the efficiency of knowledge transmittal, the teaching support materials and the trainer – trainee relationship.

## 6. CONCLUSIONS

Quality is a very complex notion, its content depending on the perspective from which it is approached. Furthermore, even according to the same perspective, the perception of quality depends on many variables and characteristics of the evaluator as a social agent (an institution, group or individual).

Karl Popper (1998) argues that human rationality consists in one's adequate action undertaken as a response to a specific situation, as he perceives it. Furthermore, according to the French sociologist Pierre Bourdieu (2007, 1984), the manifest actions or those not manifest that people undertake, i.e. *positions taken,* according to Bourdieu*,* are based on their *dispositions*, which are resulting from the accumulation of their previous life experiences, their social and professional status. Therefrom it follows that the socio-demographic variable *age*, which necessarily involves the learners' prior educational experience, could influence their rational level of satisfaction with the quality of the experienced training. In the educational process, the students play multiple key-roles and their opinion on the teaching-learning activity becomes very important.

The article presents the results of a questionnaire-based inquiry applied to students who attended two different training modules at the Centre for Tourism Training of the Babeş-Bolyai University, Cluj-Napoca, Romania: the travel agent training module (11 courses) and the tourism manager training module (14 courses). The investigation sought to evaluate the level of the students' satisfaction with the quality of their learning experience in line with the provision of the second quality indicator recommended by the EQARF: *Investment in training of teachers and trainers.*

The survey revealed that the majority of the participants declared that they were very satisfied with the quality of the training not only as a complete experience but also with specific issues referring to the contents of their training and the teachers' input. The vast majority of the courses (10) were conducted, separately, by common trainers.

At first sight, the data gathered trough the questionnaire show that the 12 'managers' (age average: 32 years and 3 month) were constantly more content with their entire learning experience than the 27 'agents' (age average: 25 years and 10 month). However, the values of the Pearson coefficient reveal a medium association between variable *courses* and variable *quality* and a medium to strong association between variables *age* and *quality,* both sample-wide ($r = 0.43$) and within each of the two subgroups – 'agents' ($r = 0.32$) and 'managers' ($r = 0.48$).

We can admit that it is possible that the superposition of the two variables - the learning module and the distribution of the subjects' age – may create an appearance of uncertainty. We decided to use a *focus group* because it is the proper sociological instrument for providing information generated in a peculiar social environment and context characterized by specific relations, which leads to excesses which in sociology is called the "atomist perspective" induced by the questionnaire-based investigation (Rotariu and Iluţ, 2006, Iluţ, 1997)

The results of the questionnaire and the *focus group* based inquiry show a conjugation of two overlapping aspects: the 'managers' were slightly more satisfied with the content of the courses than the 'agents', especially with the presentation of new knowledge, training methods, perspectives and approaches. At the same time, mainly due to their previous learning experience, the older participants (both sample-wide and within each subgroup) were more content with the teaching-learning methods, the forms of evaluation, the efficiency of the transmittal of knowledge, the teaching support materials and the trainer –trainee relationship.

At the end of the questionnaire, three open questions asking for further comments were introduced. They referred to the weak and strong points of the training programme. Many students pointed out the need for more practical work in travel agencies or other tourism-related institutions. Given the present results, in the future, we intend to initiate an investigation concerning the students' opinion regarding the practical activities, the theory-practice relationship and the employers' expectations.

## REFERENCES


1. Biggs, J. (2004), *Teaching for Quality Learning at University*, SRHE & Open University Press, Trowbridge.
2. Bourdieu, P. (1984), *Espace social et genèses des „classes"*, Actes de la recherche en sciences sociales, Vol. 52 - 53, June 1984, pp. 3-14.
3. Bourdieu, P. (2007), *Regulile artei. Geneza și structura câmpului literar / Rules of art. The Genesis and the structure of the literary field*, 2nd edition, The Art Editorial Group.
4. Bradea, L. (2011), *Unitatea dintre teoria și practica formării profesionale a ghidului de turism – tour leader*, in Irimiea, S., Albulescu, M., eds., (2011), *Repere conceptuale și bune practicipentru învățământul vocațional în turism / Useful Concepts and Good Practices for Vocational Training in Tourism*, pp. 131 – 137.
5. *www.cedefop.europa.eu/EN/about-cedefop/projects/quality-assurance-in-vet* accessed on 21.04.2014
6. Clark, B.R. (2000), *Towards an Entrepreneurial University*, Paideia, Bucharest.
7. Clark, B.R. (2004), *Sustaining Change in Universities. Continuities in case studies and concept*, Open University Press.
8. Doherty, G.D. (2008), *On quality in education*, Quality Assurance in Education, Vol. 16 No. 3, 2008, pp. 255 – 265.
9. European Association for Quality Assurance in Higher Education (2005), *Standards and Guidelines for Quality Assurance in the European Higher Education Area*, Helsinki, *http://www.bologna-bergen2005.no/Docs/00-Main_doc/050221_ENQA_report.pdf,* accessed on 29.07.2013.
10. Harvey, L. (1999), *Quality in Higher Education.* Paper at Swedish Quality Conference, Göteborg, November 1999, *www.shu.ac.uk/research/crea/publications/gotebor.pdf*, accessed on 17.10.2009.
11. Harvey, L., Green, D. (1993), *Defining quality,* in *Assessment & Evaluation in Higher Education*, Vol. 18 (1), pp. 9 – 34.
12. Ilieș, L. (2003), *Managementul calității totale*, Edit. Dacia, Cluj-Napoca.
13. Iluț, P. (1997), *Abordarea calitativă a socioumanului*, Edit. Polirom, Iași.
14. Irimiea, S. (2011a), *A CEDEFOP outlook on European VET Strategies and Achievements. (For the Emerging Skill Demand and Supply)*, in Irimiea, S., Albulescu, M., eds., (2011), *Repere conceptuale și bune practicipentru învățământul vocațional în turism /Useful Concepts and Good Practices for Vocational Training in Tourism.* pp. 55 – 62.
15. Irimiea, S. (2011b), *Designing a Train-the-Trainer Course for Tourism Entrepreneurship,* in Irimiea, S., Albulescu, M., eds., (2011), *Repere conceptuale și bune practice pentru învățământul vocațional în turism /Useful Concepts and Good Practices for Vocational Training in Tourism.* pp. 63 – 73.
16. Kohler, J. (2009), *Quality in Higher Education*, in Sadlak, J. et al (eds.), *UNESCO Forum on Higher Education in the Europe Region: Access, Values, Quality and Competitiveness,* Topical Contributions and Outcomes, CEPES, Bucharest, 2009, pp. 175 – 218.
17. Middlehurst, R. (1992), *Quality: an organising principle for higher education*, Higher Education Quarterly, Vol. 46, No. 1, 1992, pp. 20-38.
18. Miroiu, A., Brătianu, C. (2000), *The Quality Assurance Policy in Higher Education*, Edit. Paideia, Bucharest.
19. Nica, P. (2000) *Managementul calității și ierarhizarea universităților românești*, Edit. Paideia, Bucharest.

20. Popescu, S., Brătianu, C., coord. (2004), *Ghidul calităţii în învăţământul superior*, Bucharest University.
21. Popper, K.R. (1998), *Mitul contextului*, Edit. Trei, Bucureşti.
22. Recommendation of the European Parliament and of the Council of 18 June 2009 on the establishment of a European Quality Assurance Reference Framework for Vocational Education and Training, *http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2009:155:0001:0010:EN:PDF*, accessed in 10.09.2011
23. Rocki, M. (2005), *Statistical and Mathematical Aspects of Ranking: Lessons from Poland*, *Higher Education in Europe*, Vol. 30, No. 2, pp. 173-181.
24. Rotariu, T., Iluţ, P. (2006), *Ancheta sociologică şi sondajul de opinie. Teorie şi practică*, Edit. Polirom, Iaşi.
25. Şerban, A. (2013), *Bariere de legitimate în evaluarea calităţii instituţiilor de învăţământ superior musical din România*, Edit. Argonaut, Cluj-Napoca.
26. Tsinidou, M., Georgiannis, V., Fitsilis, P. (2010), *Evaluation of the factors that determine quality in higher education: an empirical study*, *Quality Assurance in Education*, Vol. 18, No. 3, pp. 227 – 244.

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# MEASURING PLACE ATTACHMENT TO CĂLIMANI NATIONAL PARK (ROMANIA) AMONG LOCAL RESIDENTS AND TOURISTS. PRELIMINARY FINDINGS

**IZABELA AMALIA MIHALCA[1], M. B. IOVU[2]**

**ABSTRACT. - Measuring Place Attachment to Călimani National Park (Romania) among Local Residents and Tourists. Preliminary Findings.** Understanding the attachments that people develop for certain places is an interesting area of study, but with little attention in Romanian empirical research. This study introduces the concepts of place identity and place dependence in relation to a specific area within the local culture of the Land of Dorna. Starting from previous studies carried on western samples, a research instrument measuring the degree and content of place attachment was translated and adapted. 86 respondents (52 residents and 34 tourists) filled in the questionnaire. Comparing the degree of attachment, there was no significant difference among the two samples. However, local residents tended to display higher levels of place identity, while tourists displayed more emotional functionality to the study area. Place attachment is deeply embodied in the local culture. Due to the research design the generalization of the results is limited. However, this study may act as a starting point in researching other geographical mental spaces. The lands of Romania are unique social and cultural spaces with specific attachment patterns. Future studies should consider larger and representative samples in order to find additional patterns of attachment among residents and other individuals (e.g. tourists, visitors, new residents, other communities etc.).

***Keywords:*** *place attachment, place identity, place dependence, local culture, Land of Dorna, tourists.*

## 1. INTRODUCTION

For many years the concept of 'place attachment' can be found in a variety of sciences. In *geography* the concept has different connotations such as a symbolic and spiritual attachment of an individual or collective to an area, place (Relph, 1976, 1997; Tuan, 1974, 1977; Cocean, 1997 etc.) like an "affective bound between people and place" (Tuan, 1974: 4) or in terms of environmental behavioral issues (Relph, 1976; Tuan, 1974; Peet, 1998 etc.) "in which people find themselves, live, have experience, interpret, understand and find meaning" (Peet, 1998: 48). For *anthropologists* the meaning of attachment is correlated with the understanding of the role of cultural significance in the

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daily life of an individual or collective (Gupta and Ferguson, 1997). The meaning of the concept in *sociology* is perceived like a powerful link between an individual or collective and a particular place (Williams, Patterson, Roggenbuck and Watson, 1992; Kaltenborn and Williams, 2002; Williams and Vaske, 2003; Giuliani and Feldman, 1993 etc.) and it "captures in a quantitative but somewhat narrow form, the important distinction between valuing a place for the goods and services that might be associated with it versus the deeper emotional and symbolic relationships people form with place" (Williams, Stewart, Kruger, 2013: 8). In *environmental psychology* (Altman and Low, 1992; Stokols and Shumaker, 1981; Brown, 1987) the concept is seen like "the symbolic relationship formed by people giving culturally shared emotional (affective) meanings to a particular space or piece of land that provides the basis for the individual's and group's understanding of the relationship to the environment" (Low, 1992: 165).

Going through all these conceptualizations, we may conclude that the main characteristic of the 'place attachment' and its similar concepts (topophilia, sense of place, attachment etc.) is that it involves the humans (community) and their feelings, emotions and perceptions for the environment and for the place in general.

The concept of 'place attachment' was assessed in studies that decipher the environmentally responsible behavior (Vaske and Kobrin, 2001), the attachment of tourists and community to a natural place (Williams, Patterson, Roggenbuck and Watson, 1992; Williams and Vaske, 2003), the impact of natural resources over the behavior of communities (Young, Williams and Roggenbuck, 1990; McCool and Martin, 1994), the influence on managerial options and management of wilderness (Williams and Roggenbuck, 1989; Wickham and Kerstetter, 2000), the attachment to a city (Hidalgo and Hernandez, 2001), region (Cuba and Hummon, 1993) etc.

Studies in outdoor recreation have shown that the concept of 'place attachment' contains two dimensions known as *place dependence (functional attachment)* (Stokols and Shumaker, 1981; Schreyer et. al., 1981) and *place identity (emotional attachment)* (Proshansky, 1978; Proshansky et. al., 1983; Giuliani and Feldman, 1993). *Place dependence* represents a functional form of attachment and reflects the degree in which a place provides and supports the "specific goals or desired activities" (Schreyer et. al., 1981, apud. Williams and Vaske, 2003: 831) of a community and others (tourists, visitors, second home owners etc). The places with a variety of local natural resources that are equipped with optimal infrastructure access and that meet most of the needs and goals of the inhabitants and others are the best places in which the individual or collective may form the strongest sense of place dependence. On the other hand, *place identity* is formed and developed in a long time, and is the interrelation of a series of feelings, senses, emotions, principles, beliefs, habits and traditions that are formed in an individual and in a collective. Williams and Vaske (2003: 831) argue that place identity "refers to a symbolic importance of a place as a repository for emotions and relationships that give meaning and purpose to life". Most studies have shown that a natural place is important and valuable to an individual or collective if it fulfills both dimensions mentioned above.

The concepts of place dependence and place identity are addressed in studies mainly carried on western regions, but we hypothesize that some of their characteristics are similar to those of the Land of Dorna region. From a *physical-geographical* point of view, the Land of Dorna is a mountain basin surrounded by seven mountain ranges in which the hydrographic network directs the main energy flows of the territory. The

interrelation among the natural elements led to the existence of complex and varied natural resources (wood, hydro mineral resources, a large extent of grassland etc.). These were used over time by the local community and by others. This also generated certain traditional occupations specific to this region. In terms of socio-historical evolution, the Land of Dorna is entirely integrated in *the provincial mental space* (Cocean, 2010: 67) of Bucovina. This is visible in the local architecture and folklore, becoming a *cultural (ethnographic) brand* (Cocean, 2011: 219). A cultural community, like the one in the Land of Dorna, may be defined as the "historically transmitted pattern of meanings embodied in symbols, a system of inherited conceptions expressed in symbolic forms by means of which men communicate, perpetuate and develop their knowledge about and attitudes towards life" (Geertz, 1973: 89).

Besides the material characteristics, the construction of the local culture of the Land of Dorna is also the result of the constant interaction between humans (the community) and nature, through the development of attributes such as belonging, identity and attachment (nonmaterial attributes). This process "includes the mechanisms of thought, intuition and often involves imagination too" (Filip, 2009: 215-216). Thus, a place is "interpreted, narrated, understood, felt […] flexible in the hands of different people or cultures, malleable over time […]" (Gieryn, 2000: 465). In the opinion of Tuan (1974: 247) the attitudes, perceptions and values of "traditional people that live in a vertical, rotary and richly symbolical world – *like the inhabitants of the Land of Dorna,* whereas modern man's world tends to be broad of surface, low of ceiling […]" [author's note].

## 2. METHODS

### *2.1. Aim*

The aim of the current study is twofold: (1) to identify and to describe the main features and types of attachment that the local communities and the tourists in the Land of Dorna developed for a specific place (Călimani National Park); and (2) to describe any possible differences that may occur in the level of place attachment they display. The interest in studying this topic is based on the desire to find out how the inhabitants (community) perceive the sensation of attachment for a place and how is that transposed in their everyday life. To our knowledge, this process has not been attempted for these types of regions ("the lands" of Romania). We note though that these are the results of an ongoing research so only preliminary results are offered here.

### *2.2. Study area*

The study area covers Călimani National Park and three villages: *Donișoara* – part of Poiana Stampei commune, *Gura Haitii* and *Neagra Șarului* – both part of Șaru Dornei commune. All are situated in the Land of Dorna (Romania) (fig.1). The three small mountain rural localities are formed around the local natural resources (e.g. peat, sulfur deposits, rich forests etc.) of the area. The main occupations of the communities include the exploitation of wood and peat and until 1997 the exploitation of the sulfur deposits of Călimani Mountains. The exploitation of the sulfur began in 1970 at surface (in a quarry). Because of the devastating impact that the quarry had on the environment and on the health of the communities, the exploitation was suspended in 1997. Today the former mining area is an enclave of the Călimani National Park.

Today, the main occupations of local residents are mainly based on the wood exploitation and processing and on the tourism sector.

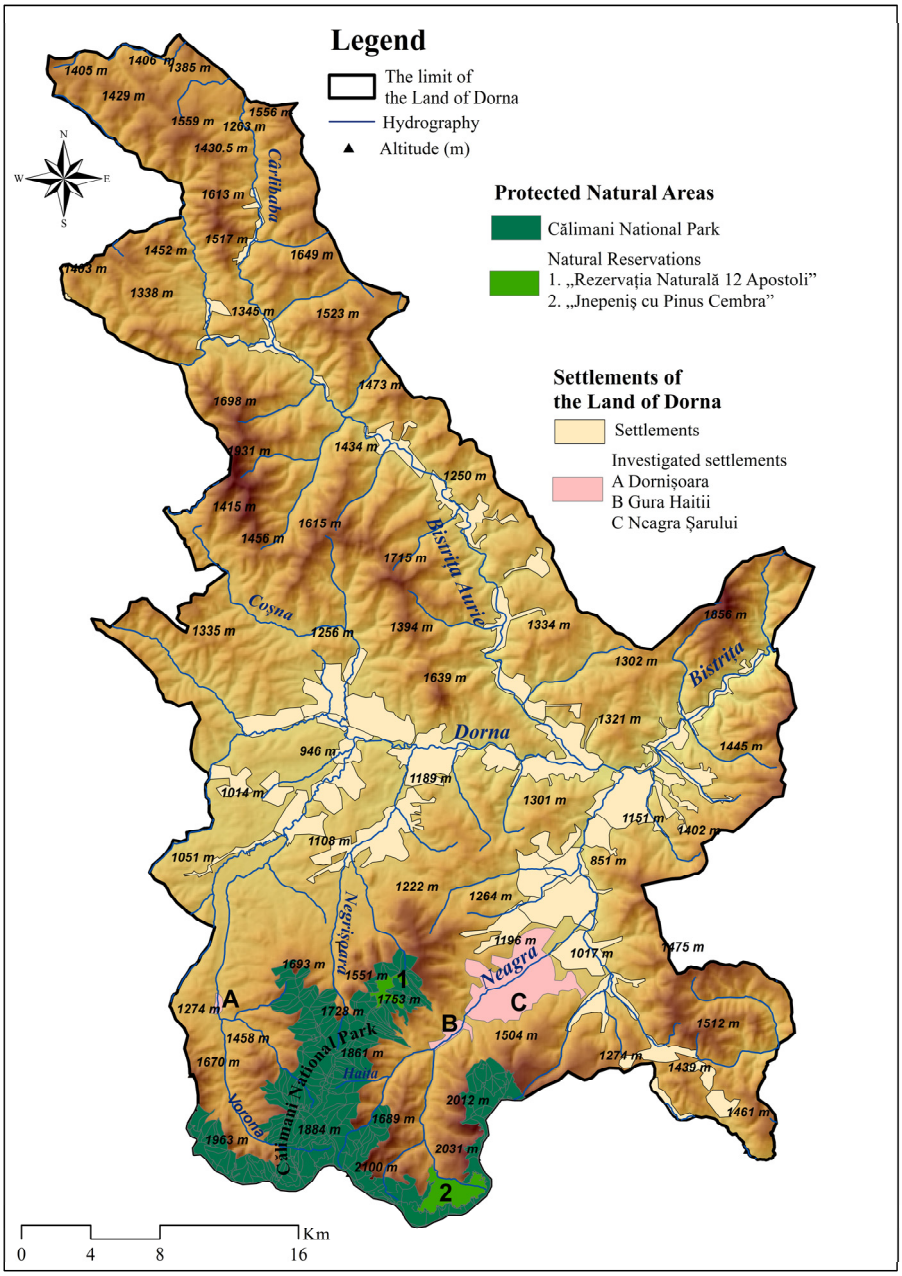


**Fig. 1.** The location of Călimani National Park in the Land of Dorna

The area (24,041 ha) was declared a national park by Law no. 5/2000 and by Government Decree no. 230/2003. The northern part of the park is situated on the territory of the Land of Dorna (15,449.3 ha) and includes two other natural reserves: "12 Apostoli" (200 ha) and "Mountain Pines with *Pinus Cembra*" (384.20 ha) (Law no. 5/2000). The main purpose for which the Călimani National Park was set is the conservation and protection of the biodiversity of the fauna and flora, maintaining the natural habitats and the natural geographical beauty of the area. All these actions are set by the law and the park management plan in order to maintain a sustainable development. The access is by foot. Horse riding is also permitted using the marked routes. The only exception is the paved road to the former sulfur quarry. Also, as a consequence of the park status, there are no structures that can accommodate tourists.

For the communities living near the park, the simple presence of the natural resources, the beauty of the place, the legends of the outlaws (Pintea, Haralambie, Miu etc.) and the magical and mythical events represented by the fairs are part of their lives, beliefs and surroundings. On the other hand, for tourists the park represents beautiful natural wilderness and a peaceful place where they can relax and visit the main attractions.

### *2.3. Sources of data*

Data were collected in one week in July 2012. Using the criteria of physical distance, three villages were chosen: Dornișoara, Gura Haitii and Neagra Șarului. Regarding the sampling method, convenience sampling was employed in the process of selecting respondents from the target population. Therefore, the study sample was selected on the basis of availability. The sample of local residents reached 52 respondents. Tourists were approached at the tourist guesthouses in the neighboring area. As a consequence, the sample for tourists reached 34 people.

**Table 1.**
Socio-Demographic Characteristics of the Study Sample (n = 86)

| Socio-demographic characteristic | N (%) |
|---|---|
| Gender | |
| Male | 49 (57) |
| Female | 37 (43) |
| Age | |
| 20-40 (young adults) | 38 (44.2) |
| 41-60 (middle adults) | 48 (55.8) |
| Income | |
| <500 RON | 33 (38.4) |
| 501-1000 RON | 36 (41.9) |
| 1001-1500 RON | 10 (11.6) |
| >1501 RON | 7 (8.1) |
| No. of visits during the last 12 months | 68 (79.1) |
| < 5 | 11 (12.8) |
| 6-10 | 6 (7) |
| 11-15 | 1 (1.2) |
| > 15 | |

### *2.4. Sample profile*

In the general sample there were more male respondents than females (57% compared to 43%). Also, more respondents were classified as middle adults (aged 41-60). Two thirds of them declared an average income per household below 1000 RON and nearly 80% had less than 5 visits in the national park in the last year. A complete description of the sample is provided in table 1.

### *2.5. Measures*

We translated and adapted the items from Williams and Vaske's (2003) measure of place attachment, containing two dimensions: place identity and place dependence.

*Place Identity (PI)* (*M* = 20.60, *SD* = 4.96) measured the meaning a particular place has to an individual, by using a 5-point Likert scale (1 = *Strongly disagree*, 5 = *Strongly agree*). By summing up the responses of the 6 items, a total score was generated, with higher scores meaning higher levels of self-identification. The Cronbach's alpha reliability coefficient for the current data is .85.

*Place Dependence (PD)* (*M* = 24.80, *SD* = 5.45) measured the opportunities a setting provides for fulfilling certain goals and activity needs. This scale also uses a 5-point Likert response format (1 = *Strongly disagree*, 5 = *Strongly agree*). By summing the responses of the 8 associated items a general score was computed where higher scores indicating a greater place dependency. The Cronbach's alpha reliability coefficient for the place dependence scale for the current data is .83.

*Demographics* included information about gender, age, residence (local[3] or tourist[4]) and income.

### *2.6. Procedure*

Data were collected on-site. A total of 86 subjects were approached to fill the questionnaire. The participants did not place their names on the papers and were told that their responses would be treated anonymously. Also, they were given the option to refuse to fill in the questionnaire. It took about 20 minutes for adults to complete the questionnaire.

### *2.7. Data analysis*

The current study employs a quantitative design. In analyzing the relationships between the variables, SPSS 14.0 was used and three main analyses were conducted:

- *Descriptive statistics* were used to reveal some demographic characteristics and associations existing within the two groups of respondents.
- *Pearson's correlation coefficient* was used to indicate whether the 2 main dimensions were significantly related to each other.
- *Mean comparison* was used to estimate the differences between local residents and visitors in the level of place attachment displayed.

## 3. RESULTS

### *3.1. Descriptive statistics about respondents' socio-demographic background*

The respondents are aged between 20 and 60 and in both samples around 55% were classified as middle adults. The average income ranged between 250 – 2400 RON, but there are significant differences between the two samples. The average income for locals is 525.07 RON, while tourists have a mean of 1176.47 RON. Two thirds of the local residents (63.7%) had a reported income below 500 RON per

[3] Local resident was defined as the person who lived in the area for at least 15 years. Only one adult aged 20-60 per household was questioned.

[4] Tourists were considered persons accommodated in the area, no matter the length of their staying and the number of times he visited the area. In the case of families, all the adults were questioned.

household, while 20% of the tourists reported an income higher than 1501 RON. If all the tourists of the sample visited the region fewer than 5 five times during the last year, there is a big variability in the answers given by the local residents. Two thirds of them (65.4%) also visited the area less than 5 times, but also 21.2% went there between 6-10 times and 11.5% between 11-15 times.

Meanwhile, both local residents and tourists reported somewhat high levels of place attachment, but to different attributes. Local residents tended to see all the elements of the place identity as more important than place dependence. The highest mean obtained for the item 'I am very attached to this place' suggests they find a strong inner connection to this place. Among the tourists in Călimani National Park, the situation is reversed. They tend to value more the functional value of the place. It seems that this place fully satisfies their 'tourist' needs so they return whenever they get the chance (table 2).

**Table 2.**

**Mean place attachment among local residents and tourists**

| Attachment item | Local residents (n = 52) | Tourists (n = 34) |
|---|---|---|
| Place identity | | |
| This place says a lot about who I am | 3.65 | 3.21 |
| This place plays a central role in my lifestyle | 3.69 | 2.68 |
| I am very attached to this place | 3.87 | 2.82 |
| I identify strongly with this place | 3.69 | 2.74 |
| I feel like this place is a part of me | 3.60 | 2.85 |
| I feel no commitment to this place | 3.12 | 2.94 |
| Place dependence | | |
| I enjoy doing the type of things I do here more than in any other area | 3.25 | 3.62 |
| I wouldn't substitute any other area for doing the type of things I do here | 3.19 | 3.50 |
| Doing what I do here is more important to me than doing it in any other place | 2.94 | 3.32 |
| | 2.83 | 3.53 |
| No other park can compare to this one | 2.23 | 3.06 |
| The things I do here I would enjoy just as much at another site | 2.87 | 3.65 |
| I think a lot about coming here | 2.83 | 3.56 |
| This area is the best place for what I like to do | 3.12 | 2.94 |
| I find that a lot of my life is organized around this place | | |

### *3.2. Correlation analysis*

To investigate whether there is a statistically significant association between *place identity* and *place dependence*, a correlation was computed. Pearson's correlation coefficient showed that *place identity* [$r(84) = .455$, $p<.001$] was statistically significant and positive correlated with *place dependence*. This shows that respondents attaching a strong emotional-symbolic meaning to Călimani National Park also tend valuing more this place's functional utility in supporting their desired leisure experiences. Simple regression was then conducted to investigate how well *place identity* predicts *place dependence* scores. The results were statistically significant [($F(1, 84) = 21.87$, $p<.001$] The adjusted R

square was .197, indicating that nearly 20% of the variance in *place dependence* was explained by *place identity*. A large percentage still remains unexplained by the regression equation and further studies should incorporate such predictive variables.

When the total sample is split, Pearson's *r* coefficient shows a strong positive correlation between *place identity* and *place dependence* for locals [($r(50) = .812$, $p < .001$], but not significant for tourists [($r(32) = .220$, $p =. 212$]. These relations are in the expected direction as local people manage to develop a sense of belonging to the place and functionality is a secondary attribute, while tourists come to this place only because it fulfills some concrete needs, but they belong to other places.

### *3.3. Mean comparison*

In order to test the differences in the level and types of attachments among locals and tourists, independent sample *t*-tests were conducted. This test for *place attachment* was found to be statistically non-significant ($p = .743$). Further, Cohen's effect size value ($d = .07$) suggests low practical significance.

**Table 3.**
**Comparison of locals and tourists on place attachment, PI and PD (n = 52 locals and 34 tourists)**

| Variable | M | SD | t | df | p |
|---|---|---|---|---|---|
| Place attachment | | | -.32 | 83.94 | .743 |
| Locals | 45.17 | 10.22 | | | |
| Tourists | 45.76 | 6.47 | | | |
| Place identity (PI) | | | 3.20 | 84 | .002 |
| Locals | 21.92 | 5.27 | | | |
| Tourists | 18.59 | 3.70 | | | |
| Place dependence (PD) | | | -3.46 | 84 | .001 |
| Locals | 23.25 | 5.47 | | | |
| Tourists | 27.18 | 4.56 | | | |

Additionally, testing for the types of attachment, the test was found to be significant both for *place identity* [$t(84) = 3.20$, $p = .002$] and *place dependence* [$t(84) = -3.46$, $p = .001$]. These results suggest that locals ($M = 21.92$) are more emotionally attached to Călimani National Park than tourists ($M = 18.59$), but tourists ($M = 27.18$) are more emotionally dependent than locals ($M = 23.25$). Cohen's effect size value for both tests ($d_1 = 0.69$; $d_2 = 0.75$) suggests a medium to large practical significance (1988).

## 4. CONCLUSIONS

The study tried to answer two research questions: *Which are the main features and types of place attachment developed within the Land of Dorna for the Călimani National Park?* and *Is there any difference of place attachment between local residents and tourists*? Employing a mean comparison analysis, the following general conclusions emerged:

- There is a strong positive correlation between place identity and place dependence among the respondents.
- The community and tourists develop different types of place attachment for the same area, namely Călimani National Park. Tourists displayed higher levels of place dependence, while local residents displayed higher levels of place identity.

The discussions are limited because we did not find similar Romanian studies focusing on this topic.

These results can be explained as a result of a long cohabitation between the locals and the environment and by the relationship developed between them. In this kind of regions (the 'lands'), the bound formed between the community and the environment drew mostly upon the natural resources and the beauty of the place. It is very strong and has been formed throughout the years. Kaltenborn and Williams (2002: 196) also concluded in their study regarding the meaning of place attachment to Femundsmarka National Park that the residents of Røros identify stronger with the area of the Femundsmarka National Park than tourists do. The main reason is that they have a long and strong bound with the natural area and its natural resources and with the cultural elements. In our case, both samples display attachment, but the content is different. The fact that the community is more emotionally attached to Călimani National Park than the tourists is a result of the connection, perception and belonging that the inhabitants have for their own place in which they live. Another possible explanation is that all three communities considered in this study are rural. The behaviors, mentalities and attachment of the rural communities are different from those of the urban communities (where the visitors come from). The evolution and the influence of the inner and/or external factors lead to major differences between rural and urban cultures (Petkov, 2007: 30). In rural communities, the persons who were born there develop a stronger bound with the places than the tourists.

Another interesting finding is that the local community develops a stronger emotional attachment than a functional relationship, despite the existence and diversity of natural resources. One possible explanation may be the legal status of the area that imposed several limitations. In the last years, most of the natural resources of the studied area could not be capitalized anymore. Therefore, the functional connection with the place is suspended and the emotional bond became stronger. On the other hand, the tourists display functional attachment to the Călimani National Park. This is expected as they already belong to another place (their emotional relationship is for their place of origin most likely) and they perceive this particular area as a place for relaxation. Here they allow themselves to see and do new things that may be censored in other circumstances. Here, their needs come first, while in their places of origin the collective needs are first.

All these aspects mentioned above show that both the inhabitants of the Land of Dorna and the tourists value and appreciate the beauty and the positive characteristics of Călimani National Park, but in different ways and with different meanings. In conclusion, the findings are in the direction also pointed by other similar studies focusing on the same topic (Kaltenborn and Williams, 2002; Williams and Vaske, 2003; Kyle *et al*, 2004). This reinforces the strong link existing between people and environment and their importance within it.

### Limitations

There are several study limitations that deserve appropriate comments. First, the sample size reduces the ability to generalize the findings. Repeating the current study with larger samples may provide better accuracy and the ability to generalize findings to a larger population. Second, the instrument used was not previously used on a Romanian sample so cross-validation and reliability cannot be computed. Additionally, the use of Likert rating on items can have deficits due to the participants' response patterns.

### Statement of authorship

Izabela Amalia Mihalca wrote the main manuscript text and Mihai-Bogdan Iovu prepared the Method and Results sections. Both authors reviewed the manuscript.

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## REFERENCES

1. Altman, I., Low, S.M. (1992), *Place attachment,* Plenum Press, New York.
2. Brown, B.B. (1987). *Territoriality*, in Stokols, D., and Altman, I. (eds.), *Handbook of environmental psychology,* (p. 505-531), Wiley, New York.
3. Cocean, P. (1997), *Ţara (The Land) – A typical Geographical Region of Romania*, Revue Roumaine de Géographie, 41, p. 41-49.
4. Cocean, P. (2010), *Geografie regională, ediția a III- a restructurată și adăugită*, Presa Universitară Clujeană, Cluj-Napoca.
5. Cocean, P. (2011), *„Ţările" regiuni geografice și spații mentale*, Presa Universitară Clujeană, Cluj-Napoca.
6. Cohen, J. (1988), *Statistical power analysis for the behavioral sciences* (2nd ed.), Lawrence Earlbaum Associates, Hillsdale, NJ.
7. Cuba, L., Hummon, D.M. (1993), *A place to call home: Identification with dwelling, community and region,* The Sociological Quarterly, 34, p. 111-131.
8. Filip, S. (2009), *Planning urban*, Edit. Presa Universitară Clujeană, Cluj-Napoca.
9. Geertz, C. (1973), *The Interpretation of Cultures*, Basic Books Inc., New York.
10. Gieryn, T.F. (2000), *A space for place in sociology*, Annual Review of Sociology, 26, p. 463-496.
11. Giuliani, M.V., Feldman, R. (1993), *Place attachment in a developmental and cultural context,* Journal of Environmental Psychology, 13, p. 267-274.

12. Gupta A., Ferguson J. (eds.) (1997), *Culture, power, place: Explorations in critical anthropology*, Duke University Press, Durham.
13. Hidalgo, M.C., Hernandez, B. (2001), *Place attachment: Conceptual and empirical questions*, Journal of Environmental Psychology, 21, p. 273-281.
14. Kaltenborn, B.P., Williams, D.R. (2002), *The meaning of place: attachments to Femundsmarka National Park, Norway, among tourists and locals*, Norwegian Journal of Geography, 56, p. 189-198.
15. Kyle, G., Graefe, A., Manning, R. (2004), *Attached Recreationists…Who are they?*, Journal of Park and Recreation Administration, 22 (2), p. 65-84.
16. Low, S.M. (1992), *Symbolic ties that bind,* in Altman, I., Low, S.M. (eds.), Place Attachment, Plenum Press, New York, p. 165-185.
17. McCool, S.F., Martin, S.R. (1994), *Community attachment and attitudes toward tourism development*, Journal of Travel Research, 22(3), p. 29–34.
18. Peet, R. (1998), *Modern Geographical Thought*, Blackwell, Oxford.
19. Petković, J. (2007), *Traditional values and modernization challenges in forming urban and rural culture,* Facta Universitatis, Philosophy, Sociology & Psychology, 6 (1), p. 23-39.
20. Proshansky, H.M. (1978), *The city and self identity*, Environment and Behavior, 10, p. 147-169.
21. Proshansky, H.M., Fabian, A.K., Kaminoff, K. (1983), *Place identity: Physical world socialization of the self*, Journal of Environmental Psychology, 3, p. 57–83.
22. Relph, E. (1976), *Place and placelessness,* Pion Limited, London.
23. Relph, E. (1997), *Sense of place*, in Hanson, S. (ed.), Ten geographic ideas that change the world, Rutgers University Press, New York, p. 205-226.
24. Schreyer, R., Jacob, G., White, R. (1981), *Environmental meaning as a determinant of spatial behavior in recreation,* P. A. G. Conference, 4, p. 294–300.
25. Stokols, D., Shumaker, S.A. (1981), *People in place. A transactional view of settings*, in Harvey, D. (ed.), Cognition, social behavior and the environment, Erlbaum, New York, p. 441-488.
26. Tuan, Y.F. (1977), *Space and place. The perspective of experience,* Minneapolis University Press, Minneapolis.
27. Tuan, Y.F., (1974), *Topophilia. A study of Environmental Perception, Attitudes and Values*, Columbia University Press, New York.
28. Vaske, J.J., Kobrin, K.C. (2001), *Place attachment and environmentally responsible behavior,* The Journal of Environmental Education, 32 (4), p. 16-21.
29. Wickham, T., Kerstetter, D. (2000), *The relationship between place attachment and First Night participants' views of crowding, overall satisfaction, and future attendance*, in Kyle G.T., (ed.), Proceedings of the 1999 Northeastern Recreation Research Symposium, Gen. Tech. Rep. NE-269, USDA Forest Service, Northeastern Research Station, Radnor, p. 332-335.
30. Williams, D.R., Patterson, M.E., Roggenbuck, J.W., Watson, A.E. (1992), *Beyond the commodity metaphor. Examining emotional and symbolic attachment to place*, Leisure Sciences, 14, p. 29-46.
31. Williams, D.R., Vaske, J.J. (2003), *The Measurement of Place Attachment: Validity and Generalizability of a Psychometric Approach*, Forest Science, 49 (6), p. 830-840.
32. Williams, D.R., Roggenbuck, J.W. (1989), *Measuring place attachment: Some preliminary results,* Abstracts of the 1989 Symposium on Leisure Research, National Recreation and Park Association, Alexandria.
33. Williams, D.R., Stewart, W.P., Kruger Linda E. (2013), *Place-based conservation: Advancing social theory and practice, i*n Stewart, W. P., Williams, D.R, Kruger Linda E. (eds.), Place-based conservation. Perspectives from the social sciences, Springer, p. 3-28.

34. Young, J.M., Williams, D.R., Roggenbuck, J.W. (1990), *The role of involvement in identifying users' preferences for social standards in the Cohutta Wilderness*, in Hope, D. (ed.), Proceedings of the Southeastern Recreation Research Conference 12, USDA Forest Service, Southern Forest Experiment Station, Asheville p. 173- 183.
35. *** *Legea nr. 5 din 6 martie 2000 privind aprobarea Planului de amenajare a teritoriului naţional - Secţiunea a III-a – zone protejate,* Monitorul Oficial al României, Partea I, nr. 152 din 12 aprilie 2000.
36. *** *Hotărârea de Guvern nr. 230 din 4 martie 2003 privind delimitarea rezervatiilor biosferei, parcurilor naţionale şi parcurilor naturale şi constituirea administraţiilor acestora (declarate prin Legea nr.5/2000 plus Parcul Natural Vânători Neamţ),* Monitorul Oficial al României, Partea I, nr. 190 din 26 martie 2003.

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# APPLICATION OF SOIL LOSS SCENARIOS USING THE ROMSEM MODEL DEPENDING ON MAXIMUM LAND USE PRETABILITY CLASSES. A CASE STUDY

**SANDA ROȘCA**[1]

**ABSTRACT. - Application of Soil Loss Scenarios Using the ROMSEM Model Depending on Maximum Land Use Pretability Classes. A Case Study.** Practicing a modern agriculture that takes into consideration the favourability conditions and the natural resources of a territory represents one of the main national objectives. Due to the importance of the agricultural land, which prevails among the land use types from the Niraj river basin, as well as the pedological and geomorphological characteristics, different areas where soil erosion is above the accepted thresholds were identified by applying the ROMSEM model. In order to do so, a GIS database was used, regrouping quantitative information regarding soil type, land use, climate and hydrogeology, used as indicators in the model. Estimations for the potential soil erosion have been made on the entire basin as well as on its sub-basins. The essential role played by the morphometrical characteristics has also been highlighted (concavity, convexity, slope length etc.). Taking into account the strong agricultural characteristic of the analysed territory, the scoring method was employed for the identification of crop favourability in the case of wheat, barley, corn, sunflower, sugar beet, potato, soy and pea-bean. The results have been used as input data for the C coefficient (crop/vegetation and management factor) in the ROMSEM model that was applied for the present land use conditions, as well as for other four scenarios depicting the land use types with maximum favourability. The theoretical, modelled values of the soil erosion were obtained dependent on land use, while the other variables of the model were kept constant.

***Key-words:****ROMSEM model, land favourability, G.I.S. modeling, scenario, Niraj basin*

## 1. INTRODUCTION

As a consequence of technological development and the socio-economic and political changes, land use has suffered dramatically changes on the Romanian territory, changes that the authors believe to be still in progress due to the present European Union enlargement and to the Common Agricultural Policy Reform. The modification tendencies of the agricultural surfaces are driven by the technological, climatic, hydrologic changes and so forth. The purpose of the present geomorphological analysis is to focus on the soil erosion process and the land use analysis with an emphasis on identifying which type of land use would be suitable in the agricultural areas in order to improve degraded soils.

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Processes such as erosion, torrentiality and sedimentation are damaging the soil cover by physical and chemical modifications of characteristics, most of the times in an irreversible manner. When an erosion process triggers important qualitative transformations to the soil cover, the "accelerated erosion" term is employed ("anthropic erosion" for the cases in which human activities play a main role due to massive deforestation or irrational agriculture) (Ioniță, I., 2000).

The hydrologic regime of rivers has changed and an increased degree of torrential processes on the upstream tributaries can be identified, phenomena due to the lately massive deforestation (Roşca et al., 2012). Hence the river transport capacity is increasing and a larger quantity of sediments is transported, constituting the river's sediment discharge. The close link between soil erosion and river turbidity in Romania has been studied as early as 1971 by Diaconu, C. et al.

Many times in the existing scientific literature the syntagm „admissible/tolerated erosion" can be encountered, the term denominating the existing erosion due to agricultural practices, without having an impact on the further agricultural development. In order for this to happen, a series of general rules are needed: the soil layer must be deep enough to ensure production in agriculture and forestry for a long period of time, hence the erosion effects have to be taken into account for every soil class and every soil type (Băldoi, V., Ionescu, V., 1986).To prevent riverbed clogging as well as large sedimentary deposits near bridges, roads, or on low terrains, soil erosion has to be minimal. It also has to be maintained under the level from which in-depth erosion begins.

Moţoc, M. (1983) mentions that the Romanian territories presenting a steeper slope than 5° are subject to erosion. In the present case, for the Niraj River basin, the surfaces characterised by a slope greater than 5° represent 65.43% out of the total surface.

## 2. ESTIMATING SOIL EROSION BY THE ROMSEM MODEL

The universal equation of soil erosion (U.S.L.E.) was elaborated and published in 1965 by Wishmwier and Smith in Agriculture Handboook No. 537 and suffered modifications in 1997, by Renard and Foster: R.U.S.L.E. (Revised Universal Soil Loss Equation).

The GIS technology makes use of several useful tools created for the study purpose: Moore and Wilson, 1992, Mitasova et al., 1996, Filip, 2008. In the international scientific literature Zigg, R., W., 1940 proposes a mathematical model based on the relationship between the slope length and its value expressed in degrees. More enhancements were subsequently brought by D.D., Smyth, 1941, Browning et al., 1947, Lloyd and Eley, 1952. According to the research done by Morgan R. P. C. et al., 1998, the American model for quantitative soil erosion evaluation has been adapted to the European specific conditions, hence the EUROSEM (The European Soil Erosion Model) was created.

The ROMSEM Model (Romanian Soil Erosion Model) has been generated by the use of an empirical model (determined from a series of statistical databases) for the Romanian territory. It has at its foundation the equation developed by Moţoc, M. et al. (1973, revised in 1979, reconfirmed in 2002) which is based on the universal relationship used by the Soil Conservation Service in the USA, taking at the same time into consideration the climatic conditions from Romania.

### *2.1. Database and Methodology*

Taking into consideration that the employed equation has a general form, there exists the need for an objective quantification of values for each of the factors taken into account according to the specificity of the analysed territory.The database consists of vector primary entities (representing the soil, land use, water divide) and raster entities (the Digital Elevation Model (DEM), the erosion coefficient established on the basis of rain erosivity, correction coefficient for anti-erosion works), as well as derived data (correction coefficient for soil erodibility, crop/vegetation and management factor, correction coefficient for the effect of anti-erosion works, slope length (m) and slope angle (%). Obtaining the database composed of these several coefficients waspossible via a series of methodological steps which are described in the lines that follow (Fig. 1).

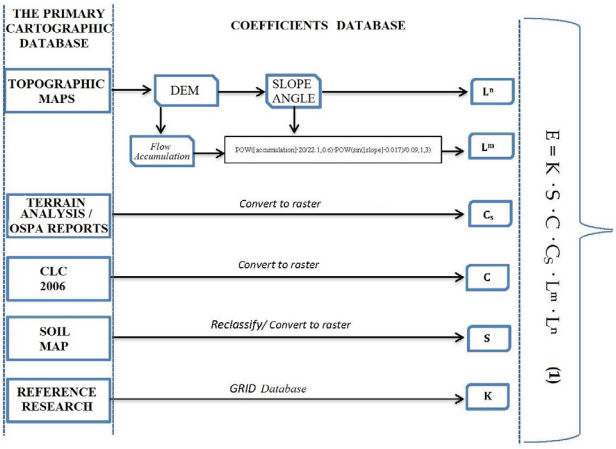


**Fig. 1.** Stages of model application for determining soil erosion.

where,
E- mean annual erosion (t/ha/year)
K- Erosivity coefficient established on the basis of climate erosivity
S- Correction coefficient for soil erodibility
C- Correction coefficient for cover-management factor and vegetation characteristics
Cs- correction coefficient for the effect of anti-erosion works
Lm- Slope length (m)
In- Slope angle (%)

In order to obtain the primary database, the water divide was delineated from the topographic maps 1:25000, maps that had been previously georeferenced in the Stereo 70 system. The hydrological network and the contour lines needed for the DEM generation at a resolution of 4 meters were obtained as well.

#### *2.1.1. Rainfall erosivity*

The coefficient of rainfall erosivity for the Niraj river basin has a value of 0.127 (Fig.2.A), a value determined by Moţoc, M., et al. in 1970 (Florea et al., 1989) on the basis of experimental parcels at the Perieni and ValeaCălugărească Research Stations. This indicator takes into account the combined effect of torrential rain and surface flow computed as a product of rainfall quantity and the intensity of the rainfall event's centre, the latter having a 15 minute duration. The coefficient of rainfall erosivity was extracted from the *Rainfall Erosivity Map in Romania* by LiviaDrăgan and P. Stănescu, 1970.

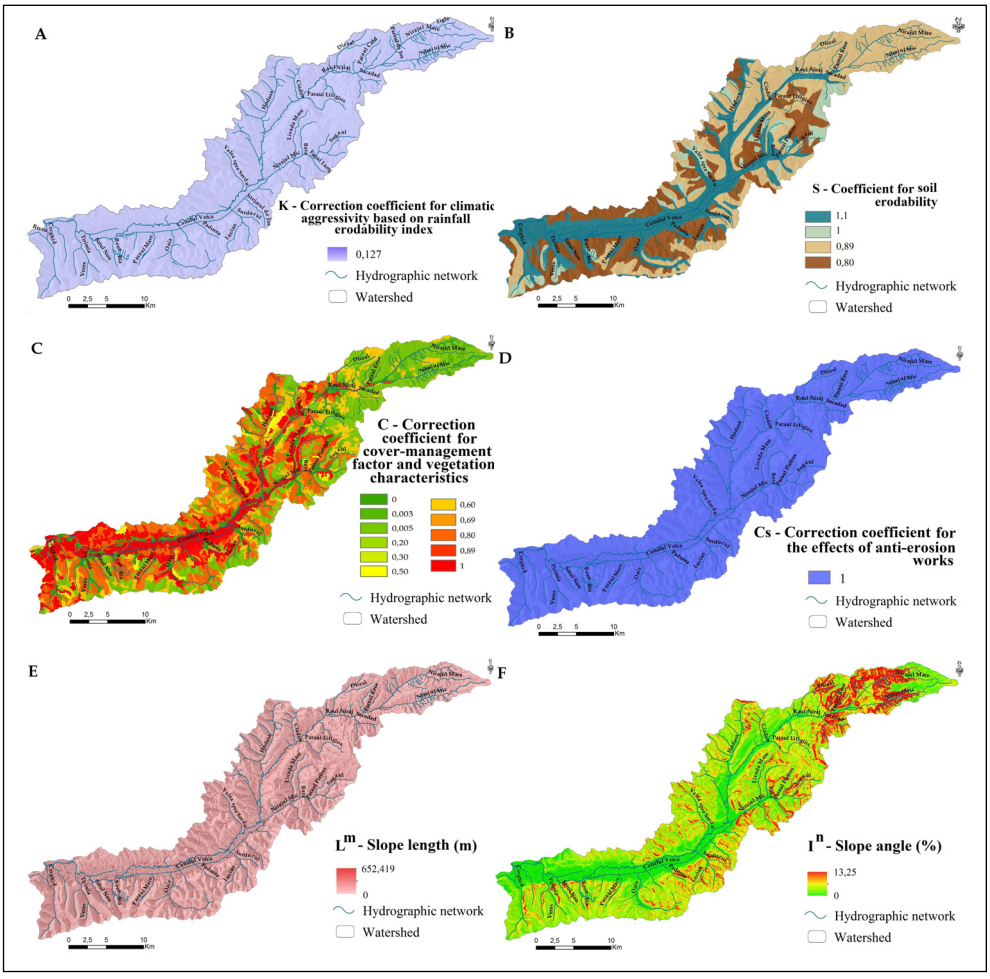


**Fig. 2.** The cartographic data base used in the modelling process

*2.1.2. Soil erodibility*

In order to establish the soil erodibility coefficient, several characteristics have been taken into account: the genetic type of soil, the erosion degree, the texture. The values of the Romanian Soil Erodibility Classification (M., Moţoc, 1975) have been employed. The different types of soil were vectorised from the Romanian Soil Map 1:200000 and the soil classes were modified in accordance with the Romanian System of Soil Taxonomy 2003 (Florea and Munteanu, 2003). The values of the factors were determined by taking into account the Romanian pedo-climatic characteristics and have values between 0.8 and 1.1 (Fig. 2.B).

### *2.1.3. Correction coefficient for cover-management factor and vegetation characteristics*

The crop/vegetation and management factor is computed in geomorfological, hydrological and pedological studies as the anti-erosion role that the vegetation has is a widely known. Wanting to use databases as recent as possible so as to establish the correction coefficient for the crop/vegetation and management factor for the entire basin the land use data was used, namely the land use was vectorised from the existing ortophotographs from 2005. The values given to the parcels range from 0, for the urban and industrial areas, to 1, for arable land (Fig. 2.C).

It is known that a crust reducing the soil infiltration exists on the terrains sown with plants that are in an incipient stage of growth. In the study area the arable land surfaces are predominant in the middle and inferior sectors of the basin where a high productivity is registered for corn, wheat and vegetables. This coefficient indicates the soil erosion for every land use category in connection to the surface it occupies, the existing topography, the degree of vegetation development and the agricultural management. The forest assures a high anti-erosion protection due to the tree leaves and the water consumption in the evapo-transpiration process, giving away step by step the water volume resulted from snowmelt. The transition areas occupied by bush shrubs and pastures offer a medium protection, while the arable or cultivated lands have a low anti-erosion protection factor.

### *2.1.4. Correction coefficient for the effect of anti-erosion works*

The positive effects of anti-erosion works are well known on the Romanian territory. When it comes to the study area, however, after having verified the real situation on the terrain, it has been concluded that such works are confined to certain arable strips of land along the contour lines on very small areas. Hence the correction coefficient for the effect of anti-erosion works has the value of 1 (Fig. 2.D).

### *2.1.5. The topographic factor*

This topographic indicator takes into account the length of slope and its inclination. The longer the slope, the greater the water volume drained and its speed, hence the erosive effect of drainage increases (Desmet et al. 1996).

The length coefficient of slopes has been computed with the help of the ArcInfo software, using the formula proposed by Mitasova et al., 1996.

POW([accumulation]·20/22.1,0.6)·POW(sin([slope]·0.017)/0.09,1,3), where
Accumulation – Drainage accumulation
20 – raster resolution
0.6,1.3,22.1,0.017 – experimental coefficients (Moore, I.D., Wilson, J.,P., 1992)
Slope - Slope angle (%)

The steepest path length is obtained on the basis of the Digital Elevation Model (DEM) via the Lm function, where m = 0.3 for the slope length shorter than 100 m and m = 0.4 for slope lengths bigger than 100 m. Hence the spatialisation of the Lm factor (slope length) has been computed in meters and displays values between 0 and 652 (Fig. 2.E).

The spatial repartition map of the In coefficient (slope angle), computed as percentage, has values between 0 and 13.2 % (Fig. 2.F). A higher slope determines a greater speed of drainage enhancing the erosion potential and vice-versa, a smoother slope slows down the water speed favouring the sedimentation process.

*2.2. Sub-Basin Result Interpretation*

Having had the entire database converted in a raster format, it was via the *Raster Calculator* function from *Spatial Analyst* extension that the value of potential soil erosion was computed for every pixel. Hence the value for the annual soil erosion in the Niraj hydrographic basin lies between 0 and 42.07 t/ha/yr (Fig. 3).

Making use of the GIS technology conclusions at the basin level can be drawn (Fig. 3), or interrogations can be done on some regions or sub-basins. For the detailed identification of soil erosion and its zoning, the units that have a relatively homogenous land use, slope and length of the hillside had been previously identified. Erosion was afterwards computed at this unit level in t/ha/yr.Analysing the entire river basin, counting 658 km2, it can be noticed that the largest area of 56.7% (373 km2) registers low values for mean erosion (between 0,5 and 1,5 t/ha/yr).This corresponds to the mountainous areas with a high degree of forestation, resistance to high erosion and a lower degree of anthropic interference.Erosion values between 0 and 1.5 t/ha/yr corresponding to 30% (197 km2) of the study area, characterise the basin divide covered by forests. 1.5-3 t/ha/yr over a 65 km2 area correspond to hillsides with higher slope values than 10%, where grasslands are predominant.

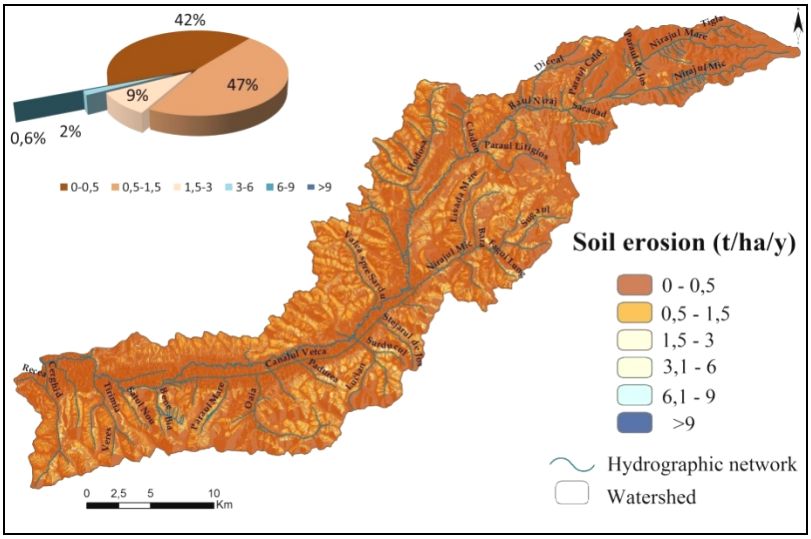


**Fig. 3.** Mean soil erosion computed via the RUSLE model

High erosion values >6 t/ha/yr characterise small areas, namely the higher degree slope areas and the deforested piedmont areas in the settlements' vicinity. The land use categories in these areas generally consist of arable land with no agro-techniques put into practice against soil erosion.

The low values in the areas with a smooth slope are noticeable and specific to the inferior Niraj river basin, a dense populated area with important built-up territory. The same values are characterising the mountainous area due to the increased resistance of soil to erosion process. Our attention will be further focused on the sub-basins' analysis, namely on those sub-basins where soil erosion values are superior to the admissible limits. The admissible limit for the Romanian territory according to Moţoc, M., et al., 1979 lies between 2 and 8 t/ha/yr.

Analysis at the sub-basin level depicts low values for soil erosion (for example on Nirajul Mic and Nirajul Mare sub-basins in the mountainous area) as well as values indicating soil erosion acceleration, for example in the Nirajul Mic II sub-basin, Pârâul Litigios, Săcădad, Pârâul Cald, etc. (Table 1, Fig. 4).

**Table 1**

**Morphometric characteristics and erosional values at sub-basin level**

| Nr. | Sub - basin | Surface (km2)/% | H. Med. | H. max | C (km) | E mean (t/ha/an) | E max. (t/ha/an) | |
|---|---|---|---|---|---|---|---|---|
| 1. | **Nirajul Mic** | 25/3,8 | 1054 | 1544 | 2,08 | 0.051 | 12.4 | **Mountainous basin** |
| 2. | **Nirajul Mare** | 39/5,9 | 1040 | 1402 | 1,74 | 0.050 | 13.5 | |
| 3. | **Nirajul Mic II** | 44/6,6 | 945 | 1085 | 1,89 | 0.035 | **34.7** | |
| 4. | **Pârâul Cald** | 10/1,5 | 833 | 1175 | 1,25 | 0.110 | 19.4 | |
| 5. | **Diceal** | 13/2 | 813 | 1175 | 1,01 | 0.193 | 10.2 | |
| 6. | **Săcădad** | 10/1,5 | 745 | 1026 | 1,38 | 0.119 | **20.1** | |
| 7. | **Aluniş** | 8/1,2 | 648 | 1081 | 1,45 | 0.194 | 15.3 | |
| 8. | **Pârâul Litigios** | 13/2 | 626 | 1082 | 1,35 | 0.239 | **22.1** | |
| 9. | **Ţigani** | 10,4/1,5 | 555 | 911 | 1,41 | 0.473 | 16.9 | **Hillside basin** |
| 10. | **Ciadon** | 9/1,4 | 520 | 618 | 1,53 | 0.121 | 10.0 | |
| 11. | **Bâra** | 11,2/1,7 | 487 | 639 | 1,30 | 0.518 | 19.4 | |
| 12. | **Hodoşa** | 38/5,0 | 461 | 617 | 1,52 | 0.355 | 9.34 | |
| 13. | **Văraticul** | 20/3,1 | 432 | 583 | 1,27 | 0.389 | 15.7 | |
| 14. | **Zambo** | 19/2,9 | 425 | 547 | 1,49 | 0.305 | 12.1 | |
| 15. | **Stejarul** | 7/1,1 | 425 | 539 | 1,43 | 0.397 | 13.3 | |
| 16. | **Pădurea** | 9/1,4 | 415 | 536 | 1,45 | 0.586 | 13.7 | |
| 17. | **Maiad** | 10/1,5 | 406 | 507 | 1,40 | 0.399 | 9.6 | |
| 18. | **Valea spre Sardu** | 31/4,7 | 405 | 424 | 1,42 | 0.443 | 13.1 | |
| 19. | **Oaia** | 41/6,3 | 402 | 545 | 1,52 | 0.316 | 13.1 | |
| 20. | **Bogdan** | 9/1,4 | 401 | 527 | 1,64 | 0.304 | 16.0 | |
| 21. | **Bene** | 12/1,8 | 397 | 523 | 1,23 | 0.379 | 15.5 | |
| 22. | **Tirimia** | 22/3,3 | 390 | 501 | 1,37 | 0.349 | 10.9 | |
| 23. | **Ceghid** | 29/4,4 | 369 | 495 | 1,70 | 0.380 | 15.2 | |
| | **Bazinul Nirajului** | 658 | 523 | 1578 | 2,21 | 0.286 | 42.07 | |

where: % river basin percent out of the total basin surface, C – Circularity coefficient (km), H. max. – maximum height (m), H. med. – the basin mean height (m), E med – Mean soil erosion (t/ha/yr), E max – Maximum soil erosion (t/ha/yr).

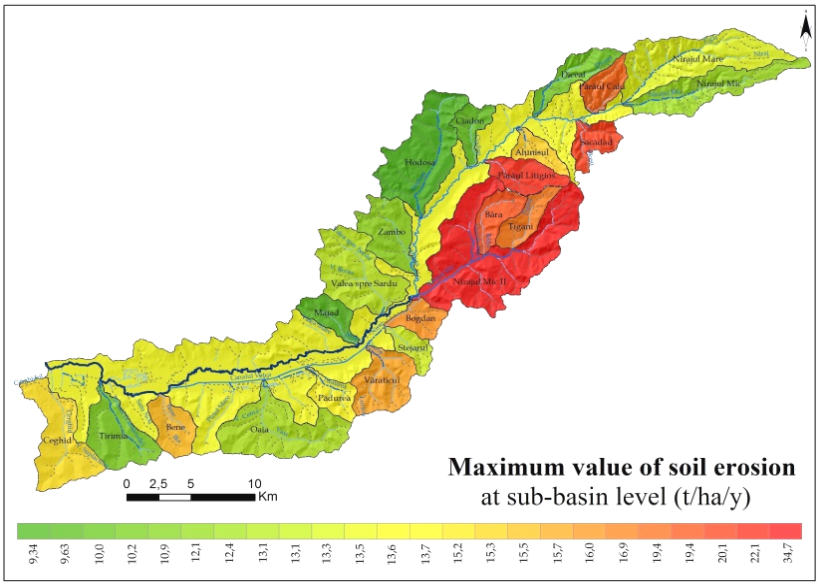


**Fig. 4.** Maximum soil erosion values at sub-basin level

At regional level, the influence of hillslope morphographical characteristics is important (convexity, concavity), the microdepressions playing a role in water accumulation and sediment storage, as well as in the complexity displayed within the soil classes. In the example illustrated in Fig. 5 (the Săcădad sub-basin), where it had previously been identified an accelerated soil erosion phenomenon, the major role played by the storage areas can be seen. These areas have been identified through the morphometric indicator profile curvature.

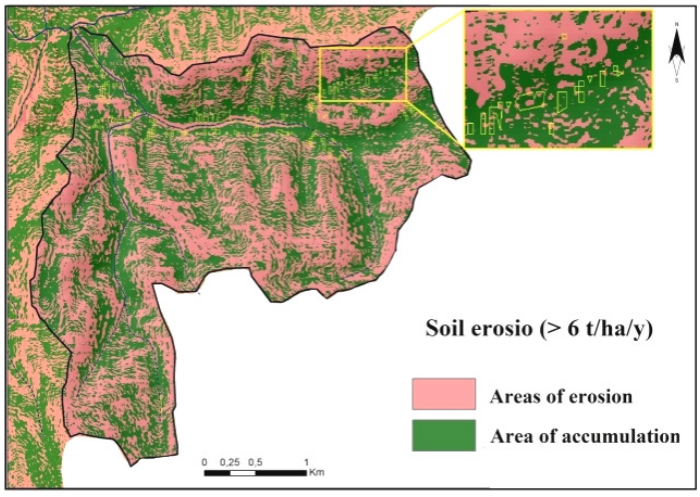


**Fig. 5.** Erosion and accumulation areas highlighted with the help of profile curvature

Hence the eroded soil from the areas with high erosional potential (mainly located in erosion areas displaying negative values of the profile curvature), once placed the accumulation areas (having positive values of the profile curvature) will remain there depending on the hydrologic and anthropic factor.

## 3. LAND FAVOURABILITY IDENTIFICATION FOR AGRICULTURAL USE

The entire basin has a strong agricultural trait as the economic activities are strongly connected with the existing agricultural potential, characterising the middle and lower basin parts, as well as with the forestry resources situated in the upper basin. In the Local Development Plan for the Valea Nirajului Microregion, 2012, the territory is divided in three sectors: the inferior sector recognized due to vegetable crops as main land use, at the local level the region being called "The Carrot Country"; in the middle sector the cereals are predominant among cultures and in the upper sector the orchards.

Taking into account the physico-geographical characteristics of the territory with their advantages and restrictions that are imposed at the local level regarding favourability with respect to different land use, the authors applied the model of scoring the agricultural terrains. This was done according to the Methodological Norms of the ICPA and OJSPA, vol I and II, 1987, as well as to the Methodology of conducting pedological and agrochemical studies, and to that of the National and Departmental Monitoring System of agricultural soil-terrain (Decision. no. 598 on the 13th of August, 2002) for the identification of favourability classes regarding agricultural land use at sub-basin level.

The emphasis lies on the terrain's geomorphology (by identifying the landforms at a micro and macro scale, elevation identification, terrain fragmentation) and underground description of the bedrock (Teaci, 1980, 1989). Together with this geomorphological analysis, the main climatic factors influencing the crops are taken into consideration, together with the vegetation (wooden, shrub-like, crops), with consequences in humus formation, and the soil characteristics (Blaga and Bunescu, 1994, Bunescu et al., 1994, Păcurar, 2001).This approach can be put in application by identifying the favourable degree of the terrain as well as by identifying the concrete needs (Ţârău, 2003, 2006, Spârchez, 2009) streaming from the problems related to the soil resources capitalisation at the level of natural units, in the present study case at the level of the Niraj river basin and its sub-basins.

### *3.1. Data base and methodology*

Each factor describing topographic conditions, soil characteristics and climate and hydrological resources (corrected multiannual mean temperature (3C indicator), multiannual mean precipitation (indicator 4C), gleisation (indicator 14), pseudogleisation (indicator 15), texture in the first 20 cm (indicator 23A), slope angle (indicator 33), landslides (indicator 38), inundability (indicator 40), useful edaphic volume on the 0-150 cm depth (indicator 133) and surface humidity excess (indicator 144) have been integrated in a database containing primary data layers and their repartition at the basin level.

To facilitate the analysis, the indicators have been given values ranging from 1 to 0, according to the influence they have on every crop type, resulting in scores for each crop after having applied formula no. 2 (Fig. 6).

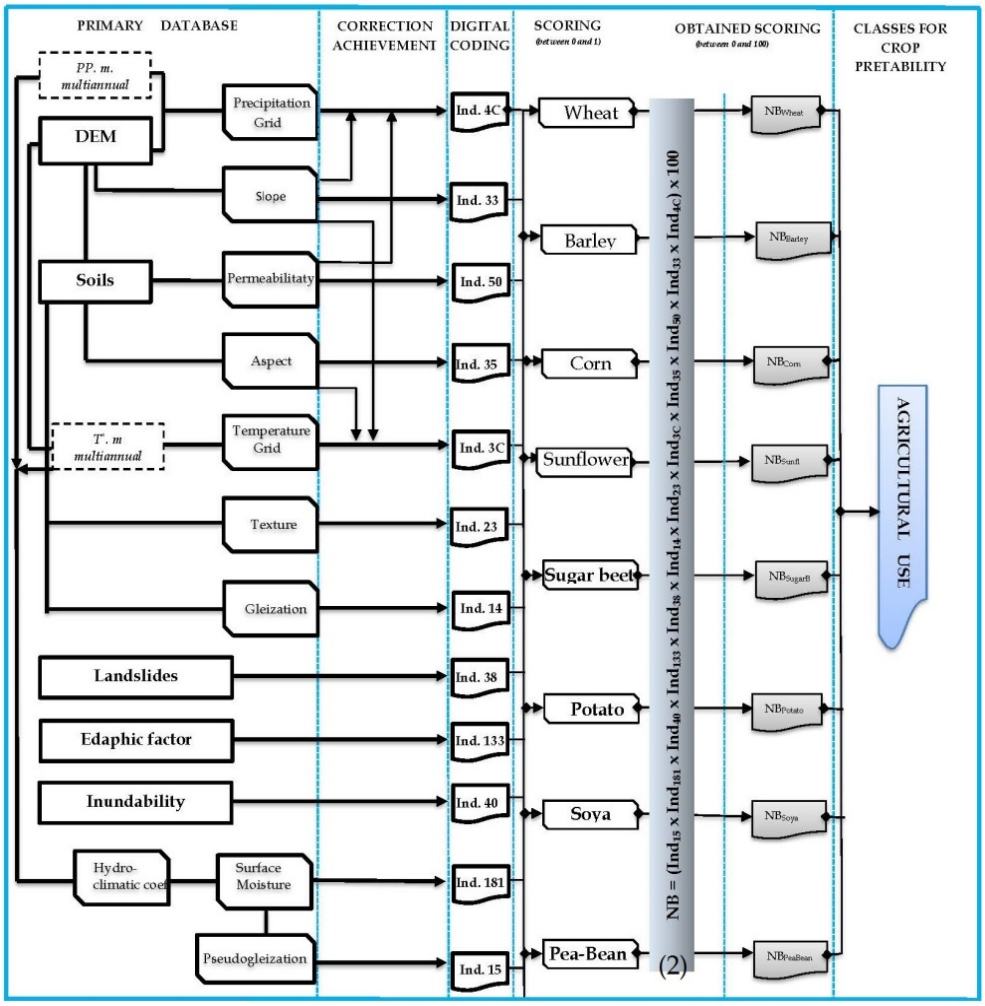


**Fig. 6.** Stages of the model determining the favourability classes for agricultural land use

### *3.2. Identification procedure of sub-basin pretability classes to specific crops*

By manipulating the resulted GIS databases and by making the relevant computations, the territories can be fitted into pretability classes to specific crops as a mean resulted from the scores given for wheat, barley, corn, sunflower, sugar beet, potato, soy, pea-beans (Fig. 7).

In the I$^{st}$ class the territories with scores situated between 81-100 points are included, consisting of terrains with a very good pretability, present on extended surfaces on the sub-basins in the inferior sector Oaia, Bene, Pădurea (Fig. 6), due to the smooth surfaces or slightly sloped ones (2.1-5°), with fertile lands where the climate and hydrological conditions do not restrict the cultures' development, assuring really good harvests.

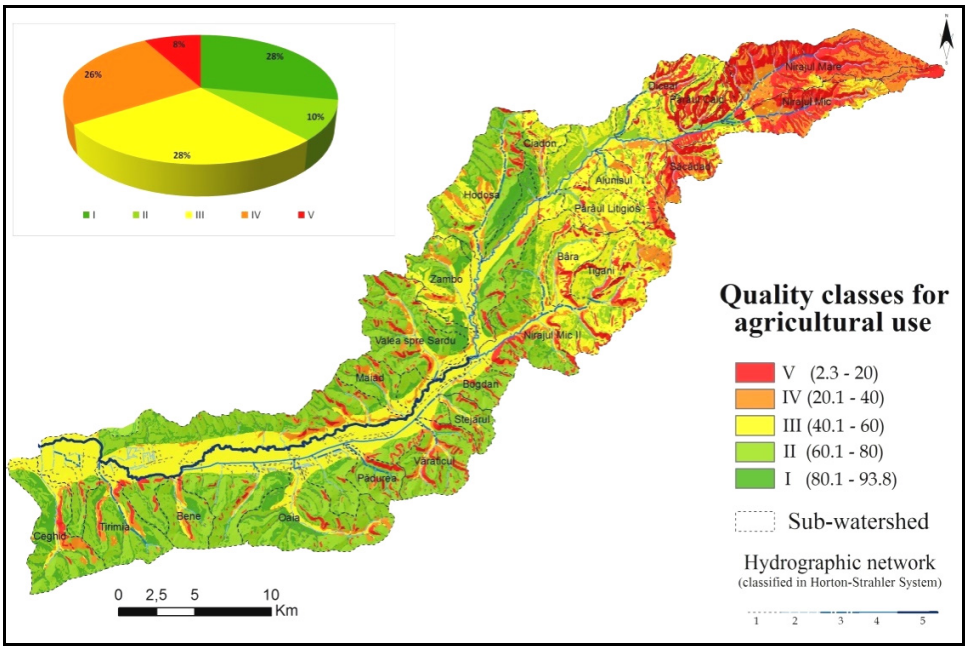


**Fig. 7.** Quality classes for agricultural use at the basin level

The II$^{nd}$ class (61-80 points) corresponds to the terrains with a good pretability being well spread in the sub-basins in the inferior and middle sectors of the river Tirimia, Ceghid, Valea spre Sardu, where the climatic and hydrological conditions do not restrict the crops' development, the lands are fertile with good and medium permeability, slightly affected by the humidity excess. At their level the limitation factors for the crops can be avoided by undertaking some improvement measures.

Extended surfaces corresponding to the Bâra, Țigani, Aluniș, Pârâul Litigios belong to the III$^{rd}$ class, as well as the floodplains of the Niraj where the score values range between 41-80. The terrains have a medium pretability due to the medium fertile soils, affected by surface humidity and landslides that are in need of improvement works.

The IV$^{th}$ class, with scores between 21-30 points representing terrains with low pretability, characterisies surfaces in the Nirajul Mic II, Săcădad, Nirajul Mic and Nirajul Mare sub-basins due to low fertility soils affected by landslide and humidity excess, as well as by meteo-hydrologic conditions with a low favourability regarding the existing crops.

The V$^{th}$ quality class of agricultural terrains regroups some snall surfaces from the sub-basins in the inferior and middle sector of the river, and large areas in the upper sector due to the soils with low fertility affected by degradation (having between 0 and 20 points on the scoring terrain sheet, displaying severe restraints and unsuitability as long as no improvement works are undertaken) necessitating improvements such as fertilization, structure stabilizing, soil loosening, drainage etc. (according to the Decision. 598/13 august 2002). For the terrains with a very low and extremely low pretability (the Vth class), their use as orchards terrains, vineyards, grasslands, pastures or forests is seen as a generally valid alternative.

## 4. APPLICATION OF SOIL LOSS SCENARIOS DEPENDING ON THE SUB-BASINS' LAND USE

In order to identify the erosion according to the corresponding land uses and the highest degree of favourability resulted from the local soil, climate and topographic conditions, three scenarios have been applied. They contain variants of the correction coefficient (Fig.8A, B, C and D) for crop management applied on the sub-basins with the highest rates of surface erosion: Nirajul Mic, Bâra, Ţigani and Pârâul Litigios, that will be subsequently described.

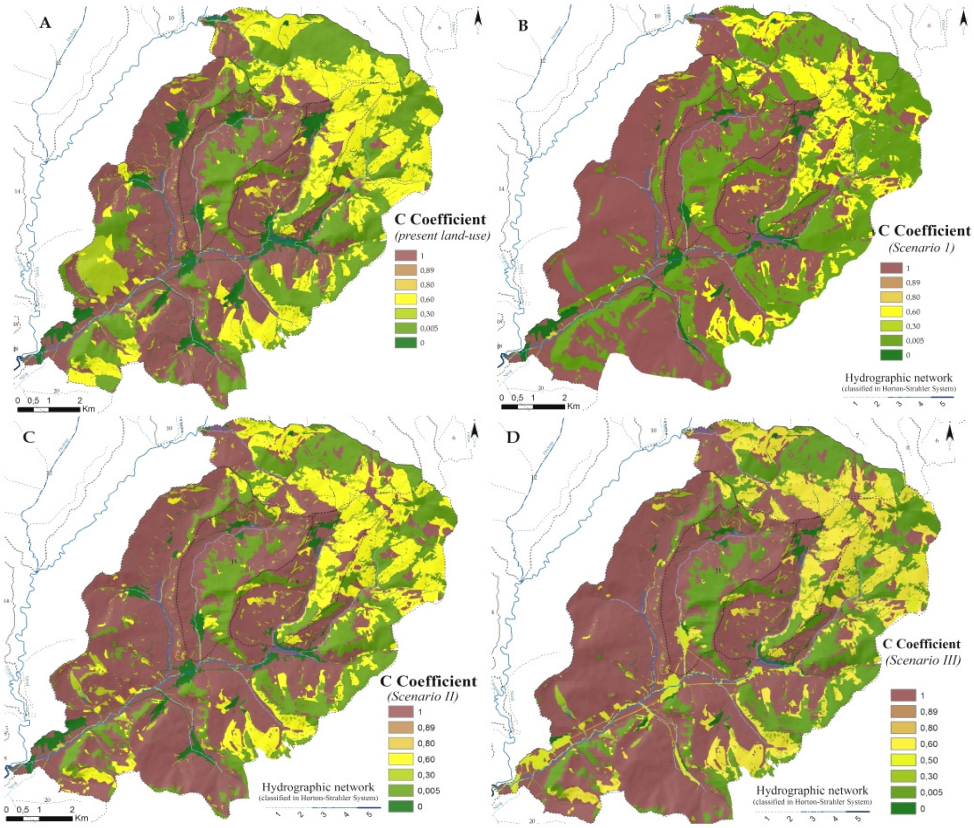


**Fig. 8.** Spatial expansion of the C coefficient according to the present land use (A), scenario 1 (B), scenario II (C) and scenario 3 (D) at the level of the Nirajul Mic, Bâra, Ţigani and Pârâul Litigios sub-basins.

For the first scenario the modelling of the present situation was undertaken and the databases previously listed were used. Hence it can be observed that some important percentages of 58.17% of the Bâra sub-basin, 43.42% for the Nirajul Mic and 40.7% for Ţigan correspond to the high rates of surface erosion. Class 0 that indicates accentuated stability of the analyzed territories is represented by low percentages (8%) (Table 2).

For the IInd scenario the first two classes have been kept according to their pretability for agricultural land, the rest of the terrains keeping their land use criteria specific to the present moment. By eliminating the last two favourability classes occupied by forested areas, it can be observed with respect to the agricultural areas an increase of the surfaces (Fig. 9) having maximum values: 57.7% in the Nirajul Mic sub-basin, 62.4% in the Bâra sub-basin, 49.6% in Țigani and 29.8% in Pârâul Litigios sub-basin.

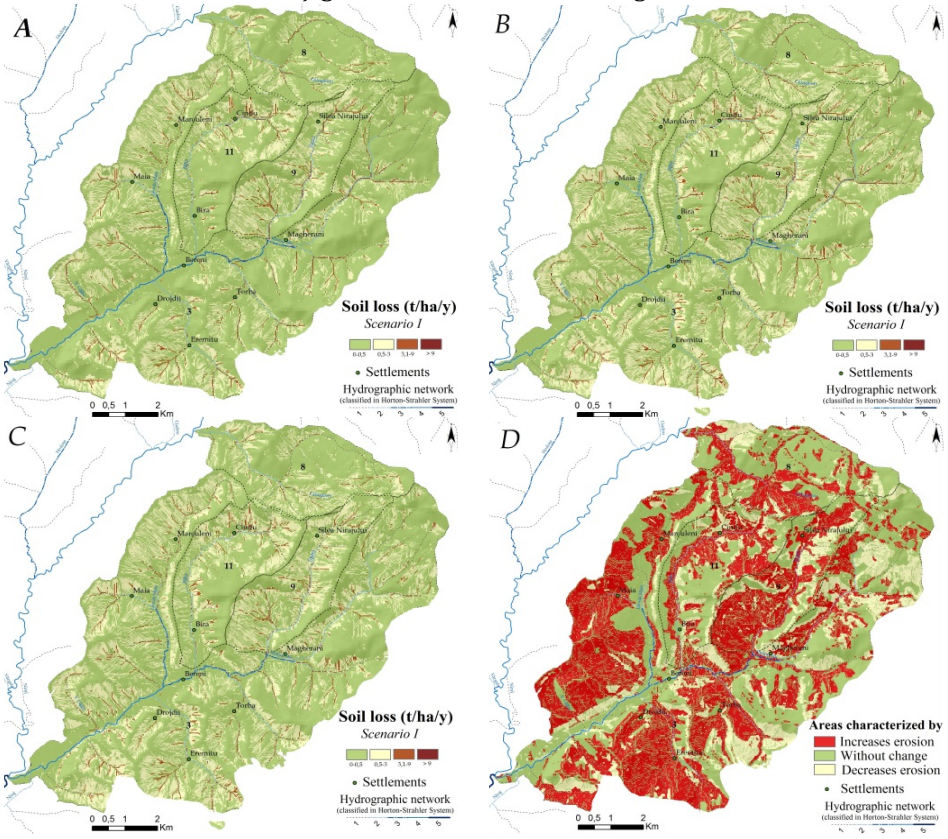


**Fig. 9.** Soil loss estimation according to scenario 1 (A), scenario 2 (B) and scenario 3 (C) with highlighted differences (D) at the level of the Nirajul Mic, Bâra, Țigani and Pârâul Litigios sub-basins.

**Table 2**

**Relative dimension of areas characterised by extreme values of the C coefficient**

| | | River basin | | | | Moment in time |
|---|---|---|---|---|---|---|
| | | **Nirajul Mic** | **Bâra** | **Țigani** | **Pârâul Litigios** | |
| **Spatial expansion** | **C=1** | 43.42% | 58.17 % | 40.70% | 16.97% | Prezent |
| | **C=0** | 6.92% | 6.37% | 7.61% | 2.36% | |
| | **C=1** | 53.93% | 54.68% | 48.53% | 25.50% | Scenario I |
| | **C=0** | 3.26% | 4.38% | 42.65% | 0.88% | |
| | **C=1** | 57.78% | 62.45% | 49.69% | 29.81% | Scenario II |
| | **C=0** | 4.53% | 4.81% | 4.42% | 1.01% | |
| | **C=1** | 60.29% | 62.45% | 49.69% | 29.81% | Scenario III |
| | **C=0** | 1.34% | 2.85% | 4.38% | 0.85% | |

The III[rd] scenario is based on the use of the first classes of pretability to arable land and on that of the IInd class for pretability to orchards. At the level of the Bâra and Ţigani sub-basins, having introduced the class with favourability for orchards, the percentages characterised by the maximum values of the C coefficient are constant. Some modifications can be seen however as there is an increase in the Nirajul Mic and Pârâul Litigios sub-basins.

By applying the ROMSEM model and by the use of the three variants of the C coefficient according to the three scenarios while maintaining constant the other factors that contribute to the modelling, major modifications can be observed when it comes to the level of erosion class distribution in the studied sub-basins.

**Table 3**

**Relative spatial expansion of erosion classes in river sub-basins**

| Sub-basin | Erosion Classes (t/ha/an) | | | | Moment |
|---|---|---|---|---|---|
| | **0 - 0,5** | **0,5 - 3** | **3 - 9** | **>9** | |
| Nirajul Mic | 77,387 | 20,661 | 3,678 | 0,423 | Scenario I |
| | 60,010 | 36,972 | 3,476 | 0,350 | Scenario II |
| | 65,486 | 31,858 | 2,417 | 0,239 | Scenario III |
| Bâra | 75,705 | 21,902 | 4,448 | 0,715 | Scenario I |
| | 59,431 | 36,760 | 2,700 | 0,353 | Scenario II |
| | 73,689 | 24,013 | 2,035 | 0,263 | Scenario III |
| Ţigani | 67,835 | 29,080 | 6,133 | 1,204 | Scenario I |
| | 52,587 | 43,338 | 3,628 | 0,585 | Scenario II |
| | 64,714 | 32,511 | 2,391 | 0,383 | Scenario III |
| P. Litigios | 83,131 | 15,360 | 1,827 | 0,692 | Scenario I |
| | 72,735 | 25,312 | 1,467 | 0,374 | Scenario II |
| | 78,570 | 19,981 | 1,153 | 0,296 | Scenario III |

## 4. RESULTS AND CONCLUSIONS

The quantitative analysis of results indicates an increase of the surface percentages where low levels of erosion occur (0-0.5 t/ha/yr) in the Niraj river basin, when scenario II is put in application, namely for the first two maximum favourability categories. As a comparison, the results of scenario I, where classes IV and V were proposed for forest as a land use, show a decrease in percentage of the surfaces with mean erosion (21.8%). The results of scenario III offer the best results in the entire river basin, namely when the first classes are used as arable land and the IInd class as orchards (Fig. 10).

Having at hand the research results regarding the anti-erosion role played by vegetation (M. Moţoc, 1975), along with the identification of areas with a high level of erosional potential in the Niraj river basin, a series of invasive methods can be suggested which would diminish the negative effects of soil erosion, such as: crop rotation (substituting the crops with perennial herbs and lucerne, offering a high protection due to their high density and their water consumption), hence offering an acceptable agricultural productivity; works orientated along the hillslope-valley directions, works along the contour lines, terraces etc.

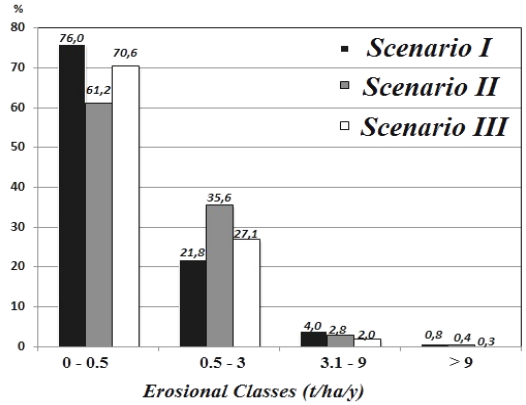


**Fig. 10.** Percentual distribution of the erosion classes in the Niraj river basin

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## REFERENCES

1. Băldoi, V., Ionescu, V., (1986), *Apărarea terenurilor agricole împotriva eroziunii, alunecărilor şi inundaţiilor*, Editura Ceres, Bucureşti.
2. Blaga, Gh., Bunescu, V., (1994), *Bonitarea terenurilor agricole. Lucrări practice*, Editura Tipo Agronomia, Cluj Napoca.
3. Browning, G.M., C.L. Parish, J. Glass, (1947), *A method for determining the use and limitations of rotation and conservation practices in the control of soil erosion in Iowa*. J. Am. Soc. Agron. 39(1), p. 65-73.
4. Bunescu V., Blaga, Gh., Rusu, M., (1994), *Cartarea solurilor şi bonitarea solurilor agricole*, Ed. Tipo Agronomia, Cluj Napoca.
5. Diaconu, C., (1971), *Probleme ale scurgerii aluviunilor pe râurile din România. Studii de hidrologie*, XXX IMH, Bucureşti.
6. Desmet, P.J.J., Govers, G., (1996), *A GIS procedure for automatically calculating the USLELS factor on topographically complex landscape units*, Journal of Soil and Water Cons, Vol. 51, pp. 427-433.
7. Drăgan L.,Stănescu, P., (1970), *Zonarea erozivităţii pluviale,* Analele ICIFP, Vol. III, Bucureşti.
8. Filip, S., (2008), *Depresiunea şi Munceii Băii Mari. Studiu de geomorfologie environmentală*, Edit. Presa Universitară Clujeană, Cluj-Napoca.
9. Florea, N., Untaru Georgeta, Berbecel, O., Teaci, D., Tudor Ana, Răuţă C., Canarache, A., (1989), *Microzonarea pedoclimatică a teritoriului României*, Analele I.C.P.A. vol. XLIX, Bucureşti.
10. Florea N., Munteanu I., 2003, *Sistemul Român de Taxonomie a Solurilor*, Editura Estfalia, Bucureşti.
11. Ioniţă, I., (2000), *Geomorfologie Aplicata. Procese de degradare a terenurilor deluroase* Editura Univ. "Al.I. Cuza", Iaşi.

12. Lloyd, C.H., G.W. Eley., (1952). *Graphical solution of probable soil loss formula for the North eastern Region.* J. Soil and Water Conserv. 7(4), p. 189-191.
13. Mitasova, H., J. Hofierka, M. Zlocha, L. R. Iverson, (1996), *Modeling topographic potential for erosion and deposition using GIS.* Int. Journal of Geographical Information Science, 10 (5), 629-641.
14. Moore, I.D., Wilson, J.P., (1992), *Length-slope factors for the Revised Universal Soil Loss Equation: Simplified method of estimation*. Journal of Soil and Water Conservation. Vol. 47 (5), p. 423-428.
15. Morgan R.P.C., Nearing M.A. (2011), *Handbookf of Erosion Modelling*, Wiley-Blackwell.
16. Morgan, R.P.C., Quinton, J.N., Smith, R.E., Govers, G., Poesen, J.W.A., Auerswald, K., Cnisci, G., Torri, D. (1998), *The EUROSEM model*, in Boardman, J.B. and Favis-Mortlock, D. (Eds.) Global Change: modelling soil erosion by water, NATO ASI series, Series 1: Global environmental change. Springer Verlag, London, 373–382.
17. Moţoc, M., Munteanu, S., Băloiu, V., Stănescu, P., Mihai, Gh. (1975), *Eroziunea solului şi metode de combatere*, Editura Ceres, Bucureşti, p. 301.
18. Moţoc M, Stanescu P, Taloiescu I, (1979), *Metode de estimare a eroziunii totale şi a eroziunii efuente pe bazine hidrografice mici,* Buletinul I.C.P.A., Bucureşti.
19. Moţoc, M. (1983), *Ritmul mediu de degradare erozională a solului în R.S. România* în Buletinul Informativ al A.S.A.S., no. 13, ASAS, Bucureşti.
20. Moţoc M., Stănescu P., Luca Al., Popescu C.N., (1973), *Instrucţiuni privind studiile şi calculele necesare la proiectarea lucrărilor de combatere a eroziunii solului*, Redacţia Revistelor Agricole, Bucureşti.
21. Moţoc, M., Stănescu, P., Taloiescu, I., (1979), *Metode de estimare a eroziunii totale şi a eroziunii efluente pe bazine hidrografice mici*, ICPA, Bucureşti.
22. Moţoc, M., Sevastel, M., (2002). *Evaluarea factorilor care determină riscul eroziunii hidrice în suprafaţă*, Editura Bren, Bucureşti.
23. Păcurar, I., (2001), *Pedologie generală şi bonitarea terenurilor agricole*, Editura Academic Press, Cluj Napoca.
24. Renard K.G., Foster G.R., Weesies G.A., McCool D.K., Yoder D.C., (1997), *Predicting Soil Loss by Water: a Giude to Conservation Planning with the Revised Universal Soil Loss Equation (RUSLE)*, Handbook, vol 703, US Department of Agriculture, Washingtion DC.
25. Roşca Sanda, Rus, I., Petrea, D., (2012), *Using GIS tools in Niraj river fluvial morfodynamics*, in Revista de Geomorfologie,nr. 14, 89-95.
26. Smith, D.D., (1941), *Interpretation of soil conservation data for field use*. Agric. Eng. 22 (5). p. 173-175.
27. Spârchez, Ghe., (2009), *Cartarea şi bonitarea terenurilor agricole şi silvice*, Tipografia Universităţii, Braşov.
28. Ţârău, D., (2003), *Bazele teoretice şi practice ale bonitării şi evaluării terenurilor din perspectivă ecologică*, Editura Solness, Timişoara.
29. Ţârău, D., (2006), *Cartarea, bonitarea solurilor şi evaluarea terenurilor*, Ed. Eurobit, Timişoara.
30. Teaci, D., (1980), *Bonitarea terenurilor agricole*, Ed. Ceres, Bucureşti.
31. Teaci, D., (1989), *Concepte moderne pentru definirea şi determinarea capacităţii de producţie a terenurilor agricole prin modelare matematică şi matematico-euristice*, în Lucrările ştiinţifice S.N.R.S.S. România, nr. 26 B.
32. Zingg, A.W.,(1940), *Degree and length of land slope as it affects soil loss in runoff*. Agric. Eng. 21(2). p. 59-64.
33. Wischemeier, W., H., Smith, D.D., (1965), *Predicting rainfall-erosion looses from Cropland East of the Rocky Mountains. Guide for selection practices for soil land waterconservations,* US Department of Agriculture in cooperation with Purdue Agricultural Experiment Station, Agriculture Handbook No. 282, pp. 47. Zigg, R., W., 1940.
34. ***, (1987), Metodologia elaborării studiilor pedologice, Partea I, Partea II, Partea III, ICPA, Bucureşti.
35. ***, (2012), Local development plan of the Niraj Valley Microregion, available online at http://www.valeanirajului.ro/
36. ***, Decizia 598/13 august 2002 – *Metodologiei întocmirii studiilor pedologice si agrochimice, a Sistemului national si judetean de monitorizare sol-teren pentru agricultura*.

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# GEODEMOGRAPHIC RISKS WITHIN THE APUSENI MOUNTAINS

**GABRIELA-ALINA MUREŞAN**[1]

**ABSTRACT. – Geodemographic Risks within the Apuseni Mountains.** The territorial system of the Apuseni Mountains can be considered a critical region from a geodemographic viewpoint. At present, the system is characterised by severe geodemographic risks, which are due to two major processes, namely significant output of population who chooses to exit the system (massive emigration, mainly young and adult age groups) and high decrease in birth rate, due to emigration. These processes determine the main geodemographic risks in the area namely, on one hand, depopulation and *the geodemographic decline of the settlements* and, on the other, *the population ageing* process. The first of these two phenomena is studied within the Land of Moţi through an analysis done on two elements: population evolution between 1992 and 2011 and the geodemographic size of the settlements. The results show a decrease in the number of inhabitants in all the studied territorial-administrative units and in the majority of the settlements which make up these units. Meanwhile, there is an increase in the number of small villages (with less than 200 inhabitants) and especially of those with less than 50 inhabitants. Some of these are under risk of disappearing in the near future, if this downward trend will continue.

***Keywords:*** *geodemographic risk, emigration, depopulation, geodemographic decline, geodemographic potential.*

## 1. INTRODUCTION

The concept of *demographic risk* (as demographers call it) or *geodemographic risk* (as geographers call it) seems rather ambiguous and more difficult to define in comparison with the concept of *natural risk*. Starting from the present meanings of the concept of risk, T. Rotariu (2004) highlights that the initial sense — to be found in the dictionaries and that has a limited significance as it refers mainly to 'any human action which can harm its producer' (2004: 173) — is broader in everyday speech and in the scientific milieus. In the latter the term is not referring to a certain action but to a series of 'undefined actions and behaviours, which are difficult to be described and define in detail' (T. Rotariu, 2004: 174). The author considers that in both cases the concept of risk refers to the negative consequence a certain action or behaviour, of a person or of a group of people, might have. Therefore the above-mentioned author is of the opinion one can talk about demographic risk only if a process or phenomenon affecting the population has the type of consequences that can be considered 'dangerous', 'perilous', 'risky' for that

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population. But how can a consequence be labelled as dangerous, perilous, or risky? The author says one should find some objective and universal criteria based on which possible demographic evolutions might be assessed in their negative or positive consequences upon the society. As such criteria lack, T. Rotariu considers that there are two cases in which a consequence can be perceived as a risk for the population. These are: a) processes — significant in their dimension — which if prolonged in time can put in jeopardy the population's life; b) demographic processes and phenomena with consequences negatively affecting other areas of social life (where we can apply the above-mentioned labels of risk), for example economy (if a certain category of population emigrates, economy may be affected in a negative way). Considering all of the above, T. Rotariu (2004) enumerates and analyses three of the demographic risks which are frequently taken into account and mentioned in scientific papers or even in political discourses, namely the risk of over-population, the risk of sub-fertility and the risk of demographic ageing.

V. Surd (2001: 184) defines demographic risk as 'an extreme social process (phenomenon), dangerous for man and society at large'. The consequences of the demographic risks are not only economy and socially-related but, in extreme cases, they can be represented by the number of victims — as in the case of natural risks (V. Surd, 2001).

As there is the threat of over-population, V. Surd *et al.* (2007) also considers another risk — that of under-population — at least in the case of some territorial units, delineated on physical or political and administrative criteria. V. Surd (2001) adds on the list of demographic risks affecting a nation: the crime rate, the divorce rate, the unemployment rate, the rate of workplace accidents, the rate of workplace conflicts, infant mortality (an indicator which is very sensitive in showing indirectly the level of economic development), as well as the risk of feminisation (the latter referring strictly to the area of the Apuseni Mountains).

J. Benedek and E. Schulz (2003) associate the demographic risks to demographic transition and they perceive the following risks: the pronounced increase in population in less-developed countries; a pronounced increase in the young population share in less-developed countries and the process of demographic ageing, which mainly affects developed countries. The latter are also affected by another risk, namely by a process of medium and long-term decrease in population. This is due to a growing decrease in fertility, following the economic and social-cultural changes in those societies.

J. Benedek (2002) is of the opinion that demographic risks are also generated by massive and selective emigration (affecting the young and highly-educated segment of the population) in certain areas. This will lead to a negative change in the geodemographic structures and to a deterioration of public infrastructure and services, following the lowering of the demand threshold. Therefore there appears a tendency to functional mono-structuring, as these areas affected by emigration become predominantly agrarian or, at the most, spare land (J. Benedek, 2002).

T. Rotariu (2004) considers that talking about demographic risks means talking about probabilities. This means it is not enough to realize the consequences of the actions and behaviours and to issue value judgements upon them (if they are positive or negative); instead one should assess the probability of these consequences to be produced.

Integrating the concept of demographic risk in a pragmatic context applied to determined areas, Surd et al. (2007: 75) defines it as 'the incapacity of some numerically fluctuating communities of exploiting efficiently (in order to be self-sufficient) the area they control and which belongs to them. All in all they become supported and/or dependent communities. The direct, evident and quantifiable consequence of this lies in the rapid and massive migration of exodus type.' This will lead to the depopulation of the area and its geodemographic decline.

Such a process started in the Apuseni Mountains even from the second half of the 20th century and it consisted mainly in emigration. The other component of the geodemographic decline — the decrease in the fertility rate (sub-fertility) — was not active from the start; on the contrary, the geodemographic balance was re-established due to a higher rate of female fertility, if compared to the nearby territorial units (Mureş-Arieş river corridor, the Western Plain) (V. Surd *et al*, 2007). Only starting with the '80s and especially after the '90s the growth rate become negative and, along with emigration, it contributes to the geodemographic decline in the Apuseni Mountains.

The Apuseni Mountains can be perceived as a region experiencing a crisis, from a geodemographic viewpoint, as there are severe geodemographic risks. These result from two major processes: significant population output (massive emigration, affecting mainly young and adult population) and a dramatically reduction in birth rate, also as a consequence of emigration. These processes generate the main geodemographic risks in the Apuseni Mountains namely, on one hand, depopulation and ***the geodemographic decline of settlements*** and, on the other, a ***process of demographic ageing***.

These phenomena need to be carefully analysed, both overall and in detail — by analysing small territorial units which can make up patterns of evolution for the studied phenomena.

The area considered in the present paper and advanced as a pattern of geodemographic evolution, as reflecting the decline of population, focuses on the Land of Moţi as it was defined in the study *Ţara Moţilor. Studiu de geografie regională – The Land of Moţi. Study of Regional Geography* (C. N. Boţan, 2010). The Land of Moţi is defined based on geographical, economic, ethnographic, social, historical, mindset-related elements and occupies the central part of the Apuseni Mountains, namely the upstream area of Arieş River, being roughly delineated by the high ridges around it. It is altogether included in Alba County. The region includes two towns (Abrud and Câmpeni), the settlements which are part of them, and 14 communes with their belonging villages.

## 2. THE RISK OF DEPOPULATION. THE GEODEMOGRAPHIC DECLINE OF SETTLEMENTS

The Apuseni Mountains have registered an almost continuous increase in population until the mid 20th century (the 1941 Census marks the demographic peak in the region). Some areas even had population in excess and therefore some inhabitants migrated towards regions which registered a geodemographic deficit (Banat area, the Western Plain etc.) or to industrial towns (thus ensuring the workforce needed there) or even to other continents (U.S.A.) (I. Plăiaş, 1994, I. Bolovan, 1998, quoted by Magdalena

Drăgan, 2011). Nevertheless starting with the period 1940–1950, population started to diminish almost without a stop. The phenomenon intensified starting with the 1966 census and continued after 1990. Consequently in 2010 the population in the Apuseni Mountains counted three quarters less than the population in the 1956 census. The population loss during the period 1956–2010 was 28.7% (Magdalena Drăgan, 2011). Depopulation affects the entire mountainous area, rural areas being mostly affected and, out of these, the very small ones (some of them located up high in the mountains) counting under 50 inhabitants or even less. These are under risk of disappearing in the near future.

The population decrease was mainly due to *emigration*, at least until the '80s. Even starting from the beginning of the 20th century, the migration rate has been negative in the mountainous area. This has always been exceeded by the positive growth rate until the '50s, thus ensuring an increase in the number of inhabitants. During the period 1966–1980 the phenomenon of emigration (affecting the people living in the mountains) increased as living became more difficult in the area. The productivity potential of the land is low, the climate is harsher and therefore agriculture has less favourable conditions. Emigration was also stimulated by the lack of public facilities and transport infrastructure. The pull factor was represented by the forced process of industrialisation in towns (located in the region or those at the periphery of the mountains) and by the process of collectivisation, which affected the depressions located on the fringe of the mountains (Magdalena Drăgan, 2011). Starting with 1980, and more after 1990, *the growth rate* has been negative and, along with the migratory rate, determined a continuous and obvious decrease in the number of inhabitants.

After the analyses made on the regional system of the Apuseni Mountains the conclusion was that the rhythm of the depopulation process is more intense in the high mountain area (over 800m in height), which is perceived by the young population as a hostile environment. Other areas characterised by intense depopulation are those where mining activities were affected by the industrial restructuring processes.

The Land of Moți, the area studied for this paper, is characterised by a geodemographic evolution similar to that of the Apuseni Mountains. Between 1850 and 1941 there was an increase in the number of inhabitants (with a short period of significant decrease during 1910–1920 due to the human losses in the First World War), while the 1941–2011 period is characterised by a continuous decrease in the number of inhabitants (C.N. Boţan, 2010). The evolution of the number of inhabitants varies in the urban areas as compared to the rural ones. Thus the two towns of the studied region experienced a positive geodemographic evolution until 1992 (with some fluctuations in the case of Abrud during 1850–1956); afterwards a negative trend followed in the context of a generalised economic decline. In rural areas the demographic decline started in 1941 (1941 Census) and has continued to this day (C.N. Boţan, 2010).

Depopulation within the mountainous area is analysed using two indicators: *the total number of inhabitants over time* and *the geodemographic size of the settlements*.

The analysis of ***the total number of inhabitants*** at territorial unit level focused on the period 1992–2011. Our aim was to highlight the tendencies which marked the last two decades and the present situation. We used the statistical data from the last three censuses (1992, 2002 and 2011).

The Land of Moţi registered 50,033 inhabitants at the 1992 Census; 31,101 (31.2%) of these lived in urban areas and the rest (68.8%), totalling 34,426 inhabitants, in rural areas. The region registered a decrease in population (by 9.3%) until 2002, reaching 45,376 inhabitants; 14,275 of these (31.5%) lived in urban areas and 31,101 (68.5%) in rural areas. As it can be seen, urban population rate increased slightly during this period (even though absolute figures show a decrease in population) emphasising a more severe geodemographic decline in the rural areas of the region. It is indeed true that the two types of areas (urban and rural) had different evolutions. Urban areas, represented by two towns, Abrud and Câmpeni, are characterised by 8.5% decrease in population number, slightly more pronounced in Câmpeni (9%) as compared to Abrud (7.9%), as the latter is still defined by its industrial activities.

Rural areas are characterised by 9.7% decrease between 1992 and 2002, yet some communes were affected more than others by the geodemographic decline. Thus four communes (out of 14) lost more than 15% of their total number of inhabitants: Vidra (-19.6%), Avram Iancu (-15.9%), Scărişoara (-15.4%) and Bucium (-15.3%). Other four communes registered reductions between -10.1% and -15% and five communes registered smaller declines (under -10%). Nevertheless, in 2002 Horea commune registered a positive evolution as its number of inhabitants increased, even if just by 1.5%.

There were 39,055 inhabitants in the Land of Moţi in 2011, marking a decrease (of about 14%) in the number of inhabitants as compared to 2002, more pronounced than in the previous period. The decrease in population was severe both in urban areas (13.9%) and in rural ones (14%). As compared to the 1992–2002 period, the more pronounced decrease in the urban areas was mainly due to the fact that Abrud town lost some of its inhabitants (-18.1%) once the mines closed down and people emigrated.

12,293 (31.5%) people lived in towns and 26,762 (68.5%) in the rural areas. As one can see, the shares are approximately the same as the ones in 2002, which emphasises a more pronounced decline in urban areas, as compared to the previous period. This can be explained by a more pronounced geodemographic decline in Abrud after 2006 and not by an attenuation of the geodemographic decline within rural areas.

When referring to territorial-administrative units, all communes and towns in the analysed area registered reductions in the number of inhabitants between the last two censuses (fig. 1). Câmpeni town lost 10.6% of its geodemographic potential registered in 2002. Both reductions (in the case of Abrud and in the case of Câmpeni town) are higher during 2002—2011 as compared to the previous period.

In rural areas the territorial-administrative units with mining activities experienced the greatest reductions in population once the mines were closed down and population emigrated. We can mention here Roşia Montană commune, which reduced the number of its inhabitants by more than a quarter (31.4%) out of the 2002 total. It is followed by Bucium commune, with 18.9% decrease. Sohodol commune lost a great deal, namely -17.1%. Other seven communes registered losses between -10% and -15%: Vidra -13.9%, Vadu Moţilor -13.5%, Poiana Vadului -12.7%, Ciuruleasa -12.5%, Avram Iancu -12.3%, Bistra -10.4% and Scărişoara -10.2% (some of these communes being located in the high mountainous area). The other communes (Horea, Arieşeni, Gârda de Sus, and Albac) registered smaller declines in the number of inhabitants, under 10%.

When comparing the two time intervals (1992–2002 and 2002–2011), one can notice that the number of inhabitants in the Land of Moţi did not have uniform and constant evolution.

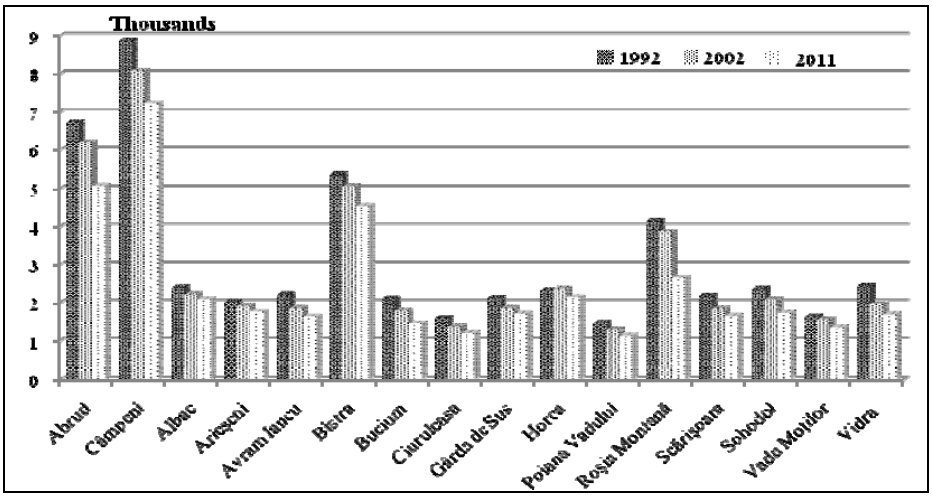


**Fig. 1.** Population evolution in the Land of Moţi between 1992 and 2011.

Some of the territorial-administrative units registered more pronounced reductions in the first period, due to the high numbers registered in emigration; afterwards the phenomenon reduced its intensity: Vidra (-19.6% during 1992–2002 as compared to -13.9% during 2002–2011); Scărişoara (-15.4% in the first period and -10.2% in the second). On the contrary, other communes experienced a pronounced decline after 2002, related in part to the industrial activities and their decline: Roşia Montană (-31.4% during 2002–2011 as compared to -6.6% during 1992–2002), Bucium (-18.9% as compared to -15.3%), Vadu Moţilor (-13.5% as compared to -4.7%), Sohodol (-17.1% in 2002–2011 as compared to -12.1% in the previous period); not to talk about Horea commune, characterised by positive figures in the first period and then by negative ones (1.5% in 1992–2002 and -9.6% during 2002–2011). Overall the process of reduction in population number was more pronounced after 2002, as we have already stated.

If we focus on the period 1992–2011 — the entire period analysed — and the whole region, we can conclude the following (table 1):

- all the analysed territorial-administrative units experienced a reduction in the number of inhabitants; the Land of Moţi as a whole registered a decline by 21.9% (from 50,033 inhabitants in 1992 to 39,055 in 2011); the decrease was pronounced both in urban areas (-21.2%) and in the rural ones (-22.3%);
- the high decrease in urban areas was mainly due to the fact that Abrud town lost a significant number of inhabitants (-24.5%) following the restructuring of industrial activities;
- there are six communes in the rural areas which registered a decrease by more than a quarter in population numbers as compared to the 1992–2002 period (fig. 2);
- the most pronounced decrease was registered by Roşia Montană (-35.9%) and Bucium (-31.3%) following the closing of the mines and the massive layoffs. Other four communes follow, with shares lower than -25%: Vidra (-30.8%), Sohodol (-27.1%), Avram Iancu (-26.2%) and Ciuruleasa (-25.1%);

- the smallest decrease was registered in the communes which lie in the northern part of the Land of Moți, as they have tourism potential; thus tourism activities have kept the population at work in the area: Horea (-8.3%), Arieșeni (-12.5%), Albac (-13.1%) and even Bistra (-15.3%).

**Table 1**

**Population evolution in the Land of Moți during the period 1992–2011**

| No. | Settlement / Year | 1992 | 2002 | 2011 | Decrease in 1992–2011 |
|---|---|---|---|---|---|
| 1 | Abrud | 6729 | 6195 | 5072 | 24.6 |
| 2 | Câmpeni | 8878 | 8080 | 7221 | 18.7 |
| | **Urban areas** | **15607** | **14275** | **12293** | **21.2** |
| 3 | Albac | 2403 | 2220 | 2089 | 13.1 |
| 4 | Arieșeni | 2017 | 1921 | 1765 | 12.5 |
| 5 | Avram Iancu | 2217 | 1865 | 1636 | 26.2 |
| 6 | Bistra | 5361 | 5066 | 4540 | 15.3 |
| 7 | Bucium | 2115 | 1792 | 1454 | 31.3 |
| 8 | Ciuruleasa | 1599 | 1368 | 1197 | 25.1 |
| 9 | Gârda de Sus | 2130 | 1865 | 1714 | 19.5 |
| 10 | Horea | 2336 | 2371 | 2143 | 8.3 |
| 11 | Poiana Vadului | 1466 | 1304 | 1139 | 22.3 |
| 12 | Roșia Montană | 4146 | 3872 | 2656 | 35.9 |
| 13 | Scărișoara | 2187 | 1850 | 1661 | 24.1 |
| 14 | Sohodol | 2371 | 2085 | 1729 | 27.1 |
| 15 | Vadu Moților | 1634 | 1558 | 1348 | 17.5 |
| 16 | Vidra | 2444 | 1964 | 1691 | 30.8 |
| | **Rural areas** | **34426** | **31101** | **26762** | **22.3** |
| | **Total** | **50033** | **45376** | **39055** | **21.9** |

The analysis went further to examine individual settlements in order to have certain geodemographic features in detail. We focused on two years, 1992 and 2011, by considering the data from the 1992 census and the 2011 census, respectively. We analysed urban and rural settlements separately (296 settlements are part of the rural areas, while 26 belong to urban areas, totalling 322 settlements).

When we consider the two towns and the belonging settlements, we can conclude that there were both moderate decreases in the number of inhabitants (no more than 30% in 10 settlements) and more pronounced reductions (30-50% for 13 settlements), while three villages belonging to Câmpeni town registered even a slight increase in the number of inhabitants.

When we consider the 296 rural settlements, most of them (93%, 275 settlements) registered a decrease in the number of inhabitants. Only two settlements stagnated (their increase was 0%) and 19 settlements (6.4%) registered an increase in the number of population. The interval of decrease is very large, yet the major part of the settlements experienced a moderate decrease. Thus, approximately half of the villages (135, or 49%) registered a reduction between 0 and -30%; 88 villages (32%) registered reductions between -30 and -50%, while 52 settlements (19%) registered the most pronounced reductions: between -50 and -100%. In the case of three settlements the losses were 100% between 1992 and 2011: Medrești (Sohodol commune) lost its 6 inhabitants from 1992; the village of Bordeștii Poieni (Vidra commune) had 12 inhabitants in 1992 and none in 2011 and Poieni village (Vidra commune) is registered with no population at all even since the 2002 Census, losing its previous 15 inhabitants. Other examples of pronounced reduction in

the number of inhabitants are: Joldișești (Sohodol commune) counts only 11% out of the 1992 population (there were 18 inhabitants in 1992 and 2 in 2011); Bunta village (Roșia Montană commune) with 14.6% (it decreased from 41 to 6 inhabitants); in Corna village (Roșia Montană commune) the population in 2012 represented slightly less than 40% of the total number of inhabitants in 1992 (the number decreased from 358 to 138 inhabitants); in the village of Roșia Montană (Roșia Montană commune) the population in 2011 represented less than half of the population in 1992, namely 39.7% (from 1,556 inhabitants in 1992 to 618 in 2011) etc.

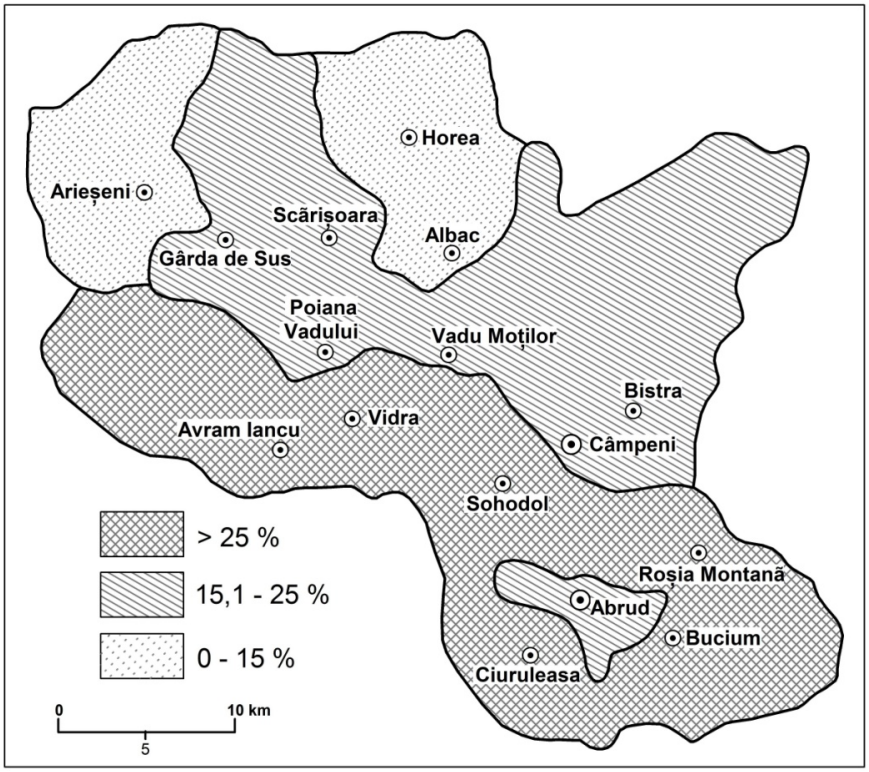


**Fig. 2.** Population evolution in the Land of Moți during the period 1992–2011.

Depopulation and the geodemographic decline of the settlements have unfavourable consequences also on their geodemographic potential. The decline is emphasised by the growing number of very small villages. The Apuseni Mountains are characterised by many villages with a small ***number of inhabitants***; there are many very small villages, with less than 200 inhabitants; the major part of the villages have less than 50 inhabitants; the number of villages with few inhabitants grows proportionally to altitude. If we focus on the Land of Moți, in 2011 there were 275 rural settlements (almost 93%), out of a total of 296, with less than 200 inhabitants. The following cases are relevant in this sense: all 30

villages of Bucium commune count less than 200 inhabitants and all 39 villages included in Vidra commune are very small villages. Moreover, out of the 275 very small villages, almost half of them (45%, 133 settlements) count less than 50 inhabitants; 18 villages, out of the 30 villages part of Bucium commune, count less than 50 inhabitants; 23 villages, out of the 39 of Vidra, count less than 50 inhabitants and two of them have no inhabitants at all; in Avram Iancu commune 32 villages, out of the total 33, count under 200 inhabitants and 24 count under 50 inhabitants. The settlements with less than 50 inhabitants form a category of settlements under the most significant demographic risk, as they are affected the most by geodemographic ageing, following the emigration of the young and adult population. Therefore these settlements are the most vulnerable and under threat of disappearing — their disappearance is sure to happen in the future (P. Cocean, 2004, C. N. Boţan, 2008).

We want to emphasise the fact that the number of these very small villages grew in time, during two decades, between the two censuses of 1992 and 2011, respectively. In 1992 there were 296 rural settlements and 261 (88%) were very small villages; they totalled 275 (93%) in 2011. If we focus on villages with less than 50 inhabitants, their number grew from 84 (28%) in 1992 to 133 (45%) in 2011.

The Land of Moţi is not the only area experiencing such reductions in the number of inhabitants as other settlements in the Apuseni Mountains are in the same situation: Mogoş commune (Alba County) has 17 villages (out of the total 21) with less than 50 inhabitants; Ceru-Băcăinţi commune (Alba County) has 9 villages (out of 10) with less than 50 inhabitants and Râmeţ commune (Alba County) has 9 settlements (out of 13) with less than 50 inhabitants.

All of the above show the critical state the regional system of the Apuseni Mountains is at in geodemographic terms. In the near future the risk for this area of the Apuseni Mountains is to have rural settlements with no population at all.

## 3. CONCLUSIONS

Depopulation and the geodemographic decline in the Apuseni Mountains augmented in the last 20 years. Even though the present study presents only a pattern of geodemographic evolution, which characterises the Land of Moţi, it emphasises certain geodemographic features and it shows the trend of the whole territorial system. The tendency after 1992 has been a continuous decrease in the number of inhabitants and it was more than half a century ago that this trend started. The population decline increased after 2002, as it was amplified by the restructuring processes within the mining activities. These affected many rural and urban settlements (Abrud town, Roşia Montană and Bucium communes). The communes which are made up of many very small villages were much affected as they do not have a minimum of public facilities and because of adverse climatic conditions they lost the major part of their inhabitants (Vidra and Avram Iancu communes).

These centrifugal geodemographical tendencies must be integrated within the general transitional period, they must be linked to the closing up of the mines and the end of industrial activities within the Apuseni Mountains. All these determined high unemployment rates, a decrease in income and therefore in living standards.

At present, the geodemographical decline is the one factor which has the highest negative effect on the functionality of the whole territorial system of the Apuseni Mountains (C. N. Boţan, 2010).

## REFERENCES


1. Benedek J. (2002), *Riscurile umane*, Riscuri şi Catastrofe, vol. I, ed. Victor Sorocovschi, Casa Cărţii de Ştiinţă, Cluj-Napoca, p. 43-54.
2. Benedek J., Schulz Ed. (2003), *Riscurile în contextul tranziţiei demografice şi epidemiologice*, Riscuri şi Catastrofe, vol. II, ed. Victor Sorocovschi, Casa Cărţii de Ştiinţă, Cluj-Napoca, p. 210-223.
3. Boţan C. N. (2010), *Ţara Moţilor. Studiu de geografie regională*, Edit. Presa Universitară Clujeană, 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. Drăgan Magdalena (2011), *Rezilienţa sistemului regional Munţii Apuseni*, teză de doctorat, Facultatea de Geografie, Universitatea „Babeş – Bolyai", Cluj-Napoca.
6. Nicoară, L. (2004), *Mutaţii structurale ale populaţiei pe grupe de vârstă şi riscurile asociate*, Riscuri şi Catastrofe, no. 1, ed. Victor Sorocovschi, Casa Cărţii de Ştiinţă, p. 173-189.
7. Nicoară L. (1999), *Geografia populaţiei*, Edit. „Focul Viu", Cluj-Napoca.
8. Plăiaş, I. (1994), *Agricultura montană ↔ Societate. Un necesar contract posibil. Munţii Apuseni*, Edit. Libris, Cluj-Napoca.
9. Pop Gr. P. (1995), *The Bobâlna Valley. A Model of Geodemographic Evolution*, Studia UBB, Geographia, XL, 1-2, p. 123-134.
10. Pop Gr. P. (1998), *Model de involuţie rurală. Satul Calna, judeţul Cluj*, Studia UBB, Geographia, XLIII, 1, p. 49-60.
11. Pop Gr. P. (2006), *Două sate din judeţul Cluj – Mănăstireni şi Mănăşturu Românesc – evoluţie geodemografică în perioada 1850-2002*, Studia UBB, Geographia, LI, 2, p. 93-110.
12. Pop Gr. P., Benedek J. (1996), *Satele mici din România şi specificul activităţii lor*, Studia Universitatis Babeş-Bolyai, Geographia, XLI, 1-2, p. 119-138.
13. Rotariu, T. (2004), *Riscuri demografice*, Riscuri şi Catastrofe, no. I, ed. Victor Sorocovschi, Casa Cărţii de Ştiinţă, p. 173-189.
14. Surd V. (2004), *Geodemografie*, Edit. Presa Universitară Clujeană, Cluj-Napoca.
15. Surd V., Zotic V., Puiu V., Moldovan C. (2007), *Riscul demografic în Munţii Apuseni*, Edit. Presa Universitară Clujeană, Cluj-Napoca.
16. * * (1994), *Recensământul populaţiei şi locuinţelor din 7 ianuarie 1992, vol. I. Populaţie-Structura demografică*, Comisia Naţională pentru Statistică, Bucureşti.
17. * * (2004), *Recensământul populaţiei şi al locuinţelor 2002*, *vol. I. Populaţie-Structura demografică*, Institutul Naţional de Statistică, Bucureşti.
18. *http://www.alba.insse.ro/cmsalba/rw/pages/index.ro.do;jsessionid=7a94a59dcd8e359822824b439db0815da6788083eec0fa07cbd444560f9ef365.e34Ma3mNaNaTb40Lbh8Te0*.

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# GIS TECHNIQUES FOR ASSESSING THE LINK BETWEEN HUMAN ACCESSIBILITY AND TERRITORIAL DISTRIBUTION OF THE POPULATION IN HUNEDOARA COUNTY

**R. COSTACHE[1], C. POPESCU[2], A. ŞTEFAN[3]**

**ABSTRACT. – GIS Techniques for Assessing the Link between Human Accessibility and Territorial Distribution of the Population in Hunedoara County.** The accessibility of an area has a very important role in the territorial distribution of the population in an area. In the present study, in order to determine the human accessibility index, some physical-geographical factors were taken into account. A link between accessibility and population density was established, based on data and maps obtained using GIS techniques. These links match or differentiate, depending on the area of analysis.

***Keywords:*** *Hunedoara, accessibility, territorial-administrative units, population, road.*

## 1. INTRODUCTION

Studying the human accessibility of a given territory represents an important part, especially in determining the territorial planning, so that it can be efficiently employed by human society. Scientific papers in Romania have approached urban accessibility in terms of routes compared with building density. Serious imbalances were observed referring to the fast development of residential areas in contrast with an underdeveloped road network, such as Pipera neighborhood in Voluntari city (Costache and Tudose, 2012). Other subjects are related only to the general layout of transport routes and corridors, for a maximal efficiency of space (Cârjan and Ghiţuleasa, 2011). Internationally, issues referring to human accessibility of geographic environment were studied by Lincoln and Friedland (1978), Selivestrova (2006), Kadri Semm and Hannes Palang (2010). The present study aims to analyze the relationship between human accessibility and population density in Hunedoara County. To determine human accessibility, physical and geographical factors such as altitude, slope, river density and temperature were taken into account. Temperature represents an essential factor for a person (it is important for humans to avoid extreme temperatures). From a social and economic point of view, the density of road network was considered an essential factor, being very important in determining human accessibility in a given area (Jakimavicius and Burinskiene, 2007).

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## 2. STUDY AREA

Hunedoara County is in central-western Romania (fig. 1) in the Western Development Region. It has an area of 7063 square kilometers (Ghinea, 2000) and a population of 396,253 people in 2011 (INS, 2011). However, the population is unevenly distributed within the county, due to the presence of favorable and restrictive factors, depending on area. These factors, as we mentioned in the introduction, refer to: altitude, slope, river network density, climatic conditions, in particular temperature, and density of the road network as a socio-economic factor.

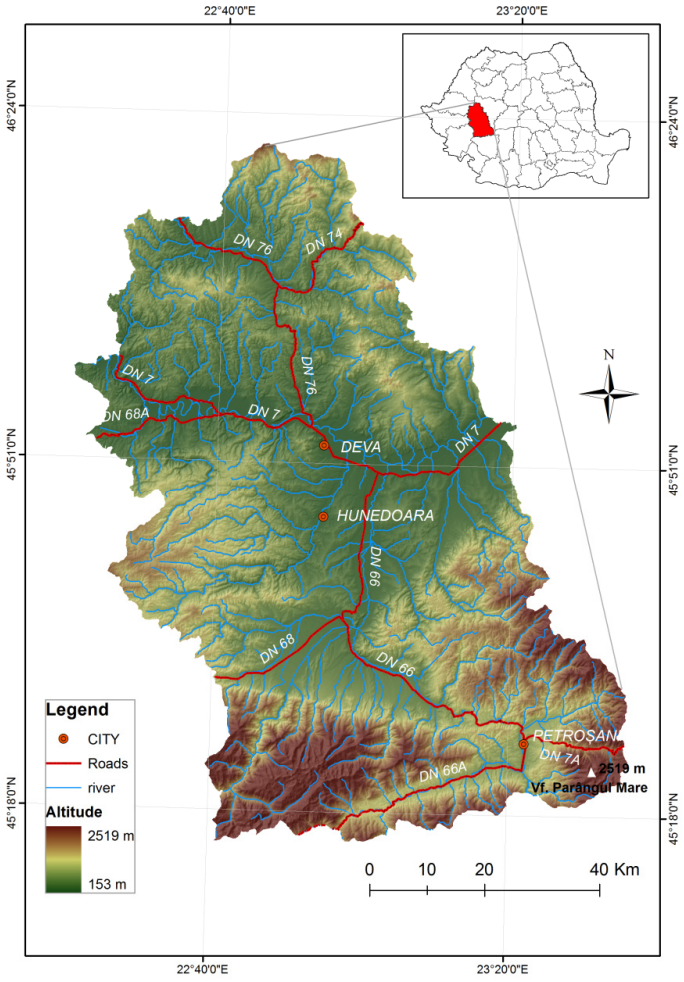


**Fig. 1.** Location of Hunedoara County in Romania

The landscape is mostly mountainous (68% of the county), having an altitude generally between 153 m, in Vărădia Depression corresponding to Mureș Valley, and 2519 m (fig. 1) in Parângul Mare Peak, located in the Southern Carpathians, Parâng Group (Ghinea,

2000). The higher the altitudes are, the lower the accessibility is. Regarding the slope of the relief, it is clear that there is an inverse correlation between slope and accessibility. The morphology of Hunedoara records slopes between 0 and 68 degrees. The lowest values occur in Vărădia, Ilia and Bulza depressions and Deva and Vântului Corridors, while slopes over 45 degrees appear in crystalline mountain areas of Parâng and Retezat (Roşu, 1980). Fragmentation with high values appears as a favorable factor for human accessibility in a given territory. In Hunedoara case, high values of this morphometric parameter of over 3 km / km$^2$ occur along major river junction nodes (Mureş, Strei, Cerna, Crişul Alb, Jiul de Est and Jiul de Vest). In these areas, the highest values of population density are recorded (Erdeli and Dumitrache, 2010).

Average multiannual temperature in Hunedoara registered important variations, because of altitudinal heterogeneity. Thus, the highest average multiannual temperature of 10.16 degrees Celsius (Clima României, 2008), was registered in Vărădia Depression along the Mureş River, while negative temperatures below -2.5 degrees Celsius (fig. 2, c) occur on the highest peaks of the Southern Carpathians. In socio-economic terms, human accessibility in Hunedoara is facilitated by the presence of a high length of road network. The most important roads that cross the county are: DN 7 with connection between Deva and Arad, DN 66 with connection between Deva, Hunedoara and Petroşani and continued with DN 76 connecting between Deva, Alba-Iulia and Cluj-Napoca (fig. 1).

At a first sight, depression and valley areas should be those with a high population density, while mountain areas should register low values. In this respect, the link between human accessibility and human density will be analyzed, based on current data.

## 3. METHODOLOGY

In order to determine the human accessibility of the areas in Hunedoara County and to compare it with the degree of occupation of these areas, in the first phase, the Human Accessibility Index (HAI) was proposed, calculated and spatialized using a proper methodology. This index was obtained in the GIS environment by integrating two kinds of factors: physical-geographical and socio-economic. The physical-geographical factors are: relief altitude, slope, fragmentation density of the relief and multiannual average temperature (fig. 2). The determination and spatial distribution of the factors was based on the Digital Terrain Model, with a resolution of 30 meters, obtained from the interpolation of contours vectors from the 1:50000 Topographic Map of Romania (geospatial.org). Using these factors, human accessibility was obtained from a physical-geographical point of view. To build the HAI using physical-geography factors, raster data were introduced and reclassified in ArcGis 9.3 program corresponding to mean annual temperature, terrain altitude, slope and fragmentation density. According to the reclassification process, each factor received evaluation notes from 1 to 5 depending on how it affects accessibility values. The first class of evaluation designates areas with a very low potential of accessibility, while the fifth class shows the most accessible areas in the study area. Reclassification factors in GIS environment and evaluation marks were done depending on the standard deviation values corresponding to the spread of values for each of them.

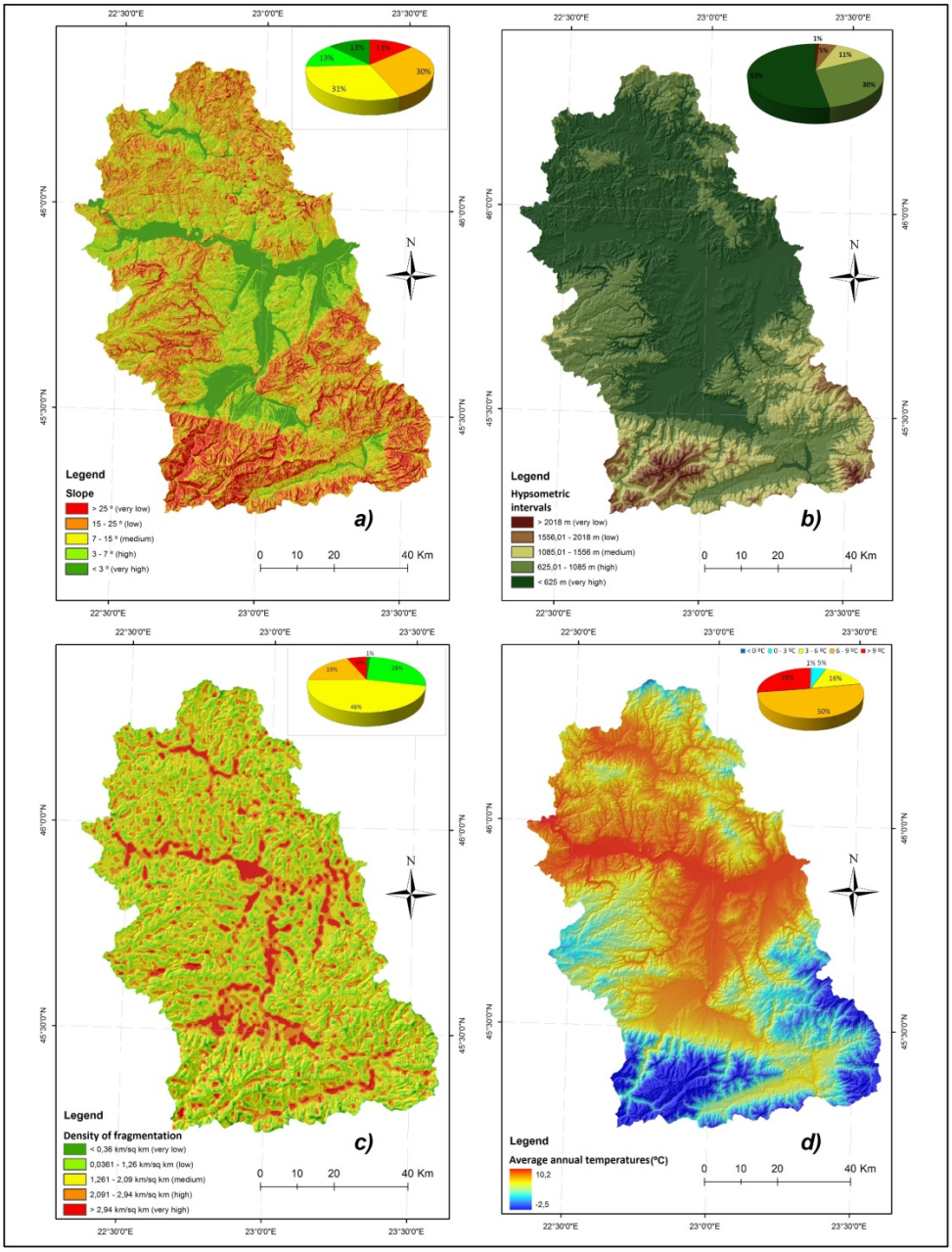


**Fig. 2.** Physical-geographical factors used to determine HAI in Hunedoara:
a) Slope, b) Altitude, c) Density of fragmentation, d) Average annual temperatures

The road accessibility index values were also grouped into five classes, from 1 to 5 (table 1), to be integrated in the calculation to obtain the final index of human accessibility.

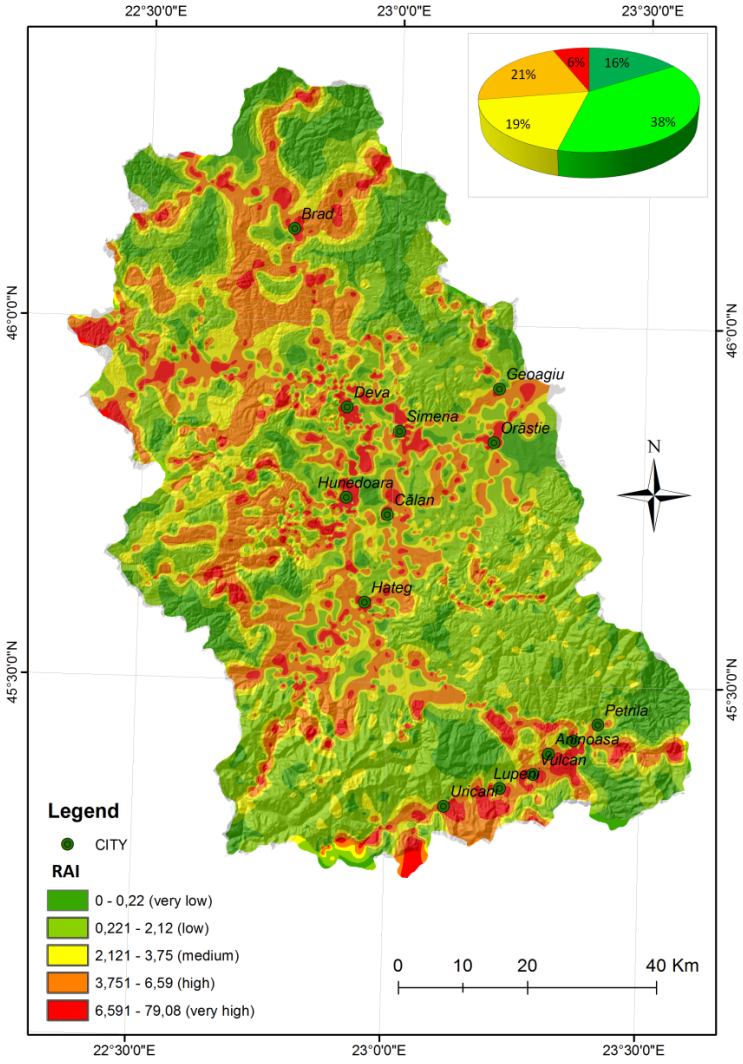


**Fig. 3.** Road accessibility index (RAI)

RAI (fig. 3) received a share of 60% in the final index, while the other four physical-geographical factors represented each 10% (table 1). The shares were set as such, because it is considered that the favorable factor represented by a road is more important and can compensate unfavorable characteristics of the geographical environment such as high altitudes, in terms of accessibility in an area.

The densities were obtained using data from the National Statistics Institute, in order to compare the obtained values with those of the HAI.

**Table 1.**

**Classification of physical-geographical and socio-economic parameters for obtaining human accessibility index**

| Parameters | | | | | |
|---|---|---|---|---|---|
| *Altitude(m)(10%)* | > 2018 | 1556.01 - 2018 | 1085.01 - 1556 | 625 - 1085 | < 625 |
| *Slope$^{o}$(10%)* | > 25 | 15 - 25 | 7 - 15 | 3 - 7 | < 3 |
| *Temperature ($^{o}$C) (10%)* | -2.5 - 0 | 0 - 3 | 3 - 6 | 6 - 9 | 9 – 10.2 |
| *Density of fragmentation (km/km$^2$) (10%)* | < 0.36 | 0.361 – 1.26 | 1.261 – 2.09 | 2.091 – 2.94 | > 2.94 |
| *Road Accessibility index(RAI) (60%)* | 0 - 0.22 | 0.221 - 2.12 | 2.121 - 3.75 | 3.751 - 6.59 | 6.591 - 79.08 |
| *Score given* | 1 (very low) | 2 (low) | 3 (medium) | 4 (high) | 5 (very high) |
| *Human Acceaibility Index (HAI)* | < 18 | 18 -26 | 26.01 - 34 | 34.01 – 42 | .> 42 |

## 4 RESULTS AND DISCUSSION

Due to applying the methodology described above, the Human Accessibility Index (HAI) was determined and spatialized for Hunedoara County with values ranging from 10 to 50 (fig. 4).

Values over 42 of HAI (fig. 4) indicate an area with a very high degree of favorability for housing and human activities. This kind of areas represent 8% of the county area and are located along the valleys, such as the Jiu Valley, Strei Valley, Mureş Valley, areas transited by important roads (E79, E68, or Şoimuş-Simeria motorway). Also, inhabited perimeters of cities in Hunedoara, such as Deva, the capital of the county, are included here. This city is located in an area with a very high accessibility due to flat terrain, the presence of Mureş River and favorable climatic conditions (approximately 600 mm / year and average annual temperatures of 8-10°C) (Ghinea, 2000). The population density is very high, over 915 people / km$^2$ (fig. 6). Similar situations are found in Hunedoara (532 people / km$^2$), Haţeg or Brad. Other factors favor high densities, besides accessibility. Jiu Valley cities have high densities as a result of coal reserves, while in Brad due to the presence of silver and gold reserves and coal.

Areas with high accessibility (HAI = 34.01 to 42) represent 23% of Hunedoara County and are located in depressions and river valleys, but also in the river valleys of the foothills and mountainous areas (Râul Mare Valley, Orăştie Valley, Geoagiu Valley), where the terrain is slightly sloped and natural resources can support human activities. Major roads pass through these areas, such as DN 68 and DN 74. There are some areas where, although accessibility is high, the population density is below the county average (56 inhabitants / km$^2$), namely southern Depression Haţeg (Sântămăria-Orlea, Bretea Română), Crişul Alb Valley (fig. 6). Lands in those areas are either covered with pastures and hayfields, or were cultivated with cereals and other crops.

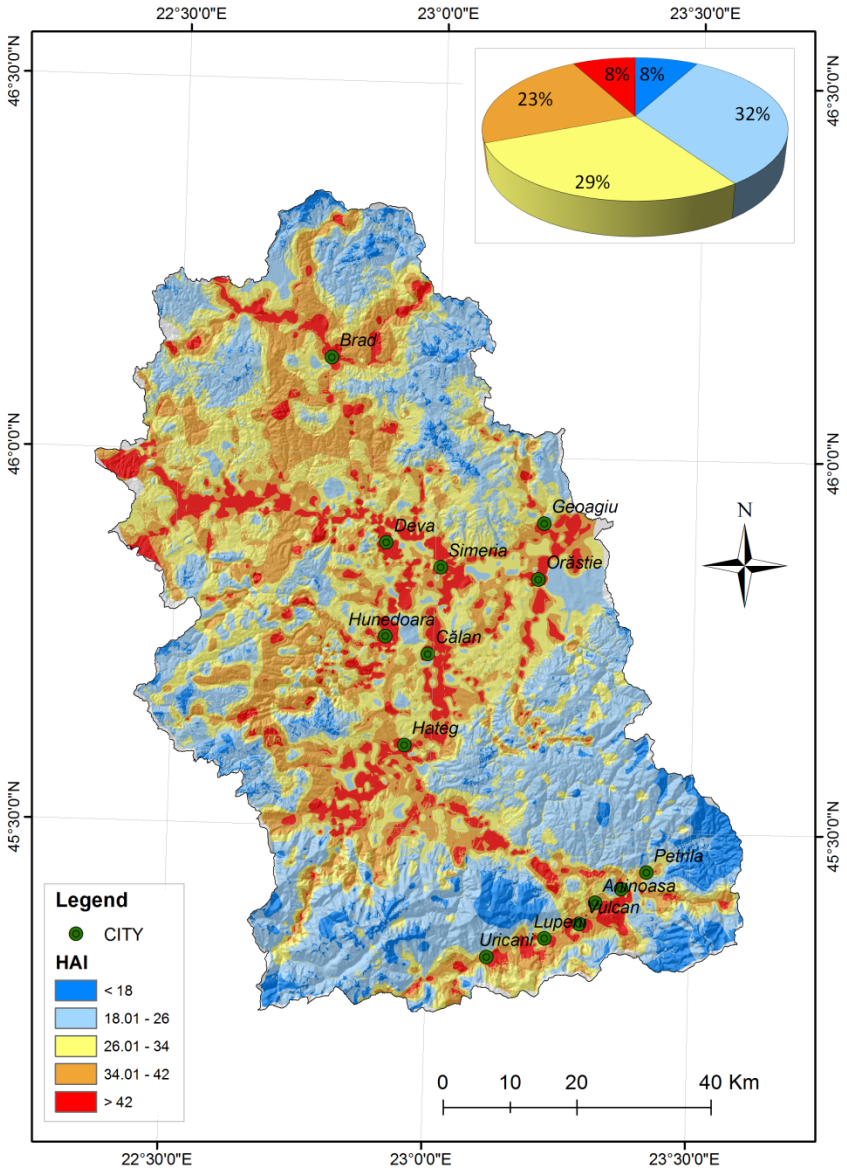


**Fig. 4.** Distribution of human accessibility index (HAI) in Hunedoara County

In areas with average accessibility (HAI = 26.01 to 34), approximately 29% of the county area, population density is average and low (Metaliferi Mountains, Poiana Ruscăi Mountains, hills in the center of Hunedoara). In those areas, water resources are limited due to low discharge or because villages are located far from the rivers.

The rest of the areas with low (32% of the county) and very low accessibility (8% of Hunedoara), represented on the map with blue and dark blue register values less than 10 inhabitants / km$^2$, or even less than 1 inhabitant per square kilometer in mountain areas, where altitudes exceed 1500 meters, relief is almost inaccessible and the terrain is rugged. The forest roads are the only way of accessing those areas (Vâlcan Mountains, Metaliferi Mountains, Şureanu Mountains). The only settlements are very small villages with scattered houses (Harţăgani, Guguiata).

Fig. 5 represents the distribution of average accessibility index of the administrative units. These include the built-up perimeters of villages, where theoretically the location is accessible, but also the periphery zones with a less accessible terrain.

Toteşti village has the highest value of the HAI per administrative territorial unit (fig. 5), because it lies along the Râu Mare River, near a lake (Păclişa) in Haţeg Depression, where the terrain is horizontal, is transited by a national road and population density is between 50 and 100 inhabitants / km$^2$ (fig. 5). So, there is a similarity between accessibility and density.

In territorial administrative units of Deva, Călan, Hunedoara, Haţeg, the average index of human accessibility shows values between 35 and 40. These values are high (fig. 5), due to the location of cities near rivers, major routes and with densities of over 100 inhabitants / km$^2$. Again, we have a correlation between accessibility and density. Besides favorable accessibility factors, the causes that led to high densities in those areas are the vertical arrangement of buildings, the rural migration and migration of people from other parts of the country in these cities until 1989 due to the economic (mainly industrial) attraction.

Although they registered a low score in terms of accessibility, Petrila and Petroşani cities are populated as a result of coal resources that are required for human activities (Ghinea, 2000). This has helped the cities develop. Thus, in a relatively small space, buildings with vertical development led to a high population density, especially until 1989. In this case we have an imbalance in terms of accessibility and population density index.

Villages with average densities and medium index values (30-35) are Şoimuş, Hărău or Sântămăria-Orlea (fig. 5). These territorial administrative units include flat favorable areas and less accessible areas with slopes.

Municipalities with a low average index value of accessibility and small densities are Bătrâna, Bunila or Lunca Cernii de Jos located in Poiana Ruscăi Mountains or Bulzeştii de Sus in Apuseni (fig. 5).

In villages there are inconsistencies in terms of accessibility index and population density. Thus, Balta, Baru or Luncoiu de Sus have a small accessibility index and very small densities (under 10 inhabitants / km$^2$), while Bucuresci shows a very low index and a small population density. Lupeni and Vulcan cities have densities over 100 inhabitans / km$^2$, although they have an average accessibility according to the index.

At county level, the average accessibility index is 37.08. This means that Hunedoara is relatively accessible. However, population density is not high, with only 56.1 inhabitants / km$^2$ in 2011 (INS 2011). Cities from Jiu Valley present large discrepancies between population density and the average index of accessibility. So, the terrain is not the only cause influencing an area to be populated. In addition, other factors are natural resources, economic attractiveness, the birth rate of population. Also, in urban areas population density is high, even if the accessibility index is smaller.

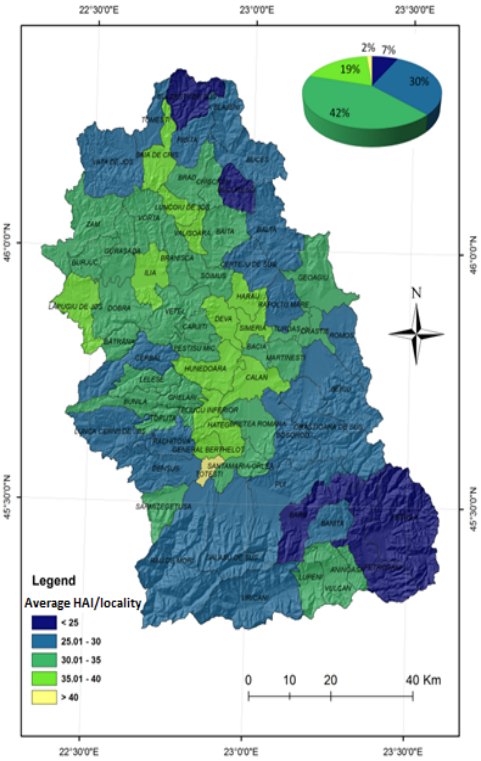


**Fig. 5.** Average human accessibility index of territorial administrative units

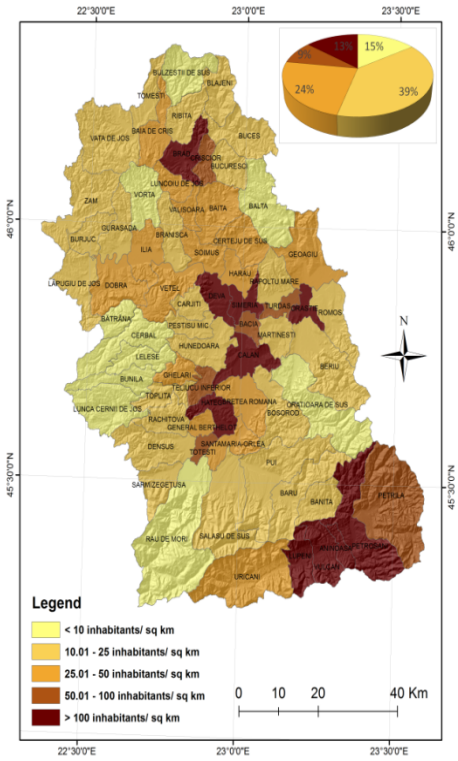


**Fig.6.** Average population density of territorial administrative units

## 5. CONCLUSIONS

The study aims to present a link between the accessibility of a land and the population density. The accessibility index was obtained using certain factors such as roads, temperature, fragmentation density, slope and altitude. Thus, in low areas such as valleys and depressions, HAI is high. However, population density is high only in some portions of these areas, such as cities. Areas with low accessibility are either foothills or mountains. The population density is very low due to the high slopes. In cities like Petrila and Petroşani the density exceeds 100 inhabitants / km$^2$ but the index of these administrative units is low. In the future the average index of accessibility is expected to grow because infrastructure becomes more diverse, but population will decrease because of the low birth rate, migration and economic transition.

## REFERENCES


1. Cârjan, Anca-Andreea, Ghiţuleasa L.G. (2011) *Compararea eficienţei rutelor şi coridoarelor de transport - Model de calcul statistico-matematic*, Revista Română de Statistică nr. 2 / 2011, Academia de Studii Economice, Bucureşti.
2. Ciulache, S., Ionac, Nicoleta (1998) *Climatologie comportamentală*, Editura Universităţii din Bucureşti, 117 p + 44 fig; ISBN 973-575-275-1.
3. Costache, R., Tudose, I., (2012). *Pipera Neighbourhood -Voluntari City.Problems regarding inconsistency between the residential dynamic and the street network evolution between 2002 and 2011*. Cinq Continents 2(6): 201-215 [Available online]| URL: *http://www.cinqcontinents.uv.ro/2/2_6_Costache2.pdf.*
4. Erdeli G., Dumitrache Liliana, (2010), Geografia populaţiei, Edit. Universitară, Bucureşti.
5. Ghinea, D., (2000), Enciclopedia Geografică a României, Editura Enciclopedică, Bucureşti.
6. Jakimavičius, M., Burinskienė, M. (2007), *Automobile Transport System Analysis and Ranking in Lithuanian Administrative Regions*, Transport – 2007, Vol XXII, No 3, 214–220.
7. Jobe, R.T., White, P.S. (2009), *A new cost-distance model for human accessibility and an evaluation of accessibility bias in permanent vegetation plots in Great Smoky Mountains National Park, USA*, Journal of Vegetation Science 20: 1099–1109.
8. Kadri S., Hannes P., (2010), *Landscape Accessibility: Spaces for Accessibility or Spaces for Communication?*, Living Rev. Landscape Res., 4.
9. Lincoln J. R., Friedland R. (1978), *Metropolitan accessibility and socioeconomic differetiation in Nonmetropolitan Areas*, Social Forces, vol. 57, 2.
10. Roşu A. (1980), *Geografia Fizică a României*, Edit. Didactică şi Pedagogică, Bucureşti.
11. Selivwatrova, I.V. (2006), *The Influence of the Territorial Factor on the Accessibility of Preschool Education*, Russian Education and Society, vol. 47, no. 6, June 2006, pp. 27–43.
12. *** (2008), *Clima României*, Administraţia Naţională de Meteorologie, Editura Academiei Române, Bucureşti.
13. *** Harta Topografică a României 1:50000
14. *** Institutul Naţional de Statistică (2011), *http://www.hunedoara.insse.ro/main.php?id=456*

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# THE THERMAL REGIME IN CRIŞUL NEGRU DRAINAGE BASIN

**V. GALIŞ**[1]

**ABSTRACT. – The Thermal Regime in Crişul Negru Drainage Basin.** The paper presents the main features of the thermal regime in Crişul Negru drainage basin on the basis of meteorological data recorded at 10 stations distributed across the basin. After the statistical processing of the data, according to the methodology specific for climatology, it was found that the thermal regime is influenced by the movement of air masses and by landforms, as evidenced by the processed values for each parameter that characterizes it.

***Keywords:*** *thermal regime, Crişul Negru drainage basin.*

## 1. INTRODUCTION

Several features are present, according to altitude, slope, aspect and so on, generating a mountain climate characterized by a decrease in air temperature together with an increasing altitude (due to the heat loss through terrestrial radiation that is greater than insolation), through the different heating of the slopes (northern slopes are cooler than the southern ones) etc. (Gaceu, 2005). The air temperature is one of the most important elements of climate that presents space and time changes as a result of the interaction between the climatic factors. It varies greatly both close to the ground and in the atmosphere, influencing the distribution of other climate elements. Besides, the thermal criterion is used in all weather and climate assessments as it defines the climatic zones, the types of air masses, the atmospheric fronts, the air temperature being a limiting factor in the distribution of the living world on Earth (Cristea, 2004).

## 2. HISTORY OF RESEARCH

Up to present no complex and complete climatic study has been conducted on Crişul Negru drainage basin (Măhăra *et al*, 1999; Moza, 2009), so there is only information about the study of wider areas. Among these we mention the doctoral theses published by: Cristea (2004) who marks the climate risks in Criş basin and mentions certain climatic elements, including temperature, all analyzed using data from several weather stations in Crişul Negru drainage basin; Gaceu (2005) who analyzes a period of 40 years and refers to climate and climate risks in Vlădeasa and Bihor Mountains, including the thermal regime, a more detailed and highly parameterized analysis but which focuses less on our study area

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(with the weather stations at Stâna de Vale and Ştei); Şerban (2010) who, in a detailed analysis, refers to climate hazards in the Western Plain North of Mureş and reveals aspects concerning air temperature at Salonta, Holod, Chişineu Criş and Ineu stations.

Climatic aspects concerning the thermal regime in Crişul Negru drainage basin were presented in other articles (Măhăra & Linc, 1993; Gaceu, 1997; Dragotă & Gaceu, 2002, 2004; Gaceu, 2004; Gaceu, 2009). Some references to Crişul Negru drainage basin climate appear in the works of Gaceu *et al* (2002, 2003), Măhăra *et al* (1999), Bogdan & Niculescu (1999).

## 3. DATA AND METHODOLOGY

Crişul Negru drainage basin covers all landforms (plains, hills, mountains), an aspect considered when selecting the weather stations for a better measurement of air temperature characteristics. Thus, we chose 10 meteorological stations (fig. 1) distributed as follows: Vlădeasa (1836 m), Stâna de Vale (1108 m), Zece Hotare (642 m) and Moneasa (703 m) for the mountain area, Dumbrăviţa de Codru (586 m) and Ştei (278 m) for the hilly area, Holod (163 m), Salonta (95 m), Chişineu Criş (96 m) and Ineu (110 m). Unfortunately, the climate analysis was more difficult due to the lack of homogeneity of the data, the stations being set up in different stages, before 1970 (1959 – Ştei, 1961 – Vlădeasa 1800, 1962 – Chişineu Criş, 1967 - Holod), during the 1970s (1975 – Moneasa, 1979 – Stâna de Vale and Ineu), the 1980s (1983 – Dumbrăviţa de Codru and Salonta), after 2000 (Zece Hotare, Moneasa, Salonta, Ineu), which is why we used data from the 1978-2007 period, for 30 years , thus respecting the climate research methodology.

A process started in Romania in the 2000s to dispense with the weather stations due to the question of the automation and computerization of the National Meteorological system. Therefore, the data of 4 out of the 10 stations in Crişul Negru basin (Zece Hotare, Moneasa, Salonta, Ineu) is 7 years short, but the remaining 6 stations (Vlădeasa 1800, Stâna de Vale, Ştei, Dumbrăviţa de Codru, Holod, Chişineu Criş) have continuous data for 30 years so they are representative according to the WMO norms and are uniformly distributed across the studied basin (Kostin & Pokrovskaia, 1964; Belozerov & Fărcaş, 1971; Arlery *et. al*, 1973; Marin, 1986; Fărcaş, 1988; Bogdan & Niculescu, 1999; Gaceu, 2002).

Thus, we tried to conduct a comparative analysis as objective as possible, which is why we used pure data, without interfering with statistical processing which can sometimes drift away from the factual reality, a goal accomplished due to the existence of six meteorological stations with complete data for 30 years.

## 4. RESULTS AND DEBATES

### *4.1. The annual average temperature*

The meteorological observation data analyzed for the 1961-2010 period or for certain stations (table 1), indicates a territorial distribution of the annual average air temperature, with distinct features due to the inhomogeneity of Crişul Negru drainage basin. Overall, the average annual values of the air temperature present a setting given by the vertical thermal gradient of 0.5-0.7$^0$C/100 m and highlight the climatic profile based on the thermal environments of the 10 weather stations located in the drainage basin.

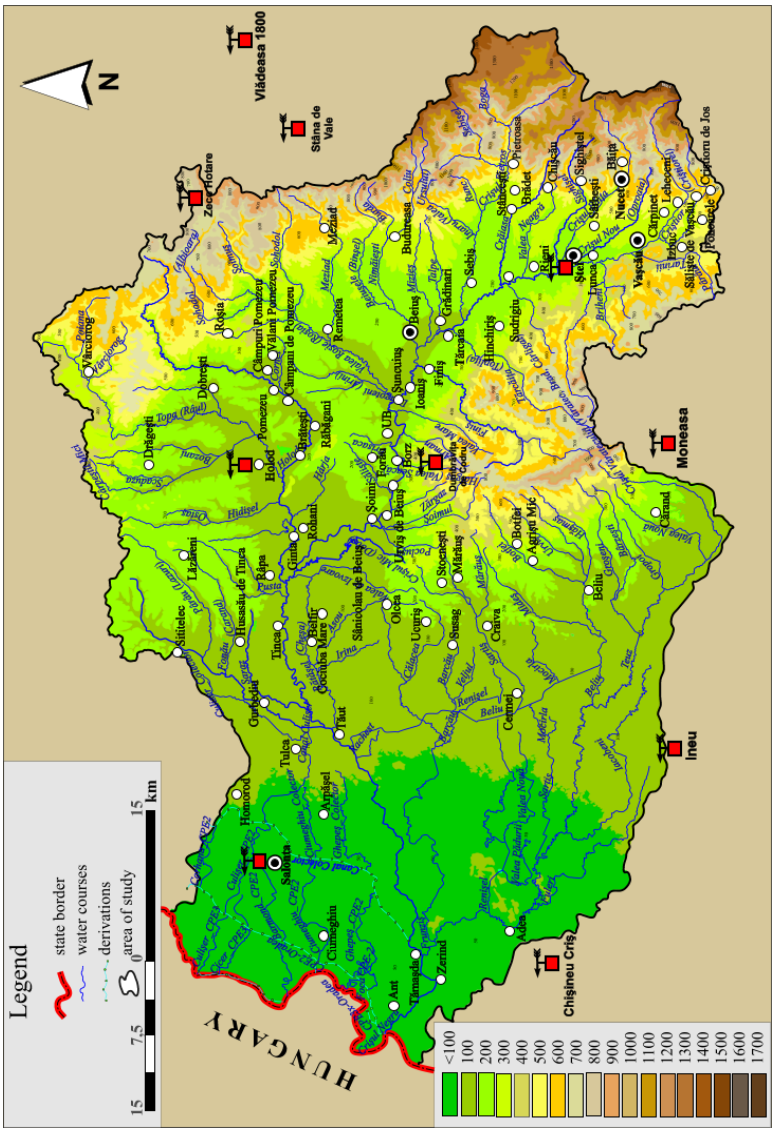


**Fig. 1.** The location of the meteorological stations in Crişul Negru drainage basin.

The air temperature is relatively evenly distributed in the plain, ranging between 10.2$^0$C at Chişineu Criş, 10.3$^0$C at Salonta, 10.4$^0$C at Holod and 10.6$^0$C at Ineu. Less significant differences occur in the hills and depressions, respectively 9.2$^0$C at Ştei and 9.6$^0$C at Dumbrăviţa de Codru. In the mountains differences are clearer: 8.2$^0$C at Zece Hotare, 7.9$^0$C at Moneasa, 4.1$^0$C at Stâna de Vale and 1.1$^0$C at Vlădeasa which represent the highest point in Crişul Negru drainage basin (fig. 2, table 1).

**Table 1.**

**The annual average temperature in Crişul Negru drainage basin**

| Station | Alt. (m) | Period | The multiannual average temperature ($^0$C) |
|---|---|---|---|
| Vlădeasa 1800 | 1836 | 1961-2010 | 1.1 |
| Stâna de Vale | 1108 | 1979-2010 | 4.1 |
| Moneasa | 703 | 1978-1997 | 7.9 |
| Zece Hotare | 642 | 1988-1997 | 8.2 |
| Dumbrăviţa de Codru | 586 | 1983-2010 | 9.6 |
| Ştei | 278 | 1961-2010 | 9.2 |
| Holod | 163 | 1978-2010 | 10.4 |
| Ineu | 110 | 1979-1997 | 10.6 |
| Chişineu Criş | 96 | 1962-2010 | 10.2 |
| Salonta | 95 | 1983-1997 | 10.3 |

Source: Data from the A.N.M. Archives

Indeed, these values are representative for the areas where the platforms of the mentioned weather stations are located, but the local slopes with different aspects recorded significant thermal differences as some are more shaded and cooler while others are sunnier and warmer.

*4.1.1. The deviations of the annual average temperature from the multiannual average*

The average temperature is the "norm" or the average calculated over several years, but this value can vary from year to year and thus we calculated the value and the direction of these deviations for each year using the Hellman criterion (table 2).

Therefore, we calculated the average annual temperature deviations from the annual average for the 10 stations in Crişul Negru drainage basin. According to this criterion, most of the years are normal from the point of view of temperature and have a frequency between 60 % and 75 % (table 3). As the altitude increases, the frequency of these normal years decreases from 69.4% recorded at the Chişineu Criş station located in the plain area, to 60 % at Vlădeasa, which indicates the situation on the highest point of Crişul Negru drainage basin (table 3).

**Table 2.**

**The thermal character of the months and years according to the Hellman criterion**

| Average monthly deviation (%) | Average annual deviation (%) | Remarks |
|---|---|---|
| >10.0 | > 5.0 | excessively rainy |
| 5.1 ÷ 10.0 | 2.1 ÷ 5.0 | very rainy |
| 2.1 ÷ 5.0 | 1.1 ÷ 2.0 | rainy |
| 1.1 ÷ 2.0 | 0.6 ÷ 1.0 | moderately rainy |
| -1.0 ÷ 1.0 | -0.5 ÷ 0.5 | normal |
| -2.0 ÷ -1.1 | -1.0 ÷ -0.6 | moderately dry |
| -5.0 ÷ -2.1 | -2.0 ÷ -1.1 | dry |
| -10.0 ÷ -5.1 | -5.0 ÷ -2.1 | very dry |
| <-10.0 | < -5.0 | excessively dry |

Source: Bogdan & Niculescu (1999); Gaceu (2002; 2005).

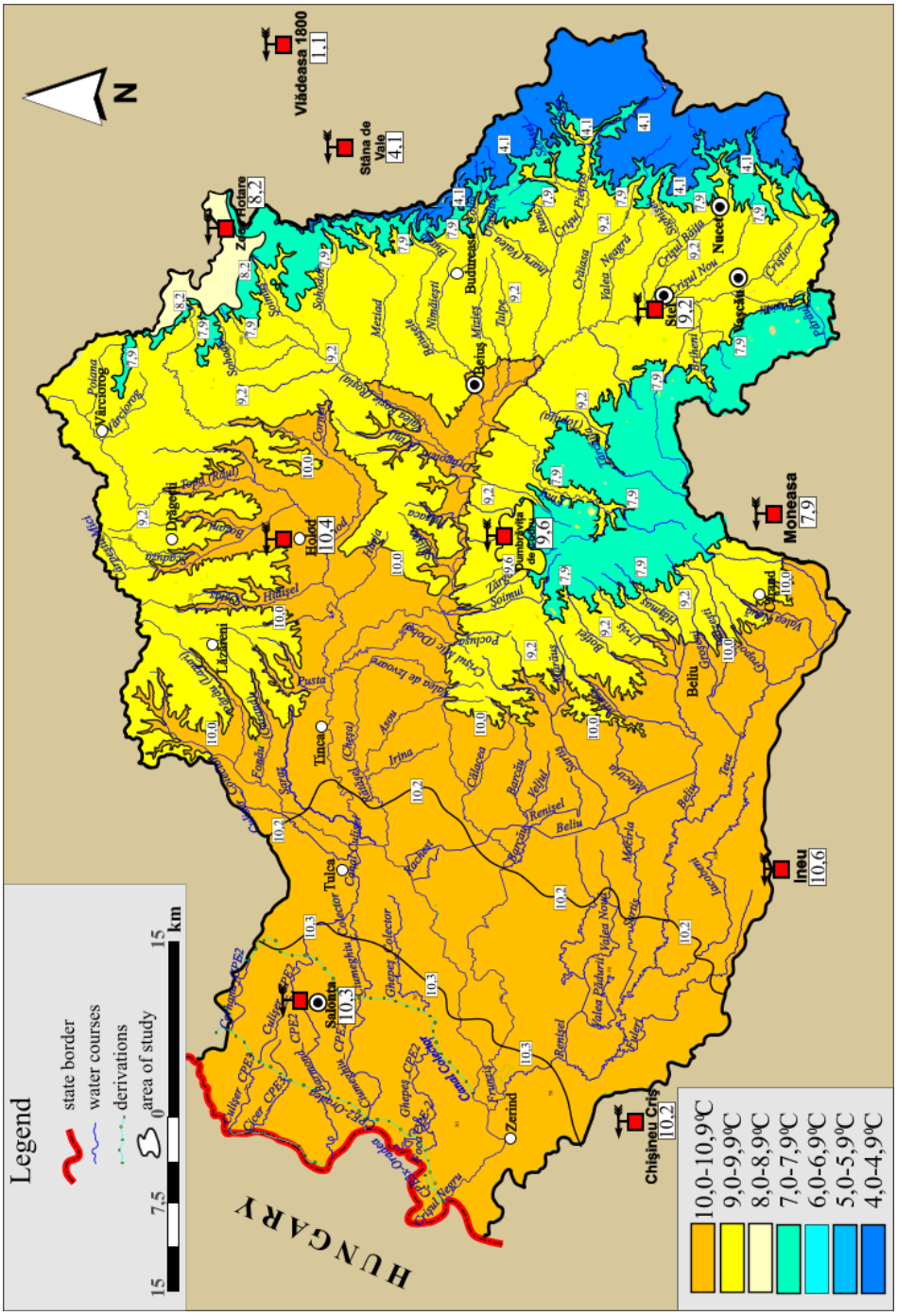


**Fig. 2.** The distribution of the annual average temperature in Crişul Negru drainage basin.

**Table 3.**

**The thermal character of the years in Crişul Negru drainage basin, according to the Hellman criterion**

| Station (Period) | | Vlădeasa 1800 (1961-2010) 50 years | Stâna de Vale (1979-2010) 32 years | Moneasa (1978-1997) 20 years | Zece Hotare (1988-1997) 10 years | Dumbrăviţa de Codru (1983-2010) 28 years | Ştei (1961-2010) 50 years | Holod (1978-2010) 43 years | Ineu (1979-1997) 19 years | Chişineu Criş (1962-2010) 49 years | Salonta (1983-1997) 20 years | Total years | The average frequency in the basin (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alt. (m) | | 1836 | 1108 | 703 | 642 | 586 | 278 | 163 | 110 | 96 | 95 | | |
| Excessively Rainy | Y | - | - | - | - | - | - | - | - | 4 | - | 4 | 1.2 |
| | F | - | - | - | - | - | - | - | - | 8.2 | - | | |
| Very Rainy | Y | 5 | 3 | 1 | 1 | 5 | 2 | 5 | 1 | 2 | 2 | 27 | 8.4 |
| | F | 10.0 | 12.5 | 5.0 | 10.0 | 18.5 | 4.0 | 11.6 | 5.3 | 4.1 | 10.0 | | |
| Rainy | Y | 5 | - | 2 | - | 1 | 2 | 2 | 1 | 2 | - | 15 | 4.7 |
| | F | 10.0 | - | 10.0 | - | 3.7 | 4.0 | 4,7 | 5,3 | 4.1 | - | | |
| Moderately Rainy | Y | 30 | 23 | 15 | 7 | 16 | 37 | 28 | 13 | 34 | 16 | 219 | 68.2 |
| | F | 60.0 | 71.9 | 75.0 | 70.0 | 59.3 | 74.0 | 65.1 | 68.4 | 69.4 | 80.0 | | |
| Normal | Y | 9 | 5 | 1 | 1 | 5 | 6 | 5 | 3 | 3 | 2 | 40 | 12.5 |
| | F | 18.0 | 15.6 | 5.0 | 10.0 | 18.5 | 12.0 | 11.6 | 15.8 | 6.1 | 10.0 | | |
| Moderately Dry | Y | 1 | 1 | 1 | 1 | 1 | 3 | 3 | 1 | 1 | - | 13 | 4.1 |
| | F | 2.0 | 3.1 | 5.0 | 10.0 | 3.7 | 6.0 | 7.0 | 5.3 | 2.0 | - | | |
| Dry | Y | - | - | - | - | - | - | - | - | 3 | - | 3 | 0.9 |
| | F | - | - | - | - | - | - | - | - | 6.1 | - | | |

Y=Years
F=Frecv.%

Source: Data from the A.N.M. Archives.

The *cool years* have frequencies between 5 and 10% at Moneasa and Zece Hotare (in medium mountains) and 18% at Vlădeasa (on the highest peaks of the basin) and the moderately dry years are less frequent, with frequency values between 0% at Salonta, Zece Hotare, Stâna de Vale and 10% at Moneasa and Vlădeasa (table 3).

The *dry* years have an even lower frequency, between 4-5% at Ştei and Moneasa and 12.5% at Stâna de Vale, being closer to that of the cold years which occur in 2-3% at Vlădeasa and Stâna de Vale and in 10% of the cases at Dumbrăviţa de Codru (table 3).

In conclusion, table 2 shows that both at the meteorological stations and the level of Crişul Negru drainage basin *the normal years predominate (69.1 %), followed by cool ones, while the cold and warm years are rare and the very cold, the very warm, the excessively cold and the excessively warm years rarely occur. Moreover, the analysis shows that excessively warm years (1994, 2000, 2002, 2010) and the very cold ones (1978 , 1980, 1985) are specific to the area of the plains, while in the hills and mountains there were no dangerous years in terms of heat (very warm, excessively warm , very cold or excessively cold years), due to the geographic location of Crişul Negru drainage basin against the oceanic air masses and the altitude that acts as a thermal moderator*, a situation emphasized by Gaceu

(1997, 2004, 2005) for the lowland, hilly and mountainous area and by Şerban (2010) for the plain areas, even though those studies analyzed a shorter period by 10 years, respectively 8 years.

### *4.2. The monthly average of the temperature*

#### *4.2.1. Changes in air temperature throughout the year*

The air temperature registered throughout the year can be analyzed based on monthly averages which indicate a summer maximum in July and a winter minimum in January, while the largest variations occur in the transition seasons, namely during March-April and September-October (table 4).

**Table 4.**

**Monthly and annual average temperature and the annual thermal average amplitude**

| Station | | Vlădeasa 1800 (1961-2010) 50 yrs. | Stâna de Vale (1979-2010) 32 yrs. | Moneasa (1978-1997) 20 yrs. | Zece Hotare (1988-1997) 10 yrs. | Dumbrăviţa de Codru (1983-2010) 28 yrs. | Ştei (1961-2010) 50 yrs. | Holod (1978-2010) 43 yrs. | Ineu (1979-1997) 19 yrs. | Chişineu Criş (1962-2010) 49 yrs. | Salonta (1983-1997) 20 yrs. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Alt. (m) | | 1836 | 1108 | 703 | 642 | 586 | 278 | 163 | 110 | 96 | 95 |
| Month | **I** | **-7.2** | **-5.0** | **-2.1** | **-1.2** | **-0.7** | **-1.1** | **-0.9** | **-1.0** | **-1.4** | **-0.9** |
| | II | -7.0 | -4.8 | -1.0 | -0.3 | -0.1 | 0.4 | 1.0 | 0.7 | -0.1 | 0.1 |
| | III | -4.6 | -1.3 | 3.4 | 3.0 | 4.0 | 5.0 | 5.4 | 5.7 | 5.2 | 5.0 |
| | IV | -0.4 | 3.0 | 7.6 | 7.6 | 9.6 | 9.6 | 10.6 | 10.7 | 10.3 | 10.8 |
| | V | 4.8 | 8.8 | 12.8 | 12.7 | 13.7 | 14.8 | 16.1 | 16.4 | 16.1 | 16.4 |
| | VI | 7.8 | 12.0 | 15.1 | 15.9 | 17.3 | 17.7 | 18.9 | 19.2 | 19.1 | 19.0 |
| | **VII** | 9.6 | **13.7** | **16.9** | **18.5** | **20.1** | **19.3** | **20.6** | **21.0** | **20.9** | **21.5** |
| | VIII | **9.7** | 13.0 | 16.4 | 18.3 | 20.0 | 19.1 | 20.1 | 20.7 | 20.4 | 20.9 |
| | IX | 6.2 | 9.0 | 12.3 | 13.0 | 15.2 | 15.1 | 15.6 | 16.3 | 15.9 | 16.0 |
| | X | 2.7 | 4.8 | 9.0 | 8.6 | 10.5 | 10.2 | 10.6 | 10.7 | 10.3 | 10.4 |
| | XI | -2.1 | -0.2 | 2.9 | 3.0 | 4.5 | 4.7 | 5.5 | 5.0 | 4.3 | 4.5 |
| | XII | -5.7 | -3.3 | 0.3 | -0.7 | 0.6 | 1.1 | 0.7 | 1.4 | 0.8 | 0.4 |
| Annual average | | **1.1** | 4.1 | 7.9 | 8.2 | 9.6 | 9.7 | 10.4 | **10.6** | 10.2 | 10.3 |
| Annual amplitude | | **16.9** | 18.7 | 19.0 | 19.7 | 20.8 | 20.4 | 21.8 | 22.0 | 22.3 | **22.4** |

Source: Data from the A.N.M. Archives.

Following the evolution of the monthly average temperatures over the year, we can observe that they have values between -7.2$^0$C at Vlădeasa in January, on the highest point of Crişul Negru drainage basin and 21.5$^0$C at Salonta in July, hence the thermal vertical amplitude of 28.7$^0$C (table 4).

In *January* (fig. 3, table 4) the monthly average temperatures are negative throughout the basin. The lowest value of -7.2$^0$C is recorded on the highest peak at Vlădeasa station (1836 m) and the highest value of -0.7$^0$C at Dumbrăviţa de Codru (586 m) that is at medium altitudes, not at lower ones, as it would be expected. There are three explanations for this situation:

a) Thermal inversions occur frequently during this month and the inversion layer of cooler air is located below the altitude of Dumbrăviţa de Codru station (586 m) (Gaceu, 2005);
b) During winter, in January, the condensation of the stratiform clouds, current in this time of the year, is located at the level of Dumbrăviţa de Codru station. The condensation of the water vapors is done releasing heat, which increases the temperature;

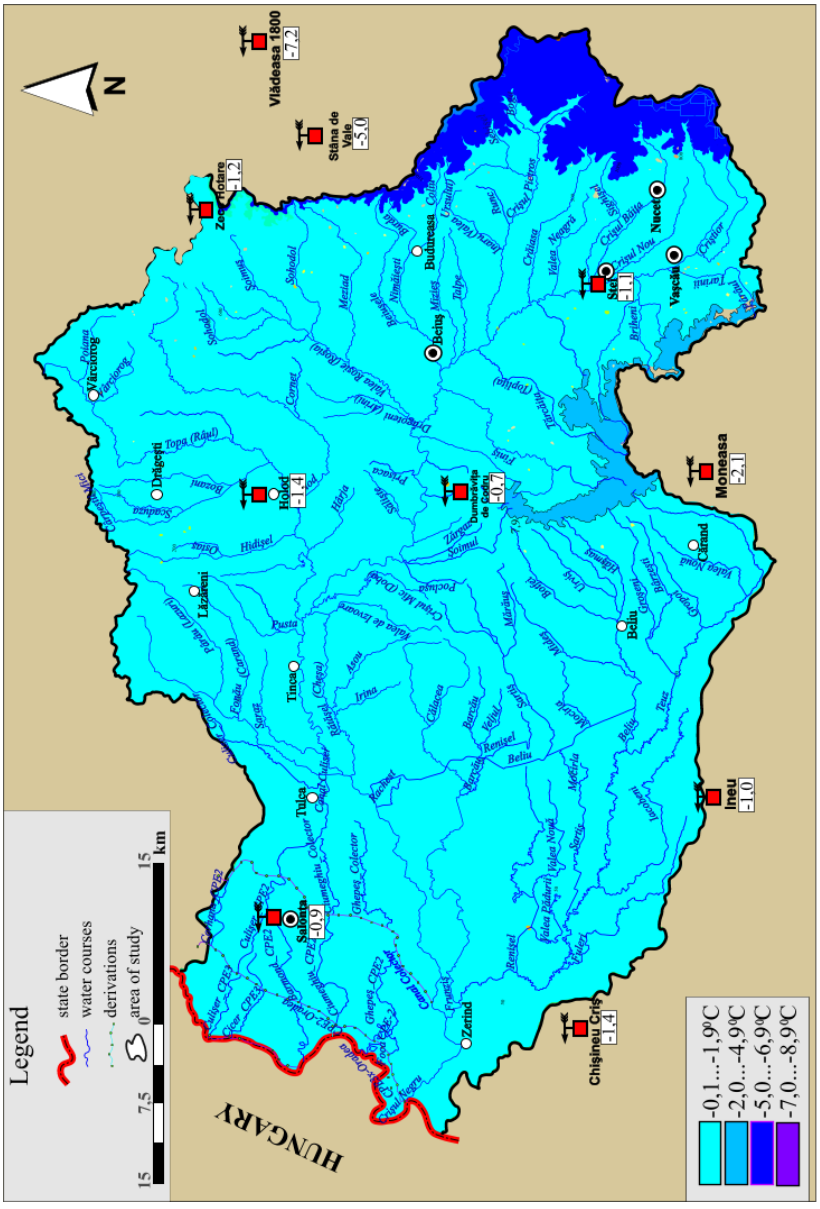


**Fig. 3.** The distribution of the average temperature during January in Crişul Negru drainage basin.

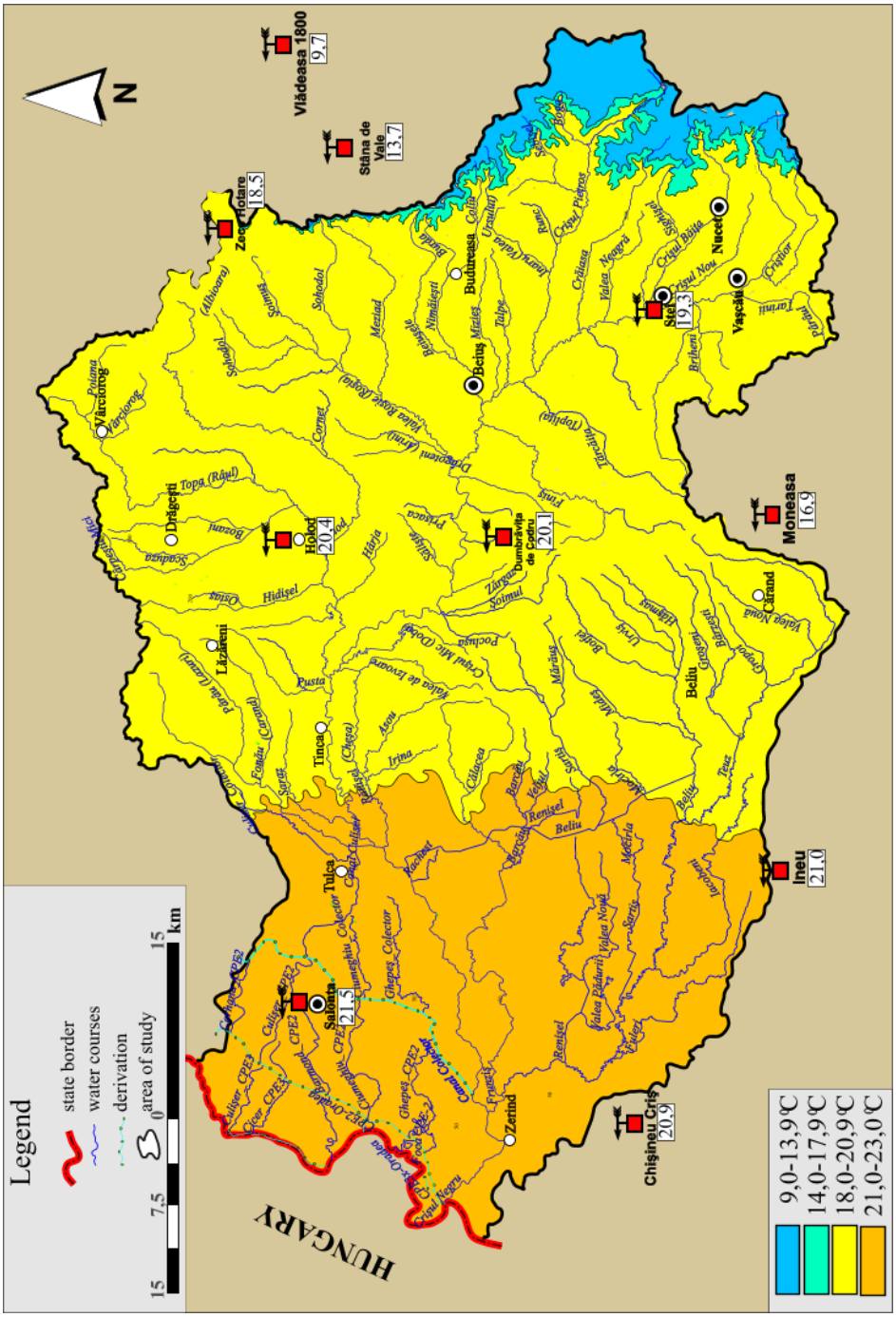


**Fig. 4.** The distribution of the average temperature during July in Crişul Negru drainage basin.

c) The meteorological station Dumbrăviţa de Codru is located "under the wind", in the way of the air masses that forward mainly from the southwest, so there is a process of drying caused by the downward movement of air in the station area (Măhăra & Linc, 1993; Măhăra *et al*, 1999).

In *February*, the average monthly temperature begins to rise and becomes positive at all stations below 250 m, and in March the temperature becomes positive up to 1000 m. In April only the highest peaks of the basin still have negative temperatures, while the rest of the territory has a positive average temperature (table 4).

The increase of temperature generally continues until July (fig. 7) when highest values are reached due to the high global radiation of this month. The average values range from 9.6$^0$C at Vlădeasa to 21.5$^0$C at Salonta in the low plains.

The exceptions are the greatest heights, where the air gets warm more slowly and the monthly maximum temperature is recorded in August, 9.7$^0$C at Vlădeasa.

In *August*, when the average thermal values are close to those of the previous month, the average monthly temperature begins to decrease at all stations in Crişul Negru drainage basin until December, reaching the minimum value in January (table 4, fig. 3).

*4.2.2. The deviation of the monthly average temperature during January and July as compared to their multiannual average, according to the Hellman criterion*

Given the fact that the data gathered is not heterogeneous enough for highlighting the thermal character of the distinguishing months of the year, January and July, we decided to analyze only three stations with longer data series, representative for the three landforms: high mountains (Vlădeasa), low hills - mountains (Stâna de Vale), plains (Ştei).

Analyzing the thermal character of January, we found that the thermally normal months are predominant, having a frequency of 30% at Vlădeasa, 37.5% at Ştei and 45.5% at Stâna de Vale.

**Table 5.**

**The thermal character of Crişul Negru drainage basin during January, according to the Hellman criterion**

| Station Period | Hot | | Warm | | Normal | | Cool | | Cold | | Very cold | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M | F | M | F | M | F | M | F | M | F | M | F |
| Ştei 1961-2010 | 135 | 22.5 | 60 | 10.0 | 225 | 37.5 | 30 | 5.0 | 120 | 20.0 | 30 | 5.0 |
| Stâna de Vale 1979-2010 | 52 | 13.6 | 52 | 13.6 | 175 | 45.5 | 17 | 4.5 | 88 | 22.8 | - | - |
| Vlădeasa 1800 1961-2010 | 105 | 17.5 | 120 | 20.0 | 180 | 30.0 | 75 | 12.5 | 105 | 17.5 | 15 | 2.5 |

M=Month
F=Freq %

Source: Data from the A.N.M. Archives.

Cold months also have a high frequency in Crişul Negru drainage basin. They have values between 17.5% at Vlădeasa and 22.8% at Stâna de Vale, followed by the hot months whose frequency ranges between 13.6% at Stâna de Vale and 22.5% at Ştei. The warm months occur in a proportion of 20% at Vlădeasa to 10% at Ştei. The cool months are rare, their frequency reaching at most 12.5% at Vlădeasa. The very cold months are the least frequent, occurring in 5% of the cases at Ştei station (table 4).

The analysis shows that there were no excessively cold or excessively hot January months in Crişul Negru drainage basin.

In Crişul Negru drainage basin, *July* has similar characteristics to January, with the predominance of the *normal character*, having frequencies between 55% at Vlădeasa and 63.8% at Stâna de Vale. The *cool* months are in second place, in terms of frequency, with a percentage ranging from 4.5% at Stâna de Vale up to 17.5% at Vlădeasa (table 6). A close frequency is also met for the *warm* months with values between 7.5% at Vlădeasa and 22.7% at Stâna de Vale. *Hot* and *cold* July months are the least frequent in Crişul Negru drainage basin, rarely exceeding 10% (table 6). Therefore, the studied period showed no *very cold, excessively cold, very hot or excessively hot* month of July, due to the influence of the western air masses and the thermal role of the mountain.

**Table 6.**

**The thermal character of Crişul Negru drainage basin during July, according to the Hellman criterion**

| Station Period | Hot | | Warm | | Normal | | Cool | | Cold | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Months | Freq % | Months | Freq % | Months | Freq % | Months | Freq % | Months | Freq % |
| Ştei 1961-2010 | 30 | 5.0 | 105 | 17.5 | 360 | 60.0 | 75 | 12.5 | 30 | 5.0 |
| Stâna de Vale 1979-2010 | 17 | 4.5 | 87 | 22.7 | 246 | 63.8 | 17 | 4.5 | 17 | 4.5 |
| Vlădeasa 1961-2010 | 75 | 12.5 | 45 | 7.5 | 330 | 55.0 | 105 | 17.5 | 45 | 7.5 |

Source: Data from the A.N.M. Archives.

### *4.3. The average annual amplitude of air temperature*

Calculating the thermal amplitudes, as differences recorded during the year, is important in order to highlight the temperature contrasts between summer and winter and to find the degree of continental climate.

The thermal amplitude values are determined by the movement of air masses, altitude, fragmentation of the landforms, slope aspect and local geographical conditions. The lowest thermal amplitudes are recorded at the highest altitudes: 16.9$^0$C at Vlădeasa, as the air is less heated on the mountain peaks. Up to about 650 m high the average thermal amplitude is below 20$^0$C: 18.7$^0$C at la Stâna de Vale, 19$^0$C at Moneasa, 19.7$^0$C at Zece Hotare (table 4, fig. 5).

At lower altitudes, the annual amplitude values increase in the depression corridor and reach 20.8$^0$C at Dumbrăviţa de Codru, 20.4$^0$C at Ştei and 22.4$^0$C at Salonta (table 4, fig. 5). As opposed to this general trend, there are also exceptions determined by local geographical conditions, slope aspect etc. Thus, at the same altitudes the annual average thermal amplitudes are higher on the northern, shaded slopes, with lower temperatures in the summer months and on the western slopes, exposed to the western wet and cloudy air masses, the average annual temperature amplitudes being lower than on the sunny, eastern slopes.

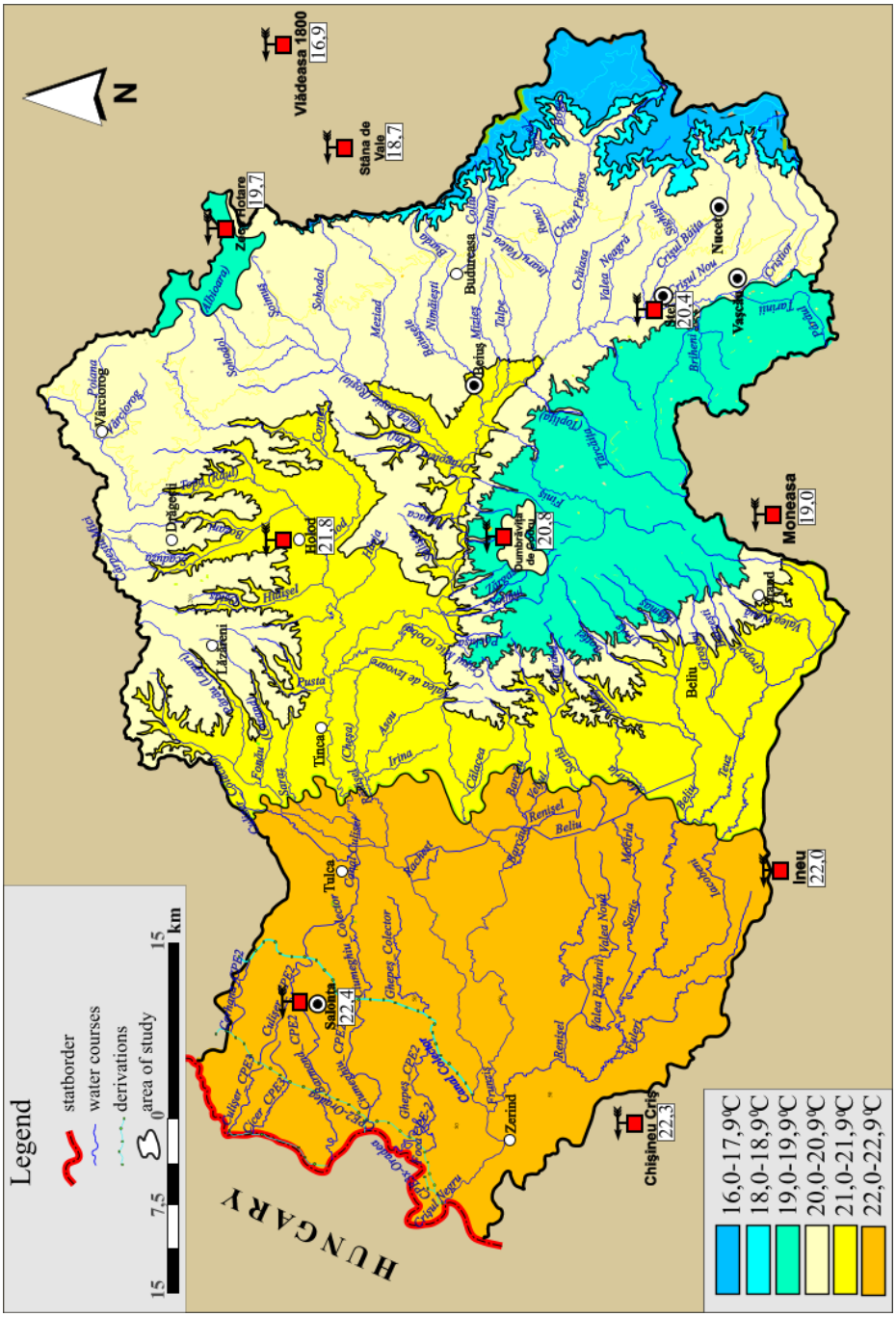


**Fig. 5.** The average annual amplitude for air temperature in Crişul Negru drainage basin.

### *4.4. The seasonal average temperature*

The distribution of the seasonal average temperature within Crişul Negru drainage basin is as follows: between 0.4$^0$C at Ineu and -6.6$^0$C at Vlădeasa during winter, so it is not very cold due to the Atlantic and the Mediterranean influences; during spring and autumn the seasonal average temperature values are close to the multiannual average air temperature; during summer, however, the air temperature in the plain area is above 20$^0$C (20.1$^0$C at Chişineu Criş; 20.3$^0$C at Ineu, 20.5$^0$C at Salonta) and it gradually decreases with increasing altitude reaching 19.1$^0$C at Dumbrăviţa de Codru, 16.1$^0$C at Moneasa, the stations representative for the altitudes specific for small mountains, 12.9$^0$C at Stâna de Vale at medium altitudes and 9.0$^0$C at Vlădeasa, the station representing the highest peak in Crişul Negru drainage basin (table 7).

**Table 7.**

**The seasonal average temperature in Crişul Negru drainage basin**

| Station | Alt. (m) | Winter | Spring | Summer | Autumn | Seasonal average temperature |
|---|---|---|---|---|---|---|
| Vlădeasa 1800 | 1836 | -6.6 | -0.1 | 9.0 | 2.3 | 1.1 |
| Stâna de Vale | 1108 | -4.4 | 1.6 | 12.9 | 4.5 | 4.1 |
| Moneasa | 703 | -0.9 | 7.9 | 16.1 | 8.1 | 7.9 |
| Zece Hotare | 642 | -0.7 | 7.7 | 17.6 | 8.2 | 8.2 |
| Dumbrăviţa de Codru | 586 | -0.1 | 9.3 | 19.1 | 10.1 | 9.6 |
| Ştei | 278 | 0.1 | 9.8 | 18.7 | 10.0 | 9.7 |
| Holod | 163 | 0.3 | 10.7 | 19.8 | 10.6 | 10.4 |
| Ineu | 110 | 0.4 | 10.9 | 20.3 | 10.7 | 10.6 |
| Chişineu Criş | 96 | -0.2 | 10.5 | 20.1 | 10.2 | 10.2 |
| Salonta | 95 | -0.1 | 10.7 | 20.5 | 10.3 | 10.3 |

Source: Data from the A.N.M. Archives.

### *4.5. Absolute extreme temperatures*

The climate of an area is not sufficiently characterized only by the average values of the parameters that define it, which is why we use absolute values. They indicate the actual boundaries between which the air temperature values in the studied area oscillate, so they are of great theoretical and practical importance.

#### *4.5.1. The absolute maximum temperature*

The occurrence of the lowest and highest values of the temperature in a geographical area depends on the characteristics and the origin of the air mass, and the balance of radiation.

In Crişul Negru drainage basin, almost all the meteorological stations recorded the maximum temperature in the month of August, 38.7$^0$C at Ineu on 28.08.1992, 37.8$^0$C at Holod on 30.08.1992, 37.7$^0$C at Chişineu Criş on 28.08.1992, 37.2$^0$C on 28.08.1992 at Salonta, 33.2$^0$C at Zece Hotare on 30.08.1992, 30.6$^0$C at Stâna de Vale on 22.08.2000.

At the stations Vlădeasa 1800, Moneasa and Dumbrăviţa de Codru, it was registered in June and July: 25.2$^0$C on 15.06.1987 at Vlădeasa, 31.6$^0$C on 02.07.1987 at Moneasa and 35.7$^0$C on 20.07.1987 at Dumbrăviţa de Codru (table 8, fig. 6). So, the highest absolute temperature value was recorded in the plain area (38.7$^0$C at Ineu) and the lowest at the highest altitudes of Crişul Negru drainage basin (25.2$^0$C at Vlădeasa).

**Table 8.**

**The monthly and annual maximum absolute temperature in Crişul Negru drainage basin**

| Station | Vlădeasa 1800 | Stâna de Vale | Moneasa | Zece Hotare | Dumbrăviţa de Codru | Ştei | Holod | Ineu | Chişineu Criş | Salonta |
|---|---|---|---|---|---|---|---|---|---|---|
| t$^0$C | 25,2 | 30,6 | 31,6 | 33,2 | 35,7 | 37,2 | 37,8 | 38,7 | 37,7 | 37,2 |
| Date | 15.06. 1987 | 22.08. 2000 | 02.07. 1987 | 30.08. 1992 | 20.07. 1987 | 28.08. 1992 | 30.08. 1992 | 28.08. 1992 | 28.08. 1992 | 28.08. 1992 |

Source: Data from the A.N.M. Archives.

The causes producing these temperature values are dynamic in nature: the advection of the warm and dry tropical continental air masses coming from the North African or Arabic Depression anticyclones. We have to note that, due to the geographical location in western Romania and to the high altitudes (in the mountain areas), the absolute maximum temperatures recorded in Crişul Negru drainage basin are much lower than in other regions of the country (***, 2008).

*4.5.2. The absolute minimum temperature*

The lowest recorded temperature values in Crişul Negru drainage basin occurred in January due to cold continental polar or arctic air invasions from the Eastern European Anticyclone or the Scandinavian Anticyclone. The lowest value was recorded at Vlădeasa: -30.0$^0$C on 16.01.1963, on the highest peak of the basin, and the highest value: -19.8$^0$C at Dumbrăviţa de Codru on 13.01.1987 due to thermal inversions present at the level of this station (Măhăra & Linc, 1993; Măhăra *et al*, 1999; Gaceu, 2005) (table 9, fig. 7).

**Table 9.**

**The monthly and annual absolute minimum temperature in Crişul Negru drainage basin**

| Station | Vlădeasa 1800 | Stâna de Vale | Moneasa | Zece Hotare | Dumbrăviţa de Codru | Ştei | Holod | Ineu | Chişineu Criş | Salonta |
|---|---|---|---|---|---|---|---|---|---|---|
| t$^0$C | -30.0 | -28.9 | -22.4 | -21.0 | -19.8 | -24.1 | -24.6 | -25.1 | -27.5 | -25.6 |
| Date | 16.01. 1963 | 31.01. 1987 | 20.02. 1985 | 01.02. 1991 | 13.01. 1987 | 18.01. 1963 | 31.01. 1987 | 31.01. 1987 | 31.01. 1987 | 14.01. 1985 |

Source: Data from the A.N.M. Archives

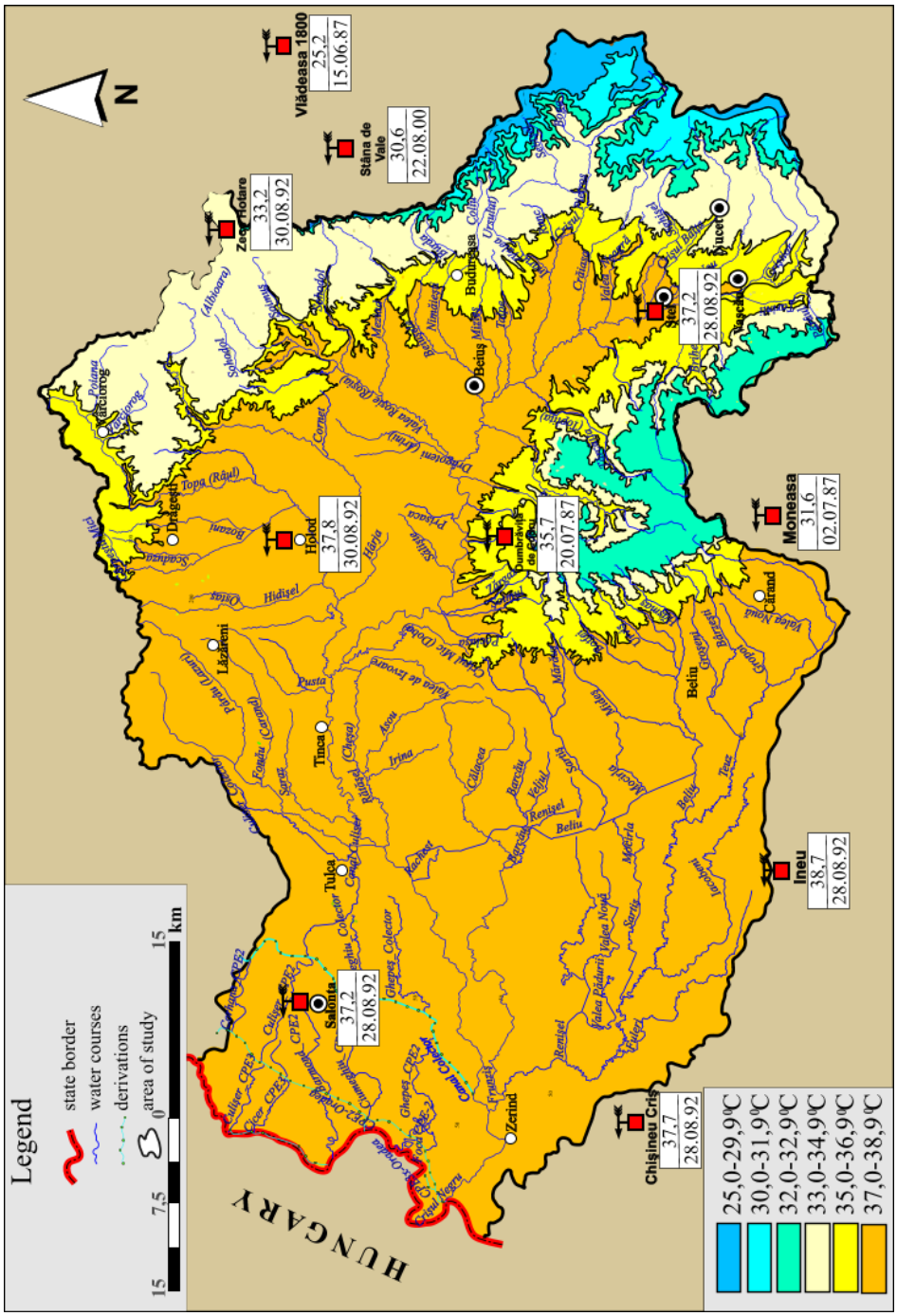


**Fig. 6.** The absolute maximum temperatures registerd in Crişul Negru drainage basin.

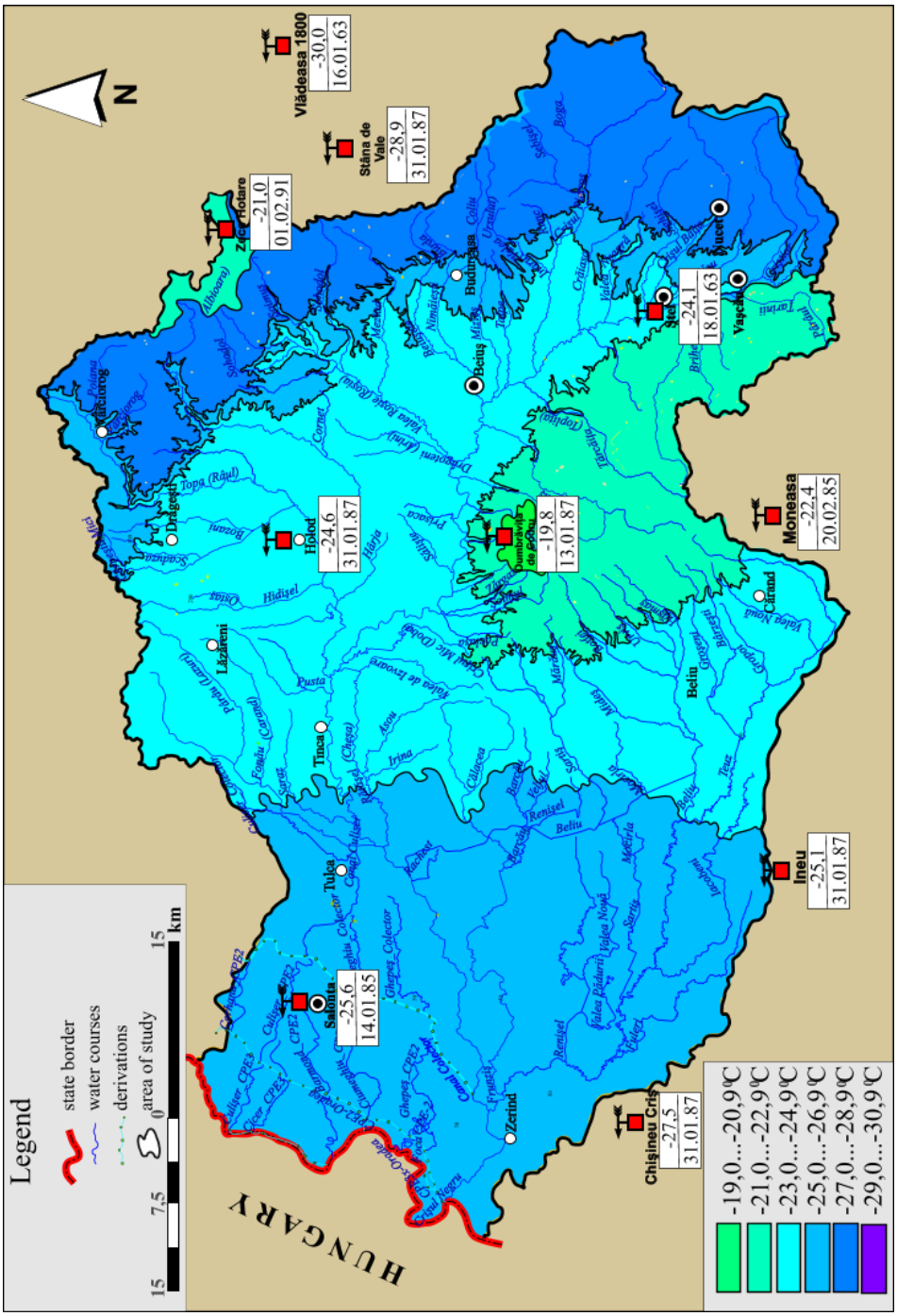


**Fig. 7.** The absolute minimum temperatures registerd in Crişul Negru drainage basin.

The meteorological stations located at lower altitudes registered lower thermal values: -25.6$^0$C at Salonta in 14.01.1985; -27.5$^0$C at Chişineu Criş in 31.01.1987; -25.1$^0$C in 31.01.1987 at Ineu; -24.6$^0$C in 31.01.1987 at Holod (Table 8, Fig. 3).

*4.5.3. Absolute amplitudes of air temperature*

In order to better highlight the degree of thermal continentalism, we determined the extreme limits of the oscillating air temperature values and we calculated the absolute thermal amplitudes. As shown in table 10, the lowest absolute thermal amplitudes are recorded at the highest altitudes of Crişul Negru drainage basin, 55.2$^0$C at Vlădeasa and 59.5$^0$C at Stâna de Vale, while the highest ones are recorded in the plain areas: 65.2$^0$C at Chişineu Criş, 63.8$^0$C at Ineu, 62.8$^0$C at Salonta and 62.4$^0$C at Holod.

**Table 10.**

**The annual absolute thermal amplitudes in Crişul Negru drainage basin**

| Station | Vlădeasa 1800 | Stâna de Vale | Moneasa | Zece Hotare | Dumbrăviţa de Codru | Ştei | Holod | Ineu | Chişineu Criş | Salonta |
|---|---|---|---|---|---|---|---|---|---|---|
| Abs.Ampl. | 55.2 | 59.5 | 54.0 | 54.2 | 55.5 | 61.3 | 62.4 | 63.8 | 65.2 | 62.8 |

Source: Data from the A.N.M. Archives

This is explained by the landforms and the mainly western movement of air masses, so that the plain area is strongly heated in summer and cooled in winter, unlike the peaks of the mountains where the intense wind stops the air from getting warm and makes it cool. Overall though, the maximum and minimum air temperature and the absolute amplitudes derived from them are not as high as in other areas of Romania and highlight the importance of the western atmospheric circulation in reducing continentalism.

## 5. CONCLUSIONS

The analysis that we conducted revealed that the air temperature regime in Crişul Negru drainage basin is strongly influenced by the circulation of air masses and landforms, as evidenced by:

a) *The average annual temperature* that decreases with increasing altitude from 10.6$^0$C at Ineu in the plain area to 1.1$^0$C at Vlădeasa, at the highest altitude.

b) The *extreme temperatures* are higher during summer in the plain area (38.7$^0$C at Ineu and 37.7$^0$ C at Chişineu Criş) and lower during winter in the mountain area (-30$^0$C at Vlădeasa and -28.9$^0$C at Stâna de Vale).

c) The *average and absolute thermal amplitudes* are higher in the plain area (22.4$^0$C at Salonta and 65.2$^0$C at Chişineu Criş respectively) and lower in the mountain areas (16.9$^0$C at Vlădeasa and 54.0$^0$C at Moneasa and 55.2$^0$C at Vlădeasa respectively).

d) The *high frequency of thermal inversions* which at average altitudes (about 600 m) determine average temperatures close to those recorded in the plain area (9.6$^0$C at Dumbrăviţa de Codru, as compared to 10.2$^0$C at Chişineu Criş), lower extreme temperatures at 100 m altitude (an absolute minimum of -19.8$^0$C at Dumbrăviţa de Codru, as compared to -27.5$^0$C at Chişineu Criş; an absolute maximum of 35.7$^0$C at Dumbrăviţa de Codru, as compared to 38.7$^0$C at Ineu), thermal amplitudes lower than in the plain area (an average annual thermal amplitude of 20.8$^0$C at Dumbrăviţa de Codru , as compared to 22.4$^0$C at Salonta, 22.3$^0$C at Chişineu Criş, 22.0$^0$C at Ineu; 55.5$^0$C the thermal absolute amplitude at Dumbrăviţa de Codru, as compared to 65.2$^0$C at Chişineu Criş).

e) The *predominance of the normal years* followed by the cool years, the cold ones and the warm years that are rare, and the very cold, the excessively cold, very warm and excessively warm years that occur even more rarely. The excessively warm years and the very cold years occur only in the plain area while in the depressions, hills and mountains there was no record of thermally dangerous years (very warm, excessively warm, very cold or excessively cold years).

## REFERENCES


1. Arléry, R., Grisollet, H., Guilmet, B. (1973), *Climatologie. Méthodes et practiques,* Edit. Gauthier-Villars, Paris.
2. Belozerov, V., Fărcaş, I. (1971), *Îndrumător metodologic pentru lucrările practice de meteorologie – climatologie,* Univ. Babeş – Bolyai, Cluj – Napoca.
3. Bogdan, Octavia, Niculescu, Elena (1999), *Riscurile climatice din România,* Edit. Sega International, Bucureşti.
4. Cristea, Maria (2004), *Riscurile climatice din bazinul hidrografic al Crişurilor,* Edit. Abaddaba, Oradea.
5. Dragotă, Carmen, Gaceu, O. (2002), *Consideraţii asupra temperaturilor extreme în Munţii Bihor şi Vlădeasa,* Universitatea "Ovidius" Constanţa.
6. Dragotă, Carmen, Gaceu, O. (2004), *Des considerations sur les temperatures extremes dans les Montagnes de Bihor et Vlădeasa,* Analele Universităţii "Ovidius" Constanţa, pag. 84-88.
7. Fărcaş, I. (1988), *Meteorologie-Climatologie (Prevederea vremii),* Fac. de Biol.-Geogr., Cluj-Napoca.
8. Gaceu, O. (1997), *Regimul termic al staţiunii balneoclimaterice Stâna de Vale,* A.U.O, **VII**, Oradea, pag. 114-121.
9. Gaceu, O. (2002), *Elemente de climatologie practică,* Edit. Univ. din Oradea, Oradea.
10. Gaceu, O. (2004), *Caracteristici ale temperaturii aerului în Munţii Bihor şi Vlădeasa,* Comunicări de Geografie, IX, Universitatea din Bucureşti, Bucureşti.
11. Gaceu, O. (2005), *Clima şi riscurile climatice din Munţii Bihor şi Vlădeasa,* Edit. Univ. din Oradea, Oradea.
12. Gaceu, O. (2009), *Thermic inversions in the area of Oradea,* Studia UBB Geographia, LIV, 2, Cluj-Napoca, pag. 63-70.
13. Gaceu, O., Vlaicu, M., Pâle, Luminiţa, Filimon, C. (2003), *Scurt istoric al cercetărilor microclimatice şi topoclimatice în România cu privire specială asupra Munţilor Apuseni*, Analele Universităţii din Oradea, Geografie, XIII, Oradea, pag. 69-76.
14. Gaceu, O., Vlaicu, M., Pâle, Luminiţa, Filimon, Claudiu (2002), *Scurt istoric al cercetărilor meteorologice în România cu privire specială asupra Munţilor Apuseni*, Analele Universităţii din Oradea, Geografie, XII, Oradea, pag. 7-18.
15. Kostin, S.I., Pokrovskaia (1964), *Climatologie. Metode de prelucrare a datelor*, Edit. Ştiinţifică, Bucureşti.
16. Marin, I. (1986), *Măsurători şi calcule în meteorologie şi climatologie,* Univ. Bucureşti.
17. Măhăra, Gh. (1977), *Câmpia Crişurilor – studiu fizico-geografic cu accent asupra climei,* în *Câmpia Crişurilor, Ţara Beiuşului, Ţara Zarandului,* Edit. Ştiinţifică şi Enciclopedică, Bucureşti.
18. Măhăra, Gh., Josan, N., Benţe, Fl., Petrea, D., Ilieş, Al., Petrea, Rodica, Linc, Ribana, Nistor, S., Pâle, Luminiţa, Vlaicu, M., Staşac, M., Gaceu, O. (1999), *Potenţialul turistic al bazinului hidrografic al Crişului Repede,* Edit. Univ. Oradea, Oradea.
19. Măhăra, Gh., Linc, Ribana (1993), *Anomalii termice în Munţii Codru Moma,* A.U.O., III, Oradea, pag. 57-63.
20. Moza, Cornelia Ana (2009), *Clima şi poluarea aerului în bazinul hidrografic Crişul Repede,* Edit. Univ. din Oradea, Oradea.
21. Şerban, Eugenia (2010), *Hazarde climatice generate de precipitaţii în Câmpia de Vest situată la nord de Mureş,* Editura Universităţii din Oradea, Oradea.
22. *** (1983), *Geografia României, I, Geografia fizică,* Edit. Academiei R.S.R., Bucureşti.
23. *** (2008), *Clima României,* Edit. Academiei Române, Bucureşti.

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# THE AESTHETIC AND ECOLOGICAL VALUES OF CLUJ-NAPOCA URBAN LANDSCAPE

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**ABSTRACT. – The Aesthetic and Ecological Values of Cluj-Napoca Urban Landscape**. The aim of the paper at hand is the aesthetic and ecological evaluation of the City of Cluj-Napoca urban landscape, relevant for designing and developing the contemporary urban space and outlining Cluj-Napoca urban landscapes. The method used in this endeavour is based on the relation between the landscape's ecological and aesthetic values. A combined matrix was developed, containing the above mentioned values, and points were awarded for every type of identified landscape (nine in total). The correlation based on these points was represented graphically. Higher scores were awarded to those landscapes with high ecological as well as aesthetic values, such as parks and public gardens which also contain wild flora, while lower scores were obtained by industrial areas and abandoned sites. Our undertaking is interdisciplinary, combining the results of geographic research with aspects of urban planning.

***Keywords:*** *Cluj-Napoca, landscape, General Urban Plan, Grigorescu neighborhood, Mănăştur neighbourhood, Gheorgheni neighbourhood.*

## 1. INTRODUCTION

Scientific literature offers numerous definitions for landscape, as well as for geographic landscape. "The landscape represents the exterior, physical side, perceived through direct sensors, of the terrestrial surface, part of a territory defined by the homogenity of natural and human features" (Cocean, 2010). The geographic landscape is more than the exterior aspect of the terrestrial surface as perceived by the human being. It is the image of a whole made of dynamic elements, each and every one having a precise role and expression within the general context in which the way of perceiving and observing its features plays and essential role. It is defined as a spatial

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structure with its own individualised physiognomy due to the interaction between abiotic, biotic and man made factors, capitalised differently depending on the manner in which it is perceived (Drăguţ, 2010).

The European Landscape Convention (2000) enforces the judicial recognition of landscapes as essential components of the environment, the establishment of landscape policies and instruments for its protection and management, the integration of landscape into territorial planning, urbanism, cultural, environmental, agricultural, social, and economic policies, establishing ways of raising awareness, population involvement and specialist preparation (according to the Landscape Identification and Evaluation Methodology, 2008). This act defines landscape as follows: „The landscape is a part of a territory, perceived as such by the population, whose feature is the result of the action and interaction between natural and/or human factors".

The main elements of a landscape, which give its specificity depending on the manner in which they combine, are: *substratum, the hydro-atmospheric elements and the biotic elements*. The landscape structure, from a systemic point of view, is identified by the relations between the elements associated with the landscape. The main structural elements of a landscape are: *ecological potential, biological exploitation, and human action.* The ecological potential is the result of combining the geomorphological factors with climatic and hydrological ones. Biological exploitation is expressed by the animal and plant communities of the area, while human action refers to the economic infrastructure.

*Urban landscapes* are defined by building density and type, size of green areas, and the active presence of human beings. In fact, urban landscape is far remote from nature, even if some elements of the natural environment are still present (the relief that defines the city's morphology, the regional or zonal climate, the existence of a river, etc.) (Taillefer, 1972, p. 167).

Vittorio Gregoti (1991), referenced by Huzui (2012) and Ileana Stupariu-Pătru (Stupariu-Pătru, 2012) sees the city (the urban environment) as the most important effort of human civilization to completely transform the natural environment, the most radical swap from "natural" to the state of culture, to the global building of a landscape.

According to the 1974 Varna Congress, the urban landscape is a snapshot of the cultural landscape and represents a type of landscape which emerged due to man's intervention. Within Ileana Stupariu Pătru's landscape typology, the urban landscape is a category of human landscapes alongside the cultural and rural landscapes (Ileana Stupariu-Pătru, 2012).

Parks and public gardens, green spaces of different sizes and purposes are the only areas offering a part of nature to the people. In contrast to the natural landscape, the urban one is the most intensively anthropicized, and increases in size every single moment.

Parks and natural green areas are the live component of the urban landscape, alongside other elements, such as the street network and public squares, cemeteries and private gardens, houses, industrial areas, abandoned sites and agricultural land. Furthermore, we may include public pools, water, playgrounds, gardens, public transport, historic protected areas, sports parks, urban forests and natural protected areas, and so on. The list is extensive, while the urban landscape is rich and complex, each piece of land contributing more or less to the urban landscape. Each category deserves special attention and careful research.

When it comes to natural elements (relief, water, vegetation), they can interlock within the city's composition, enriching its esthetics, influencing its character, determing the path, the direction, ant the value of a composition. These elements, accommodated in a composition, can be kept in their original natural state or can be transformed, adapted to an idea, thus aiming towards a compositional unity between the natural environment and architecture.

Rough terrain, rivers, or panorama spots have always been elements that contributed to city creation. These aspects, which helped determine its character, are part of the cities' artistic patrimony. Maintaining and capitalizing a valuable natural environment or influencing and transforming nature in a traditional manner is a form of connecting the new ensembles with the images gradually integrated in the city's composition, a way of emphasizing its character.

## 2. CONCEPTUAL ASPECTS REGARDING THE AESTHETICS OF URBAN LANDSCAPES

*Ethical* comes from the word *ethos,* meaning inhabiting the world, while *aesthetic* derives from ethical (even ethymologically). In other words, the way in which we inhabit the world determines the way in which we envision the world.

From a conceptual standpoint, one might consider that *the city's aesthetics* involves a architectural-urbanistic approach. Within such an approach, it is possible to acknowledge the way in which the new constructions and infrastructure have taken into account the old built stock, a principle mandatory for connecting the the city's old form with the new ensembles in order to reach unity.

Symmetry and asymmetry are part of the structure of the cities' compositions. The symmetric and asymmetric systems used in an ensemble contribute, alongside building orientation and height level, to the compositional dynamism, crucial in determining the city's character.

Dominance and contrast are other important elements of city composition. The value of a composition is acknowledged especially through its unity, that is the way in which the parts are subordinate to the whole, how the parts settle and regroup in relation to a dominance. Dominance is also attained by using certain construction materials for facades or roofs, and contributes to the creation of a specific local atmosphere; furthemore, dominance can derive from the dimensional and morphological aspects of the urban weave (Laurian R., 1962).

The balance between the natural and human landscapes has always been a goal for social sciences, in search of beauty, delight and equilibrium between human presence and its relations with the environment. A quality environment reduces the costs of running an urban system, fact proven by recent research (Vandermotten et al., 1999 quoted by Cristea V. et al., 2010). *Biodiversity* plays an important role in the normal operation of what is more and more defined as „the urbs ecosystem" (Cristea V. et al., 2010). This is a specific type of ecosystem that must offer its inhabitants not only conditions for living, working, travelling, and relaxing, but also for breathing, resting, safety and quietness, for handling the ever so present and ever so diversified stress (Duvigneaud et Denaeyae de Smet, 1977, Cristea V. et al., 2010).

Currently, *environmental aesthetics* is a interdisciplinary field, relevant for diverse disciplines such as geography, planning, landscape architecture, psychology, and philosophy. This means that the landscape's esthetic evaluation is an increasingly acute issue, a research field complementary to sustainable development, planning, and resource management (Berleant, 1997, quoted by de Saraiva Maria et al, 2005).

*Aesthetic parameters* are currently evaluated through different approaches. A large part of the scientific literature is dedicated to this evaluation from technical and mathematical standpoints, with applicability in territorial planning. Other approaches are provided by social sciences, such as environmental psychology, and integrated behavioural studies that employ perception and public preferences for esthetic values. The phenomenological approaches refer mostly to the intangible aspects of landscape assessment (Saraiva Maria et al, 2005).

Within the context of the urban landscape, the most stable balance between the natural component and the built environment is perceived as an important challenge for urban development, in close connection to insuring a better quality of life, aiming to reclaim the invigorating effects of nature for the city, as well as the natural elements in the city (Hough, 1998, Kaplan, 1995 quoted de Saraiva Maria et al, 2005)

## 3. THE CITY OF CLUJ-NAPOCA – BRIEF CONSIDERATIONS REGARDING THE LANDSCAPE MORPHOLOGY AND DYNAMICS

The name of Cluj comes from the Latin *Castrum Clus*, the toponym *Clus* meaning "closed" in Virgil's tongue and referring to the hills that surround the city. Another accepted hypothesis is that the name came from the German *Klaus* or *Klause*, meaning "mountain pass" or from *Clusa*, that is "dam", "barrier" (according to Cluj-Napoca General Urban Plan, 2012).

Its position at the confluence of three important water streams, Someşu Mic, Nadăş and Chinteni, the presence of the northern hills (Lombului, Sfântu Gheorghe), of the southern hill of Feleac, and of Hoia-Cetăţuia Hill with North and South aspects bestow Cluj-Napoca a great morphological and landscape diversity (fig. 1).

The analysis of Cluj-Napoca dynamics indicates that the city grew from 135 ha at the end of the 16th century to 3978 ha in 1989 and 10465 ha in 2012. The city grew 29 times in the last 400 years, and compared to the 19th century, when it had 770 ha, five times. In the last 100 years, the surface area occupied by constructions expanded by 400%. The population grew 6.6 times between 1900 (49295 inhabitants) and 1992 (328608 inhabitants), while the East-West axis increased from 5950 m in the 18th century to a current value of 10250 m (V. Mitrea, 2009).

"Cluj, a city situated on the banks of Someşu Mic, benefits from large panoramas from the southern and northern hills. The city's silhouette is a uniform mass of constructions, enlivened by church spires, relatively evenly set in comparison to the dominance, bulk and tower of St. Michael's Cathedral" (Laurian R., 1962). Compared to this image from the 60's, Cluj-Napoca now benefits from positive aspects such as a well established centre, historical peripheries of different standards, and urban habitation in its fringes. The negative aspects, however, are more numerous, like the insufficient attention

given to Someşul Mic River, the urban dispersion produced by the real estate bubble, the lack of a coherent transportation system, and the built up area's chaotic and poorly thought expansion.

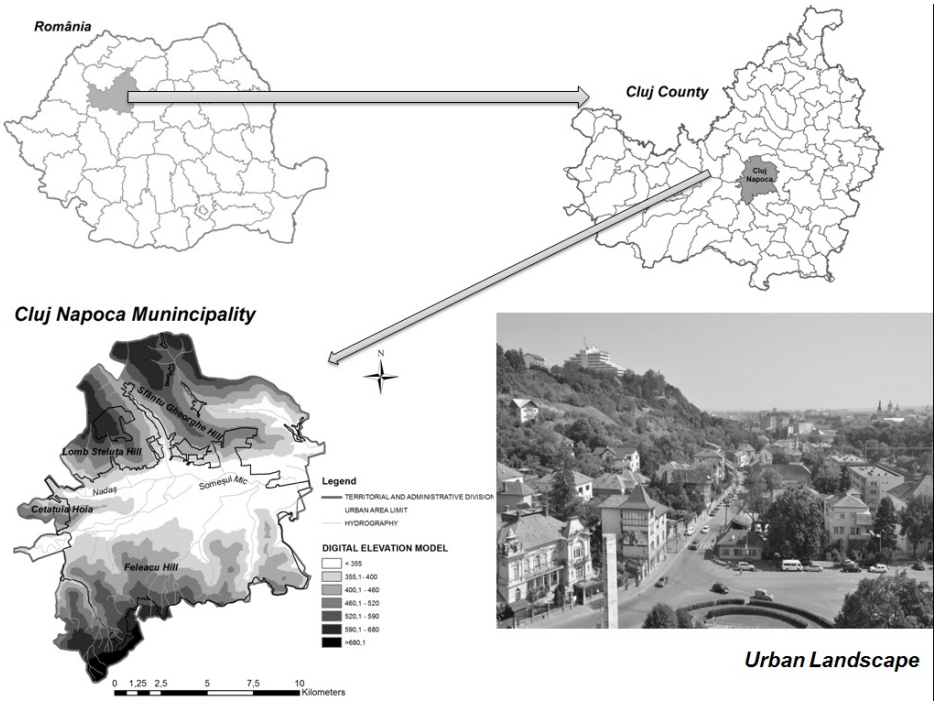


**Fig. 1.** Cluj-Napoca in regional and county contexts

The new General Urban Plan of Cluj-Napoca is currently in its final stages of approval. The objectives of this plan, relevant for our study, are (General Urban Plan, 2012):

- creating rich and quality public spaces;
- protecting the city from planning abuse;
- "turning the city towards Someşu Mic River"
- creating an urban development strategy that will mainly target the relationship with the territory;
- providing urban quality and starting the process of urban regeneration.

## 4. PAPER OBJECTIVES

The aim of the article is to esthetically and ecologically evaluate Cluj-Napoca urban landscape. This endeavour is scientific in nature without any obvious practical significance. We decided to evaluate the manner in which the landscape's ecological and esthetic traits contribute, separately and also in conjuction, to shape the physiognomy of Cluj-Napoca urban landscape.

## 5. MATERIALS AND METHODS

A pleasant, attractive, beautiful space is often associated with transformed landscapes, with landscapes modified by man. There is a theory stating that natural landscapes are not always desirable within the human environment. People find it difficult to directly see the ecological quality of a landscape, which means that biodiversified landscapes are perceived as dirty and in disarray, while landscapes arranged by human hands are often seen as beautiful (fig. 2) (Nassaurer 1995, Maija Jankevica, 2012).

These statements do not contradict important concepts of modern and contemporary urban planning: ecological city, greeen city, green planning, sustainable *planning, sustainable city, smart growth,* etc. „Green urbanism" (T. Beatley, 2000, quoted by Păcurar B., 2011) has three main intervention patterns (Filip S., 2009, quoted by Păcurar B., 2011):

- encouraging the development of compact urban forms and promoting integrated land usage;
- reducing air and water pollution, and using alternative means of transport;
- improving economic competitiveness and eliminating impoverished areas as a starting block for urban renewal.

**Fig. 2.** The first image is that of Cluj-Napoca Central Park, immediately after its 2012 rearrangement. It is a landscape created by man with low biodiversity. The second image was taken in Făget Forest and presents a natural landscape with high biodiversity. Source: google images.com

The trend of "natural aesthetics" emerged in the United Kingdom and is based on the combination of landscape's ecological and esthetic values. This idea implies that a landscape that has been planned and created based on ecological principles will always be one to satisfy all esthetic principles (Thompson, 2000, quoted by Maija Jankevica, 2012). However, landscapes created solely on esthetic principles proved sustainable even though their planning and creation were not based on ecological principles.

The article at hand and its methodology is based on *The Landscape's Aesthetic and Ecological Evaluation Matrix* (Jankevica M., 2012), adapted to local conditions.

There are countless relations between the ecological and esthetic values of landscapes. If natural, ecological factors are manifold, the landscape is perceived as one with esthetic valences. If another landscape bears the signs of human esthetic intervention, this landscape will be perceived as more beautiful than one without any human intervention.

Landscape values as well as several types of landscapes were identified and set in a *combined matrix* with the help of the scientific literature. The landscapes are ranked on a scale of 1 to 10, 1 being poor quality landscapes, while 10 landscapes with the highest esthetic and ecological values.

The landscape's natural characteristic confers a high esthetic potential, not just an ecological one. The highest aesthetic and ecological values of the landscape coincide within this matrix. A blueprint containing the parameters with different properties was developed. The evaluation criterium was based on gradual principles. The elements that are considered ecological can be replaced with their corresponding esthetic elements.

This evaluation matrix uses landscape cluster analysis. The territory under discussion is divided based *on the functional criterium* into nine types landscapes:

- small private gardens in residential areas with houses;
- the city's historical centre;
- planned parks and public gardens;
- partially natural green areas and gardens;
- natural pastures, other agricultural land and forests;
- natural water reservoirs and wetlands;
- residential areas – individual or collective housing;
- abandoned, degraded sites;
- industrial areas.

In the case of ecological values, according to methodology, we awarded high scores to landscapes with natural pastures, other agricultural land and forests, as well as to natural water reservoirs and wetlands. Low scores were given to industrial areas, followed by abandoned sites. High scores for aesthetic values were given to central areas – the city's historic centre, and to planned parks and public gardesns. Low scores went to abandoned sites and industrial areas.

*The scores were awarded based on direct observations in the field, as stipulated by the method.*

The obtained data can be represented graphically. The X axis contains the aesthetic values, while the Y axis the ecological values. The graph synthesises the interaction between ecological and esthetic for different kinds of landscapes. The landscapes with low scores in both categories are generally abandoned sites, parasitic industrial areas, and cluttered collective housing. Wild areas situated on river banks or between hills, uninhabited wetlands or large forest areas have high ecological values, but lower aesthetic quality. Landscapes that have been modified by man, such as public parks and gardens, have a low ecological quality, but amass superior esthetic qualities. The landscapes that have high scores in both categories are English type parks with spontaneous flora. The ideal situation will be the aim of future research.

## 6. RESULTS

The research report entitled „Biodiversity and ecological sites in Cluj-Napoca", commissioned for the city's General Urban Plan, emphasized the fact that Cluj-Napoca has a rich and specific biodiversity, being the first city in the country with complex environmental studies. There is a large number of species included in several national and international regulations, and the expansion of the city's built up area must also take into account the conservation of some areas for scientific research. Furthermore, the above mentioned study sees no opposition between ecological protection and social-economic aims (Cristea V. et al. 2010).

Taking into account the used methodology, we adapted and filled out the aesthetic and ecological matrix for Cluj-Napoca City (table 1). Then we made a graphical representation of all the obtained data, based on the same model provided by the consulted literature (fig. 3).

## 7. CONCLUSIONS

The aesthetic and ecological evaluation of Cluj-Napoca landscape, according to a method found in foreign literature and adapted to local conditions, led to the following results.

High ecological values of the urban landscape are registered by the natural pastures found on Cluj-Napoca administrative territory, within and also outside the built up area. High values are also registered by water areas, followed by partially natural green spaces such as the Botanical Garden, Iuliu Haţeganu Sports Park, Agronomia Park and Garden, the Central Cemetery, other green areas with a considerable natural component. Next come small private gardens from residential areas, parks and public municipal gardens mostly built on sites that kept their function within the city.

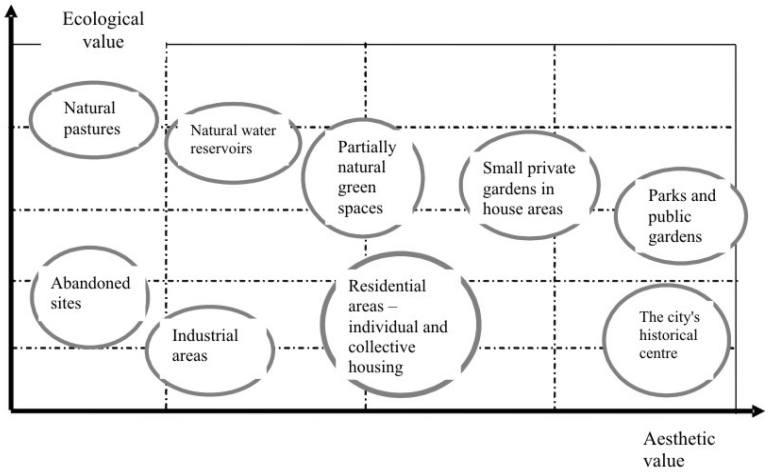


**Fig. 3.** Graphical representation of the correlation between the landscape's aesthetic and ecological values

**Table 1.**

The aesthetic and ecological evaluation matrix for Cluj-Napoca landscape

| Types of landscape values | Small private gardens in residential areas with houses | The city's historical centre | Planned parks and public gardens (*) | Partially natural green areas and gardens (**) | Natural pastures, other agricultural land and forests | Natural water reservoir and wetlands (***) | Residential areas – individual and collective housing | Abandoned, degraded sites (****) | Industrial areas | Approach |
|---|---|---|---|---|---|---|---|---|---|---|
| Order, regularity | 8 | 10 | 9 | 6 | 3 | 3 | 6 | 1 | 4 | Aesthetic value |
| Quality of human elements | 8 | 7 | 8 | 9 | 6 | 1 | 4 | 1 | 8 | |
| Visible human intervention | 9 | 10 | 10 | 8 | 4 | 7 | 10 | 1 | 8 | |
| Particularity | 8 | 8 | 9 | 9 | 8 | 8 | 6 | 2 | 7 | |
| Usage of decorative flower species | 8 | 10 | 10 | 7 | 1 | 1 | 4 | 1 | 1 | |
| Capitalisation of the natural landscape potential | 6 | 2 | 3 | 9 | 10 | 9 | 3 | 4 | 2 | |
| Architectural conformity | 7 | 7 | 9 | 8 | - | - | 4 | - | 3 | |
| Biodiversity | 5 | 2 | 2 | 7 | 10 | 9 | 1 | 1 | 1 | Ecological value |
| Conformity with the natural landscape | 8 | 4 | 7 | 8 | 10 | 9 | 3 | 4 | 5 | |
| Presence of indigenous flower species | 6 | 3 | 6 | 7 | 10 | 8 | 3 | 5 | 2 | |
| Presence of natural elements | 7 | 3 | 6 | 7 | 10 | 8 | 4 | 5 | 1 | |
| Indifference towards the landscape | 1 | 2 | 4 | 5 | 7 | 8 | 7 | 10 | 4 | |
| Presence of wildlife | 4 | 1 | 5 | 7 | 10 | 9 | 4 | 8 | 1 | |
| Lack of human intervention in natural processes | 1 | 1 | 2 | 4 | 9 | 7 | 2 | 8 | 1 | |

(*) This category includes the city's Central Park, The Roses Park on Plopilor Street, Cetaţuia Park, and the rest of the city parks with playgrounds for children and recreational areas.
(**) Comprised of the Botanical Garden, Iuliu Haţeganu Sports Park, Agronomia Garden and Park, The Central Cemetery, other remodeled green areas where the natural component has a considerable presence.
(***) Includes lakes and water streams.
(****) The old industrial areas, currently abandoned or under economic redevelopment

## REFERENCES


1. Cocean, P. (2010), *Geografie regională,* Ediția a III-a, restructurată și adăugită, Presa Universitară Clujeană, Cluj-Napoca.
2. Cristea, V., Rakosy, L., Coroiu, I., Filipaş, L., (2010), *Raport de cercetare – Biodiversitate și situri ecologice din perimetrul municipiului Cluj-Napoca*, pentru Actualizare Plan Urbanistic General al Municipiului Cluj-Napoca.
3. Drăguț L., (2000), *Geografia peisajului*, Editura Presa Universitară Clujeană, Cluj-Napoca.
4. Jankevica Maija, (2012*), Comparative analysis of methodologies for landscape ecological*
5. *aesthetics in urban planning*, Science – Future of Lithuania, 4 (2), pag. 113–1.
6. Laurian, R., (1962), *Probleme de estetică a oraşelor*, Editura Tehnică, București.
7. Mitrea, V., Maxim Danciu, I., (2009) *Cluj-Napoca, Un oraş în mişcare,* Tribuna, Cluj-Napoca.
8. Păcurar, B.(2011), *Funcțiile "terțiare" ale Municipiului Cluj-Napoca,* Editura Presa Universitară Clujeană, Cluj-Napoca.
9. Saraiva Maria Graca, Jorje Batista e Silva, Isabel Loupa Ramos, Fatima Bernardo (2005), *Rehabilitation of river landscapes in the urban context, evaluating aestethics for decision makeing process*, http://www.symposcience.org, accesat la 25 iulie 2013.
10. Stupariu Pătru Ileana (2012), *Ecologia peisajului,* http://www.unibuc.ro/prof/patru-stupariu_i_g/Ecologia_peisajului.php, accesat la 07.01.2014.
11. Taileffer, F. (1972), *Avant-propos*, Rev. geographique des Pyrenees et du sud-ouest, 49.
12. *** *Metodologie de identificare si de evaluare a peisajului*, (2008), beneficiar Ministerul Dezvoltării, Lucrărilor publice și locuințelor, coordonator arh. urb. Irina Popescu-Criveanu.
13. *** *Plan Urbanistic General al Municipiului Cluj-Napoca*, vol. Memoriu general, 2012

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# THE HISTORY OF BORSEC MINERAL WATER BOTTLING

**G. B. TOFAN**[1]

**ABSTRACT. – The History of Borsec Mineral Water Bottling.** The mineral water springs of Borsec have been known to exist since ancient times. It started as a legend, presented by Orbán Balász, who mentions an author named Salzer. In his „Voyage Diaries in Transylvania", Salzer recounts the discovery of healing springs in the area, and attributes it, like many other authors, to a Romanian shepherd called *Gheorghe*, who, suffering from ulcer, returning home one day, drank from one of the Borsec springs. Drinking the sour water, he felt better. Consequently, he remained there for a couple of days, drinking water from the same spot and curing his ailment. Written documents date back from the 16th century, when Bethlen Farkas, in the historical novel *„Historia",* recounts that, in 1594, Sigismund Bathory, who resided in Alba Iulia, suffered from nervous exhaustion. His Italian doctor, Bucello, who knew about the curing effects of the Borsec mineral waters, prescribed a treatment using the water from the *„Lobogó"* spring. The water, transported to the princely estate in large covered barrels, eventually healed Sigismund Bathory. It is easy to see why, at the end of the 16th century, the mineral water of Borsec, with its miracle properties, was well known in Transylvania and at the imperial court of Vienna. The above mentioned spring, used from the 19th century onwards, for spas and for bottling, earned great renown, especially due to the high concentration of CO2 (over 2.5 g/l). The bottled sparkling water, due to its pleasant taste and its chemical stability, is the most sought after table water. This explains why, in most cases, the notion of mineral water is associated with *„Borsec"*.

***Keywords:*** *mineral waters, Anton Zimmenthausen, BORSEC-Queen of Mineral Waters, international brand, mineral water bottling facility.*

## 1. INTRODUCTION

The municipality of Borsec, from an administrative point of view, like Bilbor, Corbu and Tulgheș, belonged to Ditrău and Lăzarea communes, being donated by Maria Teresa to the border guards of the area, who administered it until 1806, when the fame of the therapeutical properties of *„the borviz"* reached Vienna. *Valentin Iohann Günther* from Vienna requested the approval of the Imperial Court to lease, transport and sell in Vienna and beyond the water of Borsec, with exclusive privileges, alongside *Anton Zimmenthausen* (his cousin, high dignitary in the City Council of Vienna). After obtaining the approval, they informed, on 7th April 1804, the County of Giurgeu (Gheorgheni) that they obtained the right to sell the mineral water for eight years and consequently, requested, from the communes of Ditrău and Lăzarea, the construction of a glass factory and adjacent buildings.

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To be more convincing, Günther expressed his devotion *„for a country in which, with a decaying health state, before his 20th birthday... he had the fortune to become anew due to the water of Borsec"*, intending to transport the mineral water from the *Main Spring* to Vienna, as well as to other parts of the world. The mineral water of Borsec, due to its qualities, eventually defeated its competition and monopolised the Viennese market. Günther then built a glass factory, and created *„a colony, on an uninhabitable mountain, especially in winter"* (B. Orbán, 1868).

The contract was signed in Gheorgheni, in an officer's house, between Anton Zimmenthausen, Valentin Günther and several people designated by the provincial and military authorities of Ditrău and Lăzarea. The contract contained 20 stipulations, among which one that guaranteed the right of the local community to sell the mineral water in Hungary.

The said contract went into force on 25th June 1804, being signed by 12 people and sealed by the two communities. Following this, Günther advised the most famous doctors of Europe to send their pacients to Borsec „at the border of the civilised world", where he himself regained his health due to the curative properties of the local water springs.

Thus, in 1804 the *„Günter-Zimmenthausen" Association* obtained the lease of Borsec for an *„exclusive exploitation"*, also acquiring the lease for the forests and orchards of Borsec from the inhabitants of Ditrău-Lăzarea, as well as the approval for the construction of a glass factory in order to ease the mineral water trade. After several months, due to the expenses involved, Günther backed down, while Zimmenthausen was forced to take two associates from Mediaş. In 1805, Zimmenthausen settled in Borsec, with his family, starting to develop the spa. Starting in 1806, the mineral water was no longer bottled in clay pots, but in glass bottles of different sizes, made in Borsec, using the local quartz sand quarry, and coal as fuel. During this period, the colonisation of miners and glass makers from the Czech Lands, Silesia, Poland and Bavaria began.

After some time, the first real issues began to emerge, partly due to count *Lázár Ludovic*, who tried to remove the main shareholder, by using the inhabitants of Ditrău and Lăzarea as well. Therefore, the count's first complaint dates from May 1816 and is addressed to the supreme county judge, accusing Zimmenthausen of inappropriate mineral water trade, which may cause problems for the area and for the empire.

The county judge asked for the support of the Royal University in order to ascertain the correct manner of water exploitation and avoiding forgeries. The Superior Council of the Regional Government did not admit the trial, but sent the complaint to the Superior Administrative Council „The Entity for Correcting Law Violations".

After receiving an answer from the University, the Superior Royal County Government enjoined the inscription of legal provisions on the tickets issued especially to mineral water traders.

In 1835, Zimmenthausen, financially bankrupt, asked for a loan of 880 forint from the Imperial Court in order to settle his dispute with his rival, stating the following: *„Ever since 1800, the undersigned... have become aware of the healing power of Borsec mineral water... . After my return to Viena, critical times intervened due to the war with the French and only in 1806 was I able to make the journey to Borsec together with cu J.V. Günther and with the entire glassmaking staff and arrived here on 16th April of the same year"* (B. Orbán, 1868).

Left alone by Günther, Zimmenthausen had to support the expenses for the construction of the glass factory and the adjacent buildings all by himself, but *„I barely put the first bottle and I was already involved in a difficult trial. I was unable for 18 years solely conduct my business, I had to find an associate and leave the management of my business in the hands of a stranger, while myself, in order to defend my rights, was busy in courts, having to spend large sums of money"* (B. Orbán, 1868).

Zimmenthausen was involved in other trials, such as the one filed by his associate *Andras Schuster*. Zimmenthausen died in 1838, sick and poor, after spending nine months in prison. His heirs continued the trials for 38 years after the initial trial began, and on 20th September 1854, the Supreme Justice Court of Vienna ruled in favour of Zimmenthausen.

Therefore, Anton Zimmenthausen is considered to be the creator of the first establishment for the usage of the therapeutical springs of Borsec. After Zimmenthausen, Borsec was leased by *M. Vermecher* from Reghin from 1838 to 1856. This period saw the construction of many hot baths, baths with showers and houses. Also the first analyses of the *Principal* and *Lobogó* springs were conducted by Schelle and Stenner.

The trade with Borsec mineral water developed more than its usage in spa medical therapy, the Viennese pharmacists holding the priviledge to conduct this trade. Due to several scams by the pharmacists, by selling mineral water with false labels, on 13th March 1783, an order was issued which withdrew the pharmacists' priviledge to trade, giving it to the local traders, so they could exploit and sell this water in Transylvania, Hungary and Tyrol, by exempting them of border taxes.

The transport of these products was being conducted in clay pots, at first by the so called *„borviz men"*. Ever since 1822, the mineral water had been transported to Vienna, and starting in 1889 to Turkey and Greece, Hungary, after 1890 Borsec mineral water began being exported to America (New York), and in 1902 to South Africa.

The mineral water of Borsec was also being transported by rafts, to Moldova, on the Bistricioara River, and on Mureş, to Lipova, Arad, Timişoara, in well sealed crates, while after 1887, once the connection road between Topliţa and Borsec had been completed, the transport became easier, by trucks, and later by railway.

Between 1832, when the Zimmenthausen lease contract expired, and the First World War, meaning for 80 years, the spa and commercial exploitation of Borsec went through an endless string of leases. This lease system by short term auction, used by the owners of Ditrău and Lăzarea communes, was imposed by their interest of periodically raising the lease's price, thus receiving larger and larger benefits. The entrepreneurs made considerable earnings due to the many sick people that came for treatment and the consumers of bottled mineral water. From 1856, Borsec had been leased by many wealthy people, among which *Seibriger György*, for 10,000 forints/year, *Mandel David* for 30,000 forints/year and after 1862 for 62,000 forints/year. The last lease holders of Borsec of the 19th century were a group of business people from Braşov, from 1868 to 1874.

After 1874 *the Ditrău-Lăzarea Joint Venture* took back Borsec, while after 1900 we know of the bankers *Fekete Mor* and *Chrissoveloni*, and the capitalist *Tischler Mauriţiu* from Iclodul Mare. On 14th November 1903, it was decided to lease Borsec for 50 years to Fekete Mor from Vienna, while in 1921, the baths were leased to Tischler Mauriţiu, who made many investments in the area.

## 2. MINERAL WATER BOTTLING

The base of the enterprise was built in the 19th century by Zimenthausen, and further developed by Chrissoveloni Bank. Based on a decision adopted on 1st May 1833, for both local consumption and for selling, for locals and for foreigners, the price of a mineral water bottle was one silver kreutzer, while for other bottles, the price would be proportional to their volume, the bottles being filled with mineral water under military watch. This date was also the one when putting seals on the mineral water bottles started. According to the accounts of C. Károly (1873), in 1840, around 5,000 bottles were filled and shipped to Moldova and Austria, while in 1889 over three million bottles, using water from three springs: *the Main Spring*, *Prince József Spring* and *Kossuth Spring*, the water from the last two springs being only partially used, when there were issues with the Main Springs flow. Until 1940, mineral water exploitation and bottling was leased to the Chrissoveloni Bank, that had a representative in Borsec, who coordinated the spa's activity, and also the selling of water from the Main Spring. In this period, the bottling activity was conducted in a room situated in front of the existing central pavilion, the bottling station having a modest station.

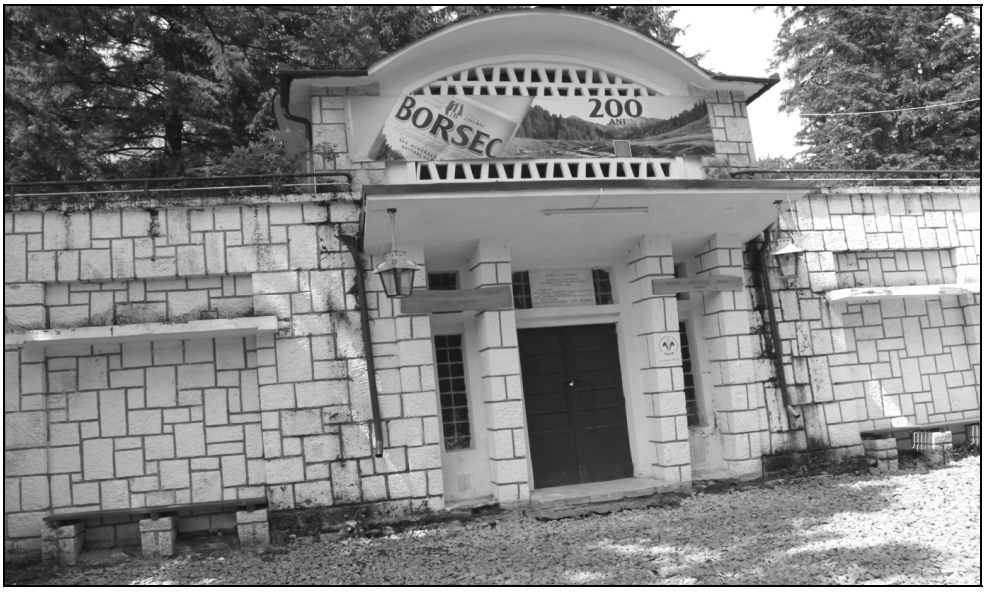


**Fig. 1.** No. 1 (The Main Spring) and no. 2 (Elisabeta) springs, 2012.

Working hours extended in some cases to 12 hours, and all bottling operations were being conducted by hand. These activities employed women who were payed very little money.

From 1940, the Ditrău-Lăzarea Joint Venture began to manage this activity, until 1946-1947, and controlled it through its representatives. During summer, work was conducted in two shifts, and most products were shipped to Austria and Hungary.

The number of people per shift was 10-15, plus several auxiliaries (loaders, unloaders, mechanics etc).

The production volume ranged between 2,000-3,000 bottles/day, using only one liter bottles. After the nationalisation of the main production units, the spa's mineral water resources and the natural curative factors were handed over to the Ministry of Health, specifically to the Borsec Spa Administration (A.S.B.B in Romanian). The enterprise had 106 employees (87 workers, one technician and 18 auxiliaries).

Electricity was provided by a *Skoda engine*, a *Rakoczi engine*, and a semidiesel one *(„Timpuri Noi")*. The daily production of that time was 5,000-6,000 bottles/day (A. Farkas, 2007).

On 15th November 1952, Apemin became a state enterprise under M.I.U, the plant was renovated and enlarged, and on 20th August 1954, the General Department of Mineral Waters Bucureşti was established, Borsec becoming an enterprise for the bottling and selling mineral water. As such, several new springs from other parts of the country started being administered by Apemin Borsec (Şarul Dornei, Tămăşău, Hebe).

This is also the period in which new bottling stations were set up, plus a *Holstein-Koper* semiautomatic machine line, with a filling capacity of 4,500 l/hour.

The enterprise's surface area grew to 1959 sqm, with 227 workers, out of which 134 basic workers, which lead to an increase in production volume, reaching, in three shifts, roughly 30,000 bottles/day. The trend of bottling only one liter bottles continued, but as a novelty, the new bottles came from Belgium.

Crates were partially introduced for water packing, while transport was done almost entirely by the enterprise's trucks.

In 1953, a modern bottling station began to be erected, equipped with machinery from Germany, *Nagema* and *Novissima* machines were brought for bottle washing, and *Phoenix* machines for bottling. To create optimal conditions for treatment and rest in the spa, the site of the bottling station was moved 1 km away from the old station.

After the station began to operate, there was a significant increase in production, with 22,000-28,000 bottles/day/shift. Two new springs were captured by drilling in the same time period, springs with a flow of 100,000 l/day (A. Farkas, 2007).

Securing transport between Borsec and Topliţa was obtained only after extending the forest railway from Capu Corbului to Borsec, and in 1954, a viaduct was built for this railway, which was opened in 1955, all the works being done by a construction enteprise from Bucharest, with approximately 1,500 men, under the management of a Polish engineer.

In 1963, through drillings done by the Geological Committee, new mineral water sources were opened in Borsec, with a flow of roughly 82 $m^3$/day. In 1970, the enterprise was equipped with a ferisation and durisation station for mineral water. The bottling line grew to 768 $m^2$, and two modern technological lines were set up, made by the *Simomazi* enterprise from Italy. These lines had automatic machines, that performed the entire technological process, starting with the bottles' extraction from the crates (semiautomatic machine), washing, filling and labeling, the production being 9,000 bottles/line/hour.

In 1968, *Apemin Borsec*, was taken over by the *Local County Industry Department Harghita*, while between 1970-1973 by the Apemin Local Enterprise. From May 1973 until September 1977, Apemin Borsec was attached to the Harghita County Enterprise for Local industry.

In 1976, Apemin Borsec had a surface area of 2 650 $m^2$, comprising a hall (850 $m^2$), garages, workshops, and a packing warehouse (1 620 $m^2$), which ensured the necessary stock of packaging for five days. The loading and unloading of bottles onto the trains and vehicles was done using electrocarts, while the transport of mineral water from Borsec to the Toplița railway station, was done using the Toplița-Bilbor-Corbu-Borsec narrow gauge railway.

In Toplița, Apemin Borsec had a two story warehouse, with a storage capacity of 576,000 full bottles and 1.4 million empty bottles.

The crates for bottles, made of wood, were manufactured by the Tulgheș Crate Factory, while later the bottles were put into plastic crates. The bottles used for water were brought from Târnăveni, Mediaș, Turda, Azuga, the capsules from Metaloglobus, București, and the labels from Miercurea-Ciuc. In 1975, a new local product called *„Deit"* was introduced, based on sugar and fruit, which was exported to Italy.

The mineral water of Borsec started being increasingly demanded for mass consumption, the counties with the highest quantity of consumed mineral water (in 1977) being: Constanţa (8.5 million bottles/year), București (7.7 million bottles/year), Brașov (3.5 million bottles/year), Harghita (2.5 million bottles/year), Neamț (1.2 million bottles/year), Sibiu (1.2 million bottles/year), Mureș (1 million bottles/year), Cluj (1 million bottles/year), Iași (950,000 bottles/year), Bihor (800,000 bottles/year).

On the international market, Borsec water was being shipped to Israel (1.4 million bottles/year), Germany (1.2 million bottles/year), Italy (1.1 million bottles/year), Hungary (950,000 bottles/year), Saudi Arabia (850,000 bottles/year), as well as Switzerland, Spain, Cyprus, Poland, in smaller quantities.

Several mineral water samples were taken from Borsec by specialists from the US, Brasil, United Kingdom, Canada, Venezuela, Syria, Lebanon, Kuwait, Iran, etc, a good opportunity for prospecting and for the promotion of this product, with leaflets printed in several languages (French, English, German), that would present the water's qualitative and curative properties. Likewise, free samples were given to medical clinics, large stores and tourist centers from abroad (over 100,000 bottles). Starting in 1977, the old station was equipped with German *Nagema BF-60* machines.

In this period, the station was run by the *Starch and Beer-Alcohol Company*, until 1990. The new bottling stations of Tușnad and Sâncrăieni, also belonging to Borsec, were built then. In 1981, there were 300,000 bottled containers of mineral water, while soda production was 3 million bottles, working in three shifts, the employees numbering 450, while after 1989, exceeding 1000. The main problem facing the enterprise was the lack of one liter bottles.

After the fall of the communist regime in 1989, the enterprise went through a series of restructures, being absorbed by the *Ministry of Industry and Resources*, the Geological Sector.

**Table 1**

**Borsec mineral water production in 1992-2011**

| Year | Production (liters) |
|---|---|
| 1992 | 16,904,060 |
| 1993 | 15,136,100 |
| 1994 | 32,779,000 |
| 1995 | 61,523,000 |
| 1996 | 82,559,000 |
| 1997 | 78,144,200 |
| 1998 | 101,260,900 |
| 1999 | 133,437,700 |
| 2000 | 136,971,400 |
| 2001 | 143,060,200 |
| 2002 | 168,093,170 |
| 2003 | 159,804,020 |
| 2004 | 160,450,590 |
| 2005 | 190,297,140 |
| 2006 | 200,471,750 |
| 2007 | 180,379,055 |
| 2008 | 363,387,000 |
| 2009 | 336,225,000 |
| 2010 | 315,750,948 |
| 2011 | 316,012,890 |

**Source:** Romaqua Group Borsec.

Five types of sodas were being bottled, with local and imported concentrate, made by Stanis SRL, a Romanian-Hungarian firm from Timişoara.

Due to the halt in railway transport, production dropped to 2 million liters /month, for various reasons: lack of bottles, their poor quality, obsolete production technology, etc.

The station of Stânceni, Mureş County, with a staff of 50, was also part of Borsec enterprise.

In 1992, taking control over Apemin's patrimony, a state run enterprise emerged, namely *S.C Regina Apelor Minerale-Borsec S.A*. What followed was a difficult period for the company, with considerable efforts to stop the decline and avoid bankruptcy.

In 1993, the number of permanent employees drastically fell to 240 people, the quantity of bottled water being 15 million liters/year. Following the Law 55/1995, the firm was privatized, water sales reaching 61 million l/year, with six production lines.

In 1998, the firm was bought by *Comchim S.A*, for 25 million German marks, with investments that reached 10 billion lei for new machinery. In October of the same year, Comchim S.A merged with *Romaqua Group S.A*, the former also being the main shareholder (Romaqua Holdings). Traditional glass bottles were replaced with plastic ones, these plastic containers being manufactured on site using the modern machinery of the *Krupp Corpoplast*.

Two bottling lines were equipped with Italian *Sasib Beverage* machines, which led to an increase in production (10 million liters).

Between 1998-2001, all production technology was renewed, and currently there are no more machines that date back before 1989, an opportunity to create 200 more jobs. The firm received the ISO-9001/2001 certificate, issued by TÜV CERT from Germany, thus confirming that European standards had been respected, at the same time guarantying a high level of quality of the finished product. The same institute issued the HAC-CP qualification, for the bottling line, that guarantees product security and conformity.

On 21st December 2001, still mineral water was introduced, due to continuous demand for non-sparkling water, and on 1st September 2003, four new products appeared on the market: 0.5 l and 0.7 l sparkling and still water.

According to unofficial sources, the intense activity of mineral water bottling could be one of the main causes for the ceasing of spa activities in Borsec, as the tubs and the installations of the spas required enormous quantities of water.

Currently, there are five functional bottling lines, three for plastic containers and two for glass bottles, one for 1 liter bottles, and the other one for luxury glass bottles, only for HORECA (Hotel-Restaurant-Catering), the name of the special product being *Borsec Premium*.

Romaqua Group Borsec has a portofolio of 11 successful brands: *Apele minerale naturale Borsec, Apa minerală naturală Stânceni, Apa minerală naturală Aquatique oligominerală, Giusto, Quick Cola, Lămâița and Cico soda beverages, „Metropolitan Caffe" coffee, Giusto Elektrik energy drink,* as well as *Albacher* and *Dorfer* beers. The group currently employs 2022 people, has 10 branches and many working stations. In 2011, Borsec celebrated 205 years of tradition.

Presently, Borsec mineral water is sold in more than 15 countries, such as: United States (874,044 l), Canada (854,064 l), Hungary (843,780 l), Spain (190,152 l), Moldova (145,440 l), Israel (153,828 l), Germany (134,064 l), United Kingdom (95,964 l), Taiwan (87,012 l), Egypt (74,619 l), Greece (73,548 l), China (39,690 l), Cyprus (30,636 l), Japan (18,090 l), Dubai (15,318 l), representing 2% of the sold volume. Borsec has 26% market share, having been a leader in 2005.

### *2. 1. The description of the current mineral water bottling technological process*

The underground mineral water is captured, and transported through sanitary approved special pipes, made of materials mainly used in the food industry, and then stored in buffer tanks to ensure the necessary flow for the technological flux.

From these tanks, the water is then taken through pipes to the MIXER, filtered, and bottled in plastic containers.

The bottling sections for the sparkling mineral water sit between the space for natural mineral water storage and the space for the reception and storage of direct products. The plastic preforms are moved from the material warehouse into the pretemperation chamber next to the formation by blowing machinery. After the temperation process, the preforms are introduced into the filling reservoir of the feeding instalation.

From here, the preforms reach the loading and unloading wheel of the formation by blowing machine, where the plastic bottles are made. The production capacity is 7200 bottles/hour, the number of mandrel takeovers at the heating wheel is 90 preforms.

The roughs (semifabricates made through plastic deformation) on the filling funnel are transported to the roll sorting instalation, taken by the return device which takes one rough at a time, turns it and delivers it to the transfer arm, transported to the transfer station and handed to the heating wheel to the blowing station, where the blowing-stretching and two stroke blowing take place. The blowed bottles are handed through the transfer station to the loading/unloading wheel and then sent to the conveyor belt. The bottles are then removed from the machine area through the bottle evacuation device, being suspended on the guiding rails with the help of air currents.

With the help of the air conveyor, the plastic bottles reach a conveyor belt with plaques that put the bottles inside the filling and monoblock capsulation machine.

The empty bottles enter the machine, are set apart, the space between the bottles being equal to the distance between rinser's grapples. The bottles are correctly positioned under the grapples and guided with the help of the guiding star shaped wheel. After the bottles are rinsed, they enter the filler where the filling process begins, this process being isobaric.

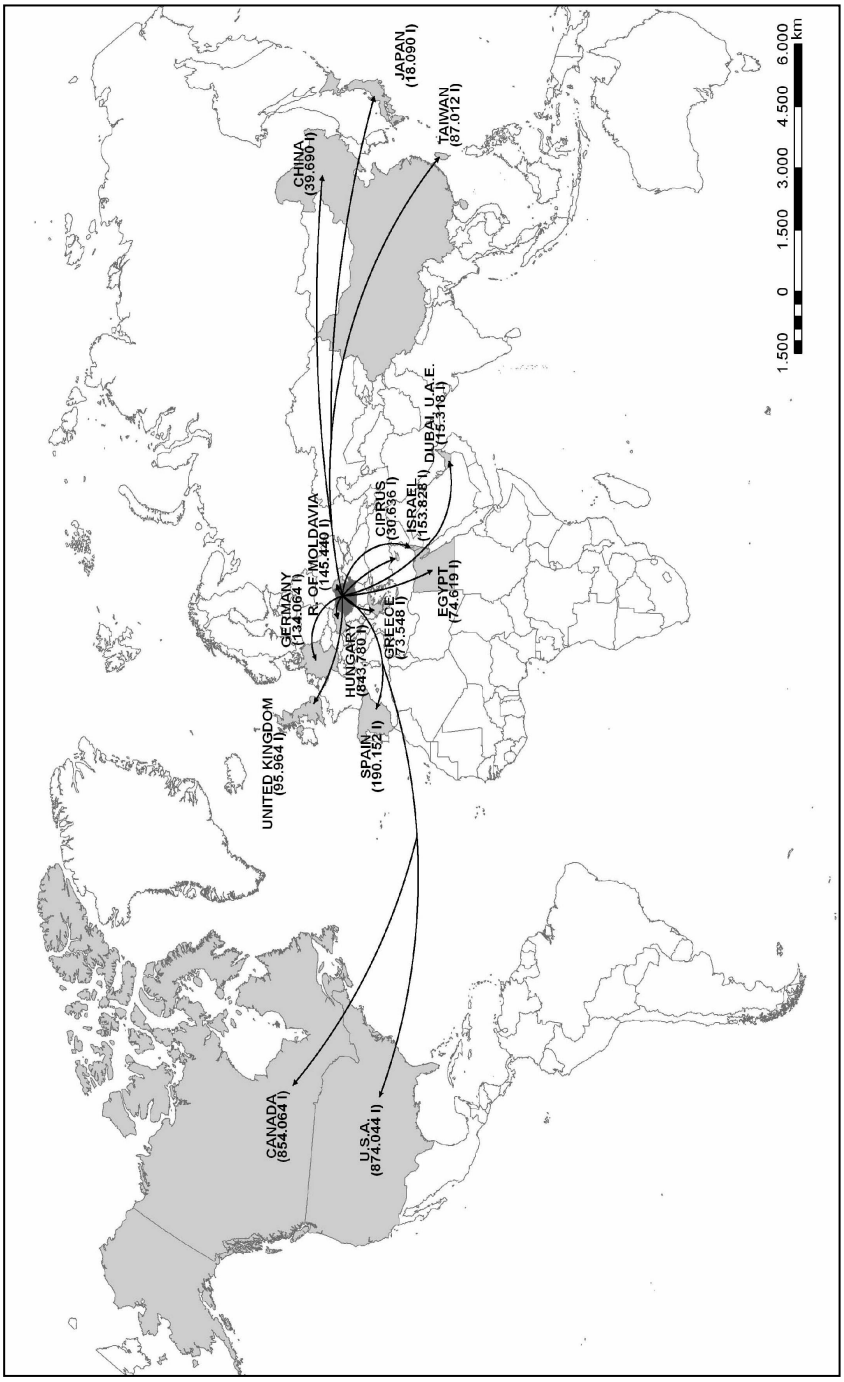


**Fig. 2.** The states where Borsec mineral water was exported, in 2011.

The bottles, after their elevation and positioning under the filling valve, are caught so that the bottle's „mouth" is in contact with the filling valve. The filling level is determined by the length of the filling tube.

These stoppers get inside the filling machine through an instalation called elevating head.

From within the bottling-capsulation machine, the plastic bottles continue their „tour" with the help of conveyor belts towards the labeling machine, where the labels are applied to the bottle. From the conveyor belt, the bottles are taken and set apart, in order to obtain the necessary distance for the bottles to be taken and sent to the central carrousel. The pallets, in their rotation movement, come in contact with the adhesive tape roll where they take the necessary quantity of adhesive to take the label from the label cartridge.

The adhesive label is transferred on the grapple cilinder, where it is set on a sponge through some grip mechanisms. The sponge sets the label on the bottle, then the label is pressed and its final position is set with brushes. Subsequently, the bottle goes on the conveyor belt.

The labeled bottles continue their journey on the conveyor belts towards an inkjet inscription system, where the minimal validity is written.

This device is automatic and is run by a computer programme. Then the bottles end up at an agglomeration table from where the package machine kicks in, with a capacity of 27 bags/minute, where the bottles are six-packed (for 1.5 liter bottles) or 12 packed (for 0.5 liter bottles), with the help of thermocontractive foil, the machine being fitted with computer run command system.

The packaged bottles move on a roll conveyor belt to the HANDLE APPLICATOR. Here, they are introduced inside the machine that applies the handle made of a cardboard band and a transparent adhesive tape.

The packages go on a steep roll conveyor belt from where they are taken and put on pallets in a particular order. The wooden pallet is then placed on a foil application device este with a ROTOPLAT rotating platform.

This device applies the stretch foil. Between the resulting levels, cardboard separators are introduced, and on top of the last level a cardboard stopper-separator is placed. From here onwards, the finite packaged product is taken by pilers to the finite products warehouse, built specially with this reason in mind, and arranged per fabrication lots. Inside the warehouse, temperature and humidity are monitored.

The delivery is made based on the FIFO principle (First IN-First OUT). Each lot has a conformity declaration which certifies the product's quality.

In order to obtain products within the quality parameters, the storage of materials (preforms, stoppers, labels, thermocontractive foil, duct tape, wooden pallets etc), is extremely important, and must be done in dry, clean, disinfected places, without any danger of contamination.

The technological process includes the following stages:

1. natural mineral water reception, according to the SNAM analysis bulletin (The National Society of Mineral Waters of Romania), issued every six months;
2. moving into the bottling section;
3. storage in buffer tanks prior to bottling section, water filtering, carbon dioxide enrichment;

4. direct material reception (preforms, stoppers, labels, glue, ink, thermocontracting foil, handles, duct tape, stretch foil, pallets, cardboard separators);

5. preform blowing, plastic bottles, plastic bottles rinsing, filling, sealing, labeling, applying handle, pallets formation;

6. storage, delivery, transport.

## 3. INTERNATIONAL RECOGNITION OF BORSEC MINERAL WATER

As a recognition of its exceptional quality, Borsec mineral water received numerous prizes, over 25 medals and many other titles at the international fairs and expos of Vienna (1873) *„The Medal of Merit"*, *„The Golden Medal"*, together with the title of *„The Queen of Mineral Waters"*, awarded by Emperor Franz Joseph, *„The Silver Medal"* and *„The Honour Diploma"* at the Berlin and Triest shows (1876), *„The Honour Diploma"* at the Paris World Expo (1878), *„The Silver Medal"* at the Budapest Expo (1885).

In the same context of international recognition, Romaqua Group S.A is the sole Romanian bottler that is affiliated to the Organisation Mondiale de la Propriete Intelectualle (OMPI). In the 1970s, Borsec mineral water won „The Honour Diploma" for goods of mass consumption, at every edition of the Bucharest International Fair, for its qualities.

Moreover, with the occasion of the 1999 and 2000 editions of the „Spring of Life" Mineral Waters Show, Borsec mineral water received the Honour Diploma, the *„Golden Mark" medal*, for the best sparkling mineral water, and the excellence prize for Romanian industry. At the 2001 edition of the same show, it received *„The Golden Mark"* for sparkling natural mineral water and *„The Platinum Mark"* for tradition and excellence in Romanian industry. Furthermore, Larex awards the enterprise the excellence prize for product quality insurance in 2000.

In June 2001, the Romanian Accreditation Society (RENAR) awarded Romaqua with the accreditation certificate, acknowledged at European level, for Borsec laboratories' ability to perform analyses in the field of mineral water, according to modern standards and methods.

Other prizes and distinctions: „The Prize for Excellence in Romanian Industry", „The Golden Mark" medal for best sparkling natural mineral water, „The Platinum Mark" medal for best new still mineral water product, „The Golden Medal" for still mineral water and „The Silver Medal" for Borsec sparkling mineral water at the Moscow International Show, all these in one single year, 2002; in 2003, it received „The Golden Mark" for Borsec sparkling mineral water, „The Golden Mark" for product design, „The Platinum Mark" for Borsec still mineral water, „The Platinum Mark" for excellence and tradition in economy and quality.

In 2004, Borsec received the title of *„Best mineral water in the world"*, at Berkeley Springs International Water Tasting Awards, in West Virginia, USA, the most internationally renowned competition in the field.

In 2005, Borsec sparkling natural mineral water was awarded *„The Special Golden Medal"*, while Borsec still mineral water received *„The Golden medal"* at the „Wold's Quality Selection", organised by the International Institute for Quality Selection from Brussels, Belgium.

In 2006, Borsec a received two remarkable titles, that of *„Trusted Brand"* and that of *„Superbrand"*, while in 2007 and 2011 the same title of *„Trusted Brand"*.

As proof of the brand's international recognition, we would like to point out that, on www.mineralwaters.org, in terms of consumer appreciation, Borsec mineral water claims the 4th place in the world at the *„Very good"* category, with a score of 4.19 (90 votes) out of total of 5 points.

## 4. CONCLUSIONS

The idea of continuity and permanence is also due to the fact that, for 205 years, Borsec has bottled roughly 34 billion liters of water. If in 1806 three million liters of mineral were bottled, the year 2011 saw more than 316 million liters of water, Romaqua Group S.A. Borsec planning to extend its operations by building mineral water bottling stations in other countries. Borsec has a 26% market share, being a market leader in 2005.

Borsec is currently the most recognised and appreciated Romanian brand, a brand that kept its quality over time and managed to hold its position through earnestness, being at the same time the name synonymous with Romanian mineral water.

Under the motto *„Borsec - Izvor de energie"*, the brand has a new attitude that promises natural energy that all consumers require in order to deal with an increasingly dynamic and competitive environment.

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## REFERENCES

1. Călimănescu, S., Zaharia, A. (1981), *Borsec. Mic îndreptar turistic*, Edit. Sport-Turism, Bucureşti.
2. Farkas, A. (2007), *Borsec. Istoricul îmbutelierii apei minerale*, Edit. Status, Miercurea-Ciuc.
3. Orbán, B. (1868), *A szekely föld leirasa (Descrierea secuimii)*, Vol. I, II, III, Budapesta.
4. Pricăjan, A. (1972), *Apele minerale şi termale din România*, Edit. Tehnică, Bucureşti.
5. Pricăjan, A, Airinei, Şt. (1979), *Apele minerale de consum alimentar din România*, Edit. Ştiinţifică şi enciclopedică, Bucureşti.
6. Pricăjan, A., Airinei, Şt. (1981), *Bogăţia hidrominerală balneară din România*, Edit. Ştiinţifică şi Enciclopedică, Bucureşti.
7. Tofan, G.B. (2011), *The balneotouristic potential of the mineral waters from Drăgoiasa-Tulgheş flume and their capitalization*, The Role of Tourism in Territorial Development, Edit. Presa Universitară Clujeană, Gheorgheni.
8. Tofan, G.B. (2012), *The Drăgoiasa-Tulgheş Depressionary Alignment. The Touristic Potential, Arrangement and Capitalization*, Studia UBB, Geographia, Anul LVII, 2, Cluj-Napoca.
9. Tofan, G.B. (2012), *Tourist Rehabilitation and Remodeling of the Borsec Resort*, Romanian Review of Regional Studies, vol. VIII, nr. 1, Edit. Presa Universitară Clujeană, Cluj-Napoca.
10. Tofan, G.B. (2013), *Componenta nordică a ulucului depresionar din Grupa Centrală a Carpaţilor Orientali (Drăgoiasa-Glodu-Bilbor-Secu-Borsec-Corbu-Tulgheş)*, Edit. Presa Universitară Clujeană, Cluj-Napoca.
11. Vrabie, N. (2003), *Turnul de strajă*, Edit. Alutus, Miercurea-Ciuc.
12. *** (2006), *Strategia de dezvoltare locală şi turistică a oraşului Borsec*, Aquaprofit Consulting Kft., Miercurea-Ciuc.
13. *http://www.romaqua-group.ro/*.
14. *http://www.mineralwaters.org/*.

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# RURAL SPACE. LAND USE AND LAND STRUCTURE. CASE STUDY: CLUJ COUNTY, ROMANIA

**ADINA-MARIA PUŞCAŞU**[1]

**ABSTRACT. – Rural Space. Land Use and Land Structure. Case Study: Cluj County, Romania.** The purpose of this paper is to assess the rural area of Cluj County, by highlighting certain aspects conclusive in demonstrating the rurality of this territory. Consequently, the rural area is being described in terms of number of inhabitants, population density, the degree of comfort and equipment of households by the existence or the access to various services and in terms of land use, resulting values which reflect the current situation of rurality in Cluj. To explain rurality of a territory involves the appeal to different fields of geographical investigations correlated with a wide range of topics (sociology, politics, anthropology, ecology, history).

***Keywords:*** *rural space, population, rural household, land use, Cluj County, Romania*

## 1. INTRODUCTION

Defining the rural has been a topic in scientific literature for decades, but there is still no clear definition, an exhaustive statement, one widely adopted worldwide or recognised as a common pattern. It comprises several fields of geographical investigation connected to different branches or sub-disciplines with references to society, economy, politics and culture. Nevertheless, the most frequently encountered approaches were in terms of non-urban status, the city acting as "the basic element of a settlements system, the place where they are issued to the surrounding areas in the form of energy and information pulses" (Benedek J., 2004) .

Wibberley J. and Turner M. (2005) have described rural areas as "those parts of a country which show unmistakable signs of being dominated by extensive use of land, either at the present time or in the immediate past". Scoutt *et al* (2007) identified five dimensions of rural: negative (non-urban), low population density, extensive land-use, the primary sector providing the main economic activity and labor, cohesion and government community.

Ianoş I. (2004) assigns rural space to "territory with a diversity of physical phenomena, economic activities and structures of variables functions and relationships". Surd V. (2002) perceives the rural through some circumstances: space, phenomena, conditions and lifestyle. It consists of "structured subspaces of various utilities: economic,

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ecological and habitat. It associates and integrates at higher levels of organization, with urban space, resulting a mixture, a complex and enhanced functionality space". Bold I. (2003), quoting Mathieu N., shows the rural as a whole, which is differentiated from urban and also, conventionally defined by statistical and administrative units. Urban or rural character is analysed based on three criteria: economic (agricultural production as essential function of the rural area), sociological (specific lifestyle and behavior in rural areas) and geographic (specific land-use and building areas layout). For Benedek J. (2004) rural areas are a "social-empirical creation, based on a number of features that refer to forms of habitat, to land-use, to production types, and to specific life-styles of certain communities in certain areas, however the creation of human activity, therefore all there are products of society".

## 2. MATERIALS AND METHOD

In recent years, there have been more intense attempts to identify the degree of rurality of an area. In this respect, the most comprehensive analysis was the study conducted by Cloke, often used as the basis for further investigation of various rural areas. According to Cloke (1985) "rurality has proved very difficult to define in all-embracing manner for three important reasons involving functions, dynamics and variation". To recognize some of the differences between degrees of rurality, he creates an index of rurality for local government districts in England and Wales using a range of statistics from 1971 and 1981 censuses. The variables used (population density, population change, population over age 65, population of men aged 15-45, population of women aged 15-45, occupancy rate, household amenities, occupational structure, commuting-out pattern, in-migration, out-migration, in/out migration balance and the distance from nearest urban center) led to a formula that placed districts into one of five categories: extreme rural, intermediate rural, intermediate non-rural, extreme non-rural and urban.

For Woods M. (2010) "rurality is performed by rural residents and immigrants, farmers, landowners, workers, tourists and tourist attractions, recreational visitors, policy-makers, the media and academic researchers".

The European Union recommends the use of OECD (Organisation for Economic Co-operation Development) methodology to identify rurality of a territory, based on population density. To calculate these indices, NUTS classification is used, a hierarchical system for dividing up the economic territory of the EU, in order to facilitate the collection, development and harmonisation of EU regional statistics. NUTS level is determined based on population thresholds, so nationwide there are: NUTS1 (3-7millions), NUTS2 (800,000-3 million), NUTS 3 (150,000-800,000) and local units: LAU1, LAU2. In Romania NUTS2 corresponds to the 8 development regions, NUTS3 to the 41 counties and Bucharest, LAU2 to the cities and communes. NUTS1 (macro-regions) and LAU1 are not yet organized.

Usually, the distinction between urban and rural areas is in accordance with Law 351/2001 regarding the approval of the national masterplan. In its terms, the administrative-territorial units are the communes, cities and counties. The commune includes "rural population united by community of interests and traditions, consisting of one or more villages, in relation to economic, social, cultural, geographic and demographic expression".

This paper aims to establish and analyze the value of rurality coefficient expressed by graphic language, maps or charts, able to highlight the dynamics of the following indicators: total population, agricultural index, the average number of persons per household, household amenities, all these calculated for each commune of Cluj County. Statistics provided by Cluj Department of Statistics (localities records) and preliminary statistics of 2011 Population and Housing Census, published by the National Institute of Statistics were used to represent these variables.

## 3. ANALYSIS

To identify the rural degree of a local unit, the OECD methodology classifies LAU2 with a population density below 150 inhabitants per km² as rural. The OECD approach classifies regions as predominantly rural, intermediate or predominantly urban based on the percentage of the population living in local rural units: predominantly rural regions (rural population is 50% or more of total population), intermediate regions (rural population between 20 and 50% of total population), predominantly urban regions (rural population less than 20% of total population).

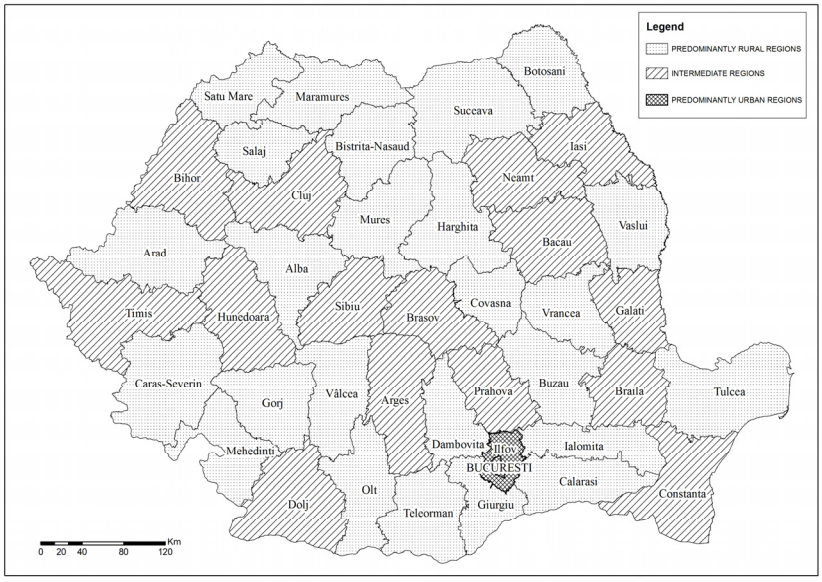


**Fig. 1.** Urban-rural typology for NUTS3 regions using the new OECD methodology

According to the new OECD classification (fig. 1), based on the demographic statistics data from 2010, only Bucharest and Ilfov County are predominantly urban regions, 17 counties are intermediate regions (35.7% of total) and about 60% of Romania is predominantly rural (25 counties).

Cluj County is located in the north-western part of the country, at the confluence of three representative natural units: Apuseni Mountains, Someş Plateau and Transylvania Plain and is bordered to the North-East by Maramureş and Bistriţa-Năsăud counties, Mureş County to the East, Alba County to the South and Bihor and Sălaj counties to the West.

Cluj County has an area of 6,674 km$^2$, representing 2.8% of the Romanian territory.

It consists of 429 settlements, organised in 5 cities (Cluj-Napoca, Turda, Dej, Câmpia Turzii and Gherla), one town (Huedin) and 75 communes.

From a demographic perspective, at the county level, the population in 2009 was 695.447 inhabitants, representing an increase of 10.43% compared to the 1966 population. Significant changes have occurred at the level of urban and rural. Thus in 1966, the rural population of the county represented 53% and the urban areas 47%.

Social and economic events that characterized the 20th century (the collectivization and modernization of agriculture, the development of labor-intensive industry which required more workforce, the 1989 events) have led to a heavy migration of the rural population to county urban centers, causing an increase of the urban population by 55.23% in 2009 compared to 1966, while the rural population fell by 29.36%. Thus, in 2009, Cluj County has a high degree of urbanization, 66.1% of the population living in urban areas and only 33.9% in rural areas. But the highest level of urbanization has been reached (table 1) in 1992, with a share of 67.4% of the total county population.

**Table 1.**

**Evolution of rural and urban population in Cluj County: 1966-2009**

| Year | 1966 | 1977 | 1992 | 2002 | 2009 |
|---|---|---|---|---|---|
| **Total Population** | **629,746** | **715,507** | **736,301** | **702,755** | **695,447** |
| - urban | 296,247 | 398,883 | 496,563 | 472,622 | 459,865 |
| - rural | 333,499 | 316,624 | 239,738 | 230,133 | 235,582 |
| Urban (%) | 47.0 | 55.7 | 67.4 | 67.3 | 66.1 |
| Rural (%) | 53.0 | 44.3 | 32.6 | 32.7 | 33.9 |
| **Population Density** | **94.4** | **107.2** | **110.3** | **105.3** | **104.2** |

The rural population density (fig. 2) is characterized by a domination of the level between 20.01 and 40.00 inhabitants/km2 in 39 communes (51.4% of all the communes). The next value level (40.01 to 80.00 inhabitants/km2) is reached in 16 communes (16.2%), and densities in the range between 80.01 and 120 inhabitants/km2 and over 120.01 inhabitants/km2 are characteristic, generally, for the communes neighboring urban centers.

According to the preliminary statistics of the 2011 Population and Housing Census, the rural population is 225.169 inhabitants (table 2), representing 34.15% of the total county population. Regionally, Cluj County has the highest urbanization rate, approaching 70%.

This statement is due to Cluj-Napoca, which is a center of polarization both at county and regional level but also due to other cities and towns: Turda, Dej, Câmpia Turzii, Gherla and Huedin.

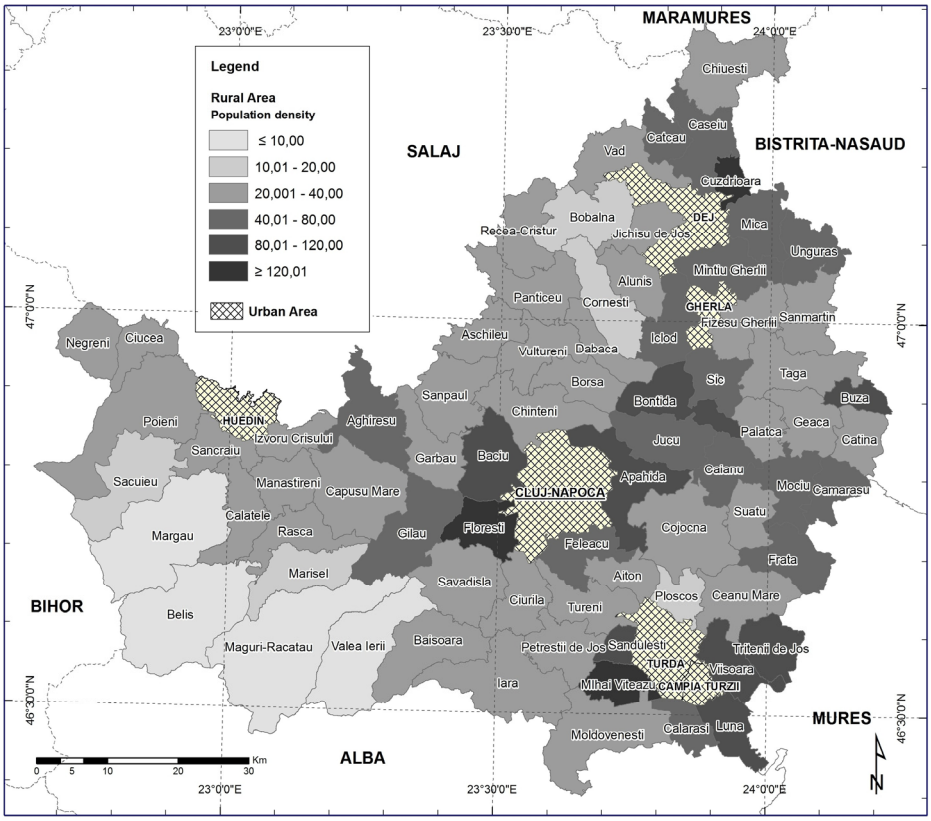


**Fig. 2.** Rural population density in Cluj County (2009)

**Table 2.**

**Classification of the rural communes by the number of inhabitants (2011)**

| Inhabitants | Communes (no.) | % of all communes | Total rural inh. | % of all rural inh. |
|---|---|---|---|---|
| 677 - 1.500 | 19 | 25,33 | 24,211 | 10.75 |
| 1,501 - 3,000 | 31 | 41,33 | 63,318 | 28.12 |
| 3,001 - 5,000 | 18 | 24,00 | 70,264 | 31.21 |
| 5001 - 10000 | 4 | 5,33 | 25,407 | 11.28 |
| 10,000 - 20,000 | 2 | 2,67 | 20,137 | 8.94 |
| ≥20,001 | 1 | 1,33 | 21,832 | 9.70 |
| **Total** | 75 | 100,00 | 225,169 | 100.00 |

In relation to the rural population of the 75 communes, there is an average of 3,002 inhabitants for a commune. But this value is not found in reality, the population is not distributed consistently, but on a sliding scale from about 677 to 21,832 inhabitants (fig. 3). Ploşcoş commune has the lowest number of inhabitants, namely 677, representing 0.3% of the rural population of Cluj County. There are between 800-1,500 people in 18 communes (10.45%), between 1,501-3,000 people in 31 communes (28.12%) and between 3,001-5,000 inhabitants in 18 communes (31.21%). The communes with the largest population (10,000-30,000 residents), namely Apahida, Baciu and Floreşti, has each a number of people even higher than some urban centers in Romania and even in Cluj County (Câmpia Turzii, Gherla, Huedin). Floreşti has twice the population of Huedin and also subsumes the rural population of Apahida and Baciu.

An interesting phenomenon occurred in recent years - the relocation of Cluj-Napoca residents to neighboring localities (due to the high prices in the housing market of the city). Floreşti is the best example in this regard; this phenomenon has increased three times the local population in the last 10 years.

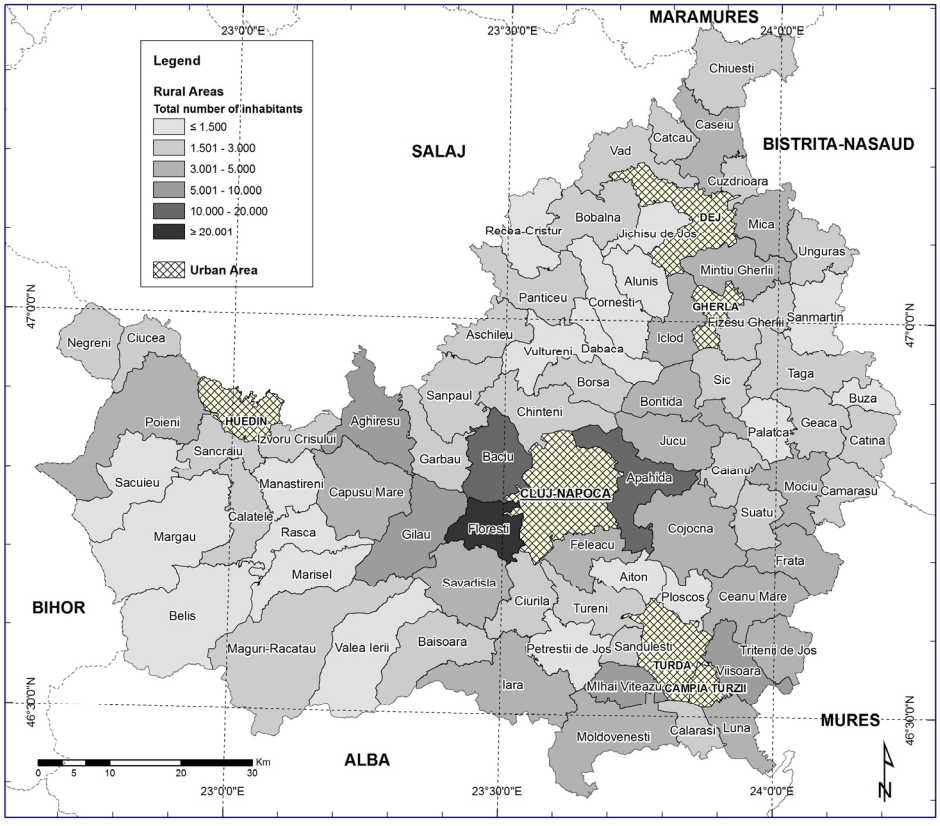


**Fig. 3.** The rural administrative units of Cluj County by number of inhabitants (2011)

"The household is the first organized form of systemic administration of the rural area" (V. Surd, 2002). Extended household includes, besides the family home and outbuildings (barn, grain barn, shed, stable, garage etc.), a small plot for flowers, vegetables, orchard, arable land, located near the main building by custom of different regions. Traditional Romanian households are organized and developed differently depending on the financial status and traditions of the inhabitants. In this respect, there is a typology of rural households based on multiple criteria such as the householder's social class, gender and age, the size, economic power, equipment and comfort level of the household etc. (V. Surd, 2002).

In the analysis of Cluj County rural households, only two criteria have been taken into account: the demographic size and the extent of equipment and comfort.

In terms of demographic size of rural households, three categories are outlined: small rural households (1-2 persons), medium (3-6 people) and large (more than 7 persons). According to the preliminary results of the 2011 Housing and Population Census, at commune level, small farms predominate in Cluj County (fig. 4). The average household has 2.54 people, a number that indicates a poor level of active labour force in agriculture. Higher values are in the following communes: Mărişel (3.12) Gilău (3.04) Cuzdrioara (3.02) and Iclod (3.01).

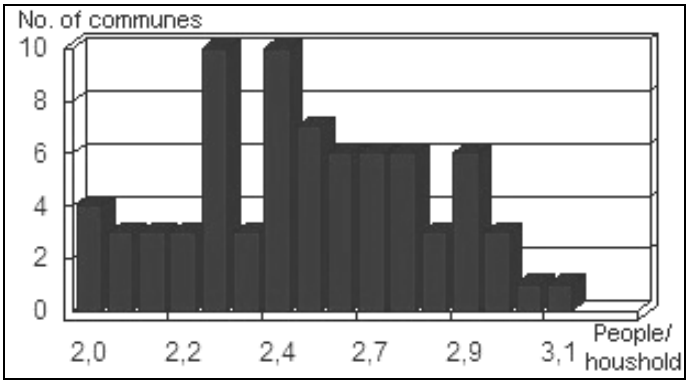


**Fig. 4.** The frequency of people/household at county level

The comfort of a household is reflected in the number and nature of existing facilities. The standard equipment of rural households is becoming better from year to year, from furniture, washing machine, television, mobile phone, to the kitchen and bathroom inside the house, as well as other utilities: water supply, sewage installation in home connected to a public network or individual system, electricity, heating (public heating or private heating system).

Classifying the facilities according to needs and their characteristics, three types have been distinguished (V. Surd, 2002): indispensable (furniture, heating and cooking appliances); affordable (radio, TV, bathroom) and occasional (car, phone).

Based on the above considerations, five types of rural households are defined: households with low minimum level of equipment and comfort (lack of essential facilities); households with mediocre equipment and low comfort level; households with an acceptable level of comfort and satisfactory equipment; households with a good level of equipment and considerable comfort (have facilities and comfort similar to the urban standards).

The existence of adequate utility infrastructure and of public access to different amenities, such as water supply system, sewage system, electricity, heating is prerequisite to any sustained economic development, reflecting the social and economic situation of the settlements, whether rural or urban.

Utility infrastructure gaps can be observed both between different regions of the country due to geographical differences (between mountains and plains, depending on the proximity of rivers, etc.), between different levels of development of an area (e.g. industrial areas have a higher economic power) and between types of urban and rural settlements.

In Cluj County (table 3), of the total rural households, only 25.7% have central heating (either public or private). We conclude from that the predominance of rural households with mediocre comfort and facilities, opposite to urban areas where a good percentage of households are equipped (84.40%). Almost half of all rural households have water supply system (55.35%), sewage (52.91%) and indoor bathroom (49.34%). As for cuisine, 74.56% of them have inside the house. In terms of connection to electricity, almost all rural households have electricity in their homes; only 3.96% do not have it. These values are quite different in urban areas, where about all households enjoy these facilities, except for some of them at the outskirts of cities.

**Table 3.**

**Utility infrastructure in Cluj County**

| Utilities | Type | Urban | Rural | Total |
|---|---|---|---|---|
| **Home water supply system** | No. | 180673 | 64831 | 245504 |
| | % | 96.83 | 55.35 | 80.83 |
| **Home sewage system** | No. | 179803 | 61974 | 241777 |
| | % | 96.36 | 52.91 | 79.61 |
| **Electricity connection** | No. | 183803 | 112489 | 296292 |
| | % | 98.51 | 96.04 | 97.56 |
| **Central heating** | No. | 157481 | 30100 | 187581 |
| | % | 84.40 | 25.70 | 61.76 |
| **Indoor kitchen** | No. | 179346 | 87330 | 266676 |
| | % | 96.12 | 74.56 | 87.80 |
| **Indoor bathroom** | No. | 177268 | 57794 | 235062 |
| | % | 95.01 | 49.34 | 77.40 |

Cluj County is located in the Transylvanian Plateau, an area that offers the possibility of developing a complex and modern agriculture, insufficiently capitalized due to the lack of investments in this sector and the endowment with inadequate and outdated equipments. Land use in the past 10 years has not changed significantly in structure. The total area of the county according to the land use is presented in the following table.

**Table 4.**

**Land use in Cluj County: 1995-2009**

| Land use | 1995 | 2000 | 2005 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|
| **Total area** | 667450 | 667450 | 667450 | 667450 | 667450 | 667450 |
| **Agricultural area** | 424355 | 428984 | 424453 | 427943 | 427273 | 426213 |
| **Forest area** | 169319 | 170802 | 170588 | 170036 | 170197 | 167662 |
| **Other** | 73766 | 72654 | 72399 | 69461 | 69970 | 73565 |

Until 2010, almost all agricultural land and more than one third of the forests have been privatized. Restitution and redistribution of agricultural land and forestry began in 1991 and took place in several successive stages. As a result, in 2005 95.6% of the agricultural area of the country and about 33% of the forest area were returned to former owners or their heirs. The land owned by the state has currently a share of only 0.5% of the total arable land (367,200 hectares), 0.7% of the total pastures (231,200 ha) and 0.2% of the total area of hayfields (32,400 ha).

In Cluj County, 7.15% of the total area of agricultural land is owned by the state: 2.88% of arable land, 14.98% of pastures, 1.83% of hayfields, 9.72% of orchards and 13.40% of vineyards (table 5).

**Table 5**

**Agricultural land use by type of property**

| Land use | Urban private area (ha) | % of total private agricultural land | Rural private area (ha) | % of total private agricultural land | Total private area (ha) | % of total area | Total area - public and private (ha) |
|---|---|---|---|---|---|---|---|
| **Arable** | 15296 | 55.54 | 161612 | 43.89 | 176908 | 97.12 | 182154 |
| **Pastures** | 6860 | 24.91 | 123768 | 33.61 | 130628 | 85.02 | 153637 |
| **Hayfields** | 3680 | 13.36 | 80389 | 21.83 | 84069 | 98.17 | 85636 |
| **Vineyards** | 48 | 0.17 | 175 | 0.05 | 223 | 90.28 | 247 |
| **Orchards** | 1657 | 6.02 | 2274 | 0.62 | 3931 | 86.60 | 4539 |
| **Agricultural Land** | 27541 | 100 | 368218 | 100 | 395759 | 92.85 | 426213 |

More than 90% of the private land is in rural areas. Of these, about 43.89% are arable, 33.61% pastures, 21.83% hayfields, 0.05% vineyards and 0.62% orchards. The main products of agriculture are: cereals (wheat, rye, barley, maize), legumes (peas, beans), oil plants (sunflower, soybean), potatoes, industrial plants (sugar beet), vegetables (tomatoes, onions, cabbages and so on) and forage (alfalfa, clover, fodder roots and so on).

The Agriculture Index (agricultural land) represents the share of the total agricultural area, expressed in percentages. The higher its value, the more pronounced rural character the locality will have. However, specific natural conditions occur, as high levels of altitude and slope, climate, infertile land not suitable for cultivation, unfavorable condition of the land etc., limiting the agricultural activities.

According to Council Regulation (EC) No. 1257/1999 (the Rural Development Regulation - RDR) on support for rural development, three types of Less Favored Areas (LFA) were defined: 1) Mountain areas; 2) LFAs in danger of depopulation and where conservation of the countryside is necessary; 3) Areas affected by specific handicaps. The Cluj communes included in the list of those located in mountain areas are: Băişoara, Beliş, Călăţele, Căpuşu Mare, Chiuieşti, Ciucea, Ciurila, Feleacu, Gilău, Iara, Izvoru Crişului, Măguri-Răcătău, Mănăstireni, Mărgău, Mărişel, Negreni, Poieni, Rişca, Sâncraiu, Sânmărtin, Săcuieu, Săvădisla, Unguraş and Valea Ierii.

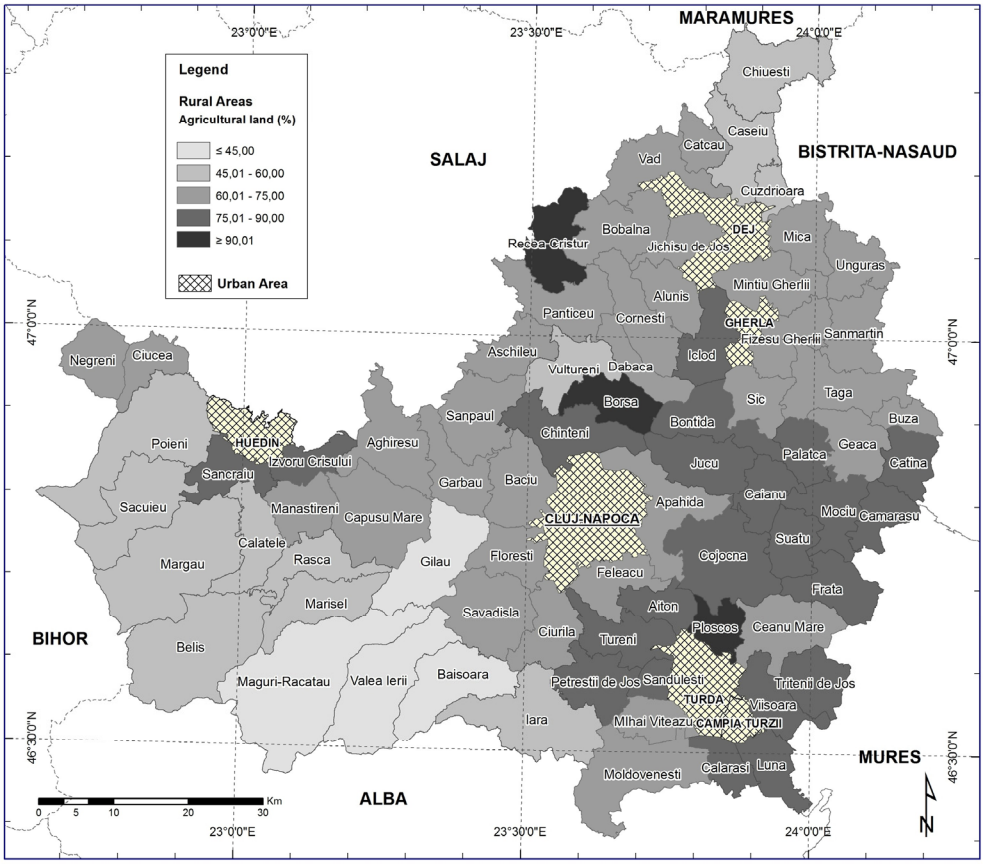


**Fig. 5.** The rural administrative units of Cluj County by weight of agricultural land

Of the 75 communes, three of them have an agricultural index below 45%, namely Măguri-Răcătău, Gilău, Valea Ierii and Băişoara, 12 communes have values between 45.01 and 60.00 and only 3 communes (Ploşcoş, Recea-Cristur and Borşa) have an index of over 90% (fig. 5).

## 4. CONCLUSIONS

This study is a brief analysis of the rural areas of Cluj County, conducted at commune level through the development of several indicators defining the concerned space. Therefore, the urban-rural distribution in time proves that Cluj County is in a continuous process of urbanization. In 2009, 66.1% of the total population lived in urban areas, a share largely influenced by Cluj-Napoca (county seat and capital of Transylvania), with a population of over 300,000 inhabitants, a number that grows from year to year due to the great interest it holds, in terms of economic and academic requirements. It is the second city of the country as polarization potential, it has one of the most dynamic economic sectors in Romania, it is the second largest financial center in the country (after Bucharest) and a major academic center. The city also provides jobs, training opportunities and entertainment for young people, at much higher levels than the rural areas.

On the level of equipment and comfort of rural households in Cluj County, one revealed a specific situation of the Romanian rural space, currently in process of development.

In terms of the land use, rural areas fit to existing patterns, thus 65% of the area is agricultural land (mainly arable), followed by forest vegetation, a fact which emphasizes the agricultural potential.

## 5. ACKNOWLEDGMENT

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## REFERENCES

1. Benedek, J. (2000), *Organizarea spațiului rural în zona de influență apropiată a orașului Bistrița*, Editura Presa Univeristară Clujeană, Cluj-Napoca.
2. Bold, I. (1974), *Sistematizarea rurală,* Editura Tehnică, București.
3. Cloke, P.J. (1979), *Key settlements in rural areas -( University Paperbacks)*, Methuen Publishing Ltd, London.
4. Clout, H.D. (1976), *Rural geography: an introductory survey*, Pergamon Press.
5. Fulea, Maria, Tamaș, Georgeta (1989), *Schimbări și tendințe în structura sociodemografică rurală*, Editura Academiei Republicii Socialiste România, București.
6. Halfacree, K. (2001), *Constructing the object: taxonomic practices, "counterurbanisation" and positioning marginal rural settlement*, International Journal of Population Geography.
7. Ianoș, I. (2004), *Dinamica urbană (Aplicații la orașul și sistemul urban românesc)*, Editura Tehnică, București.
8. Surd, V. (2002), *Introducere în geografia spațiului rural*, Editura Presa Univeristară Clujeană, Cluj-Napoca.

9. Woods, M. (2005), *Rural Geography: Processes, Responses and Experiences in Rural Restructuring*, Sage Publications.
10. *** *http://www.recensamantromania.ro*.
11. *** *http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Urban-rural_typology*
12. *** National Institute of Statistics - Cluj Department of Statistics

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# THE MACRO AND MICRO STRUCTURAL IMPACT OF THE ETHNIC ELEMENT IN BIRDA-MORAVIȚA PLAIN

**RALUCA NARCISA COVACI**[1]

**ABSTRACT. - The Macro and Micro Structural Impact of the Ethnic Element in Birda-Moravița Plain.** The article aims to perform an evaluation of the ethnic specificity both at regional level (macro structurally) and at the level of the most representative localities (micro structurally). In Birda-Moravița Plain, both regionally and on a commune level, the ethnic element registered major variations throughout the analysed censuses. These variations were caused especially by a strong migration wave. The main consequence of this wave was the transition from a heterogeneous ethnic structure to a higher degree of homogeneity and to an assimilation by the Romanians of the other ethnic elements.

***Keywords:*** *ethnicity, ethnic diversity, Romanian inhabitants, national minorities.*

## 1. INTRODUCTION

Concepts such as nation, nationality, ethnicity, ethnic or national minority groups were often discussed in literature by both Romanian and foreign authors who have tried to define or find a new meaning for already known concepts in international human geography.

Writers such as R. Hartshorne (1950, p. 43) consider the nation as "*a space occupied by a group of people between whom there is a strong connection determined by common principles and values of paramount importance in that region*".

In time, with a much broader scope and with deep implications for human geography, different definitions for the term ethnicity or ethnic group were assigned. *"Thus, a population who has the same origin, cultural tradition, consciousness of belonging to the same group and whose unity is based on the same territory and history is called ethnicity"* (R. Creţan, 1999, p.24).

The presence of numerous national minorities in ethnic groups resulted in several attempts to define them. In the paper *Political Geography*, N.J.G. Pounds (1972, p. 152) considers that the national groups represent "*the only minority in a state who can identify themselves with the national minorities"*. A similar concept is presented in the paper L'identité culturelle, where D. Schnapper (1992, p. 31) states that the difference of race, nationality or language from the majority group designates a national minority.

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In the paper *Ethnicity and Nationalism. Anthropological Perspectives*, Thomas Eriksen tries to find a suitable definition for the concepts mentioned above, equally trying to establish a relationship between them. Thus, Eriksen (1993) believes that "*when someone talks about ethnicity, he indicates that those groups and identities have developed in mutual contact rather than separately*". According to the same author, "*ethnicity is seen as an aspect of social relationship between people who consider themselves as being culturally different from members of other groups with whom they have a minimum regular interaction"*. However, in the introduction of the aforementioned work, Eriksen noted that terms like "*ethnic groups, ethnicity and ethnic conflict have become quite regular terms in the English language, and they keep appearing in the press, in TV news, in political programmes and in casual conversations". "The same thing can be said for nation and nationalism, and we should admit that the meaning of these words frequently seems ambiguous and vague for us"* (T. Eriksen, 1993, p.36).

Similar definitions were given by authors such as George de Vos (1975, p.16). He considers ethnicity as "*the subjective symbolic or emblematic use of any aspect of culture, in order to differentiate themselves from other groups*".

A more complex definition is given by Elaine Burgess. According to her, "*ethnicity is the character, quality, or condition of ethnic group membership, based on an identity with a consciousness of group belonging that is differentiated from others by symbolic 'markers' (which includes cultural, biological, or territorial), and is rooted in bonds to a common past and perceived ethnic interests*" (E. Burgess, , 1978, p. 270).

Establishing a connection between the term ethnicity and culture has also been a matter of interest for other authors. The relationship between the two terms still remains unclear to a certain degree. In this respect, Jack David Eller argues that "*not all the culturally distinct groups are ethnic groups precisely and not all the ethnic groups are culturally distinct groups"*. According to Eller, *"ethnicity and culture are not always in a perfect relationship"* (J.D. Eller, 1999, p.8). The same author states that *"ethnicity is presented as a stand-alone entity"*. Eller defines this notion as "*the symbolic use of any aspect of culture to differentiate between them and other groups (Eller, ibid) or consciousness of difference and the subjective salience of that difference"* (J.D. Eller, 1999, p. 9). According to Eller, *"ethnicity is connected to cultural or historical markers"* (*ibid*).

The relationship between the formation of ethnic groups and social and cultural processes is also treated in Fredrik Barth's studies. The work that involves the formation of ethnic groups includes social processes of exclusion and incorporation and the selection of social and cultural aspects which are deemed relevant to the construction of identity and boundaries (F. Barth, 1969). According to Fredrik Barth (1969, p.15) *"ethnic groups are not necessarily based on the occupation of exclusive territories; and the various ways in which they are maintained, not only by a once-and-for-all recruitment but by continual expression and validation, need to be analyzed"* (*ibid*).

## 2. MATERIALS AND METHODS

The evaluation of the social impact on a region was analyzed in works included in the international geographical literature in an attempt to find an appropriate definition and to present the importance of these theories in the study of a geographical area, more

or less large. A possible definition related to the social impact complexity is given by F. Vanclay in the paper Social Impact Assessment, who considers that *"the social impact assessment is not only a technique or a component of EIA, but it is philosophy about development and democracy"* (F. Vanclay, 2002, p. 33). According to the same author, "*social impact assessment is analyzing, monitoring and managing the social consequences of development*" (F. Vanclay, 2003, p. 6).

In the article Social Impact Assessment: A Contribution to the State of the Art Series, Rabel Burdge and Franck Vanclay state that "*social impacts include all social and cultural consequences to human populations of any public or private actions that alter the ways in which people live, work, play, relate to one another, organize to meet their needs, and generally cope as members of society"* (R. Burge and F. Vanclay, 1996, p. 59). The same authors also refer to the so-called "*cultural impact*", highlighting the fact that this type of impact "*involves changes to the norms, values, and beliefs of individuals that guide and rationalize their cognition of themselves and their society"* (ibid).

Based on these statements, we intend to perform an analysis on the assessment of types of impact that demographic indicators such as the ethnic structure of the population or the internal migration may have on a regional system.

The analysis of the assessment of the socio-economic impact is a common method used in international human geography. In this respect, we also had as reference the Anglo-Saxon specialized literature (N.C. Taylor, C.H. Bryan, C.G. Goodrich, 2004). The research objectives fall into two categories: the theoretical category, based on definitions, concepts, calculation formulas, interviews or semi-structured questionnaires and the practical category, highlighted by statistics.

Given the fact that this is a research based especially on the quantitative component, I have not hesitated to use a number of classical methods, such as analysis, synthesis, comparison or the geographical-historical method in order to highlight the main geographical phenomena generated by the evolution of the population ethnic structure.

Based on this principle, I have used the comparison method in order to present the passage from ethnic heterogeneity both at regional level and on a commune level (1900) to a relative homogeneity (2002). This phenomenon was caused both by the migrations and by the assimilation by the Romanians of the other ethnic groups.

The geographical-historical evolution of a territory often has various consequences on the ethnic element (causing migration, assimilation etc.). This is why the geographical-historical method aims to highlight the background on which the ethnic element in Birda-Moravița Plain has evolved over time.

## 3. BIRDA-MORAVIȚA PLAIN. GEOGRAPHICAL POSITION

The Birda Plain is located in the southern part of the Banat Plain, and it is bordered to the east by the Bârzava Plain and the Hills of Tyrol. To the west, it is bordered by the Timiș River, the Bega Mică Plain and the Timișoara Plain. *"The Moravița Plain is a low alluvial plain which flows deep into the Gătaia Plain"* (G. Posea, 1997, p. 297). To the south, the Birda- Moravița Plain is bordered by Serbia. It should be noted that the

delimitation of natural units does not coincide with the administrative division. There are villages which are part of natural units other than the Birda- Moraviţa Plain (Lăţunaş, which belongs to the Jamu Mare commune, is located in the Clopodia Plain and Cerna, which belongs to the Liebling commune, is located in the Bârzava Plain) (fig. 1).

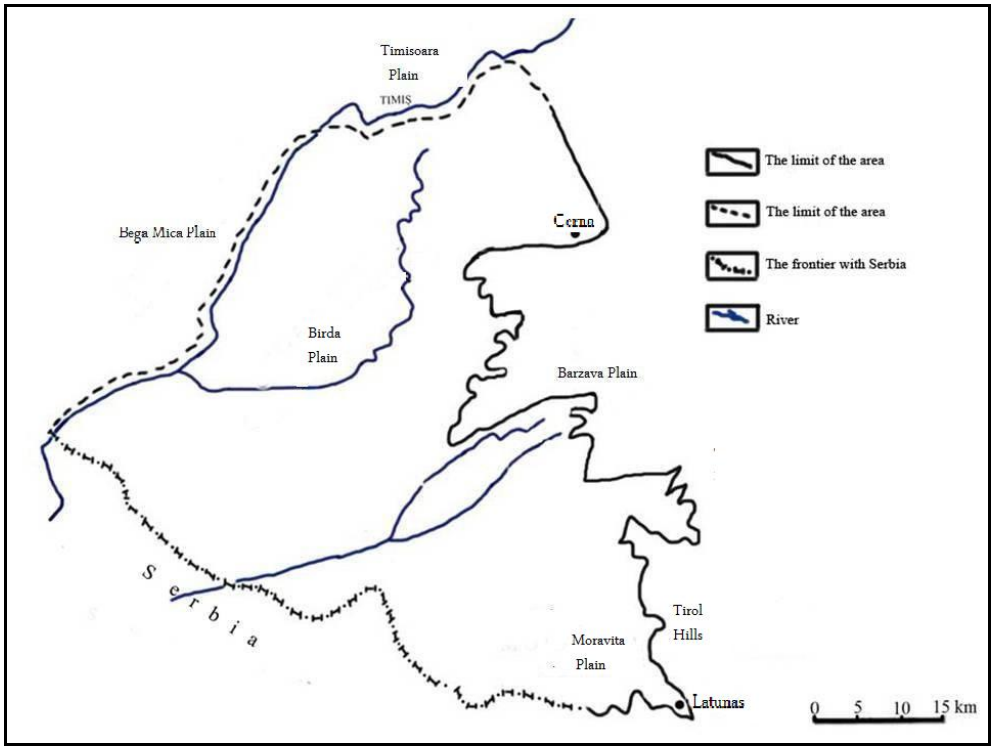


**Fig. 1.** Birda-Moraviţa Plain. Geographical Position
*Source: G. Posea (1997)*

## 4. THE ETHNIC STRUCTURE OF THE POPULATION IN BIRDA-MORAVIŢA PLAIN. FROM A MULTIETHNIC SPACE TO A HOMOGENEOUS SPACE

The regional system called Birda-Moraviţa Plain has been characterized by multi-ethnicity since early times. This is the convergence space of several ethnicities. Over time, within the main census, at a regional level, there were localities where the ethnic structure retained its Romanian specificity, while others were characterized either by ethnic heterogeneity or by a constant change of the ethnic specificity, a natural consequence of massive migrations.

Before presenting the phenomenon of multiethnicity that is characteristic to the Birda-Moraviţa Plain, it should be noted that in 1900 there were still a few old Romanian centres on which the successive colonization waves had had different impacts. It is the

case of some villages situated in the north-western and north-eastern part of the Birda Plain, and in the northern part of the Moraviţa Plain, which stand out by the majority of the Romanian population in all census years.

The massive colonisations with German population during the Habsburg rule (in the years 1722, 1775 and 1784-1787) imposed an ethnic mosaic at a regional level. Thus, the 1900 and 1930 censuses show that the Germans had relative and even absolute majority in the villages from the southern, northern and eastern parts of the Birda Plain and in most of the villages from the Moraviţa Plain.

The causes of the mass migration of the Germans both to the studied region and to the whole Banat, were of military and religious nature. Their aim consisted in *"strengthening the borders of the country, and increasing the number of Catholic people to support the Habsburg monarchy"* (G. Ilie, 1930, p.4-5 apud R. Creţan, 1999, p.86).

The entire 18th century was marked by consistent colonization in Birda-Moraviţa Plain, but one of the purposes of Josephine colonization policies in Banat required that "firstly, the settlers should be German and Catholic, secondly, that they should be non-German but still Catholic, and, in exceptional cases, they could be of other religions or dissenters" (N.M. Popp 1942, p. 360-361, apud R. Creţan, 1999, p. 86). From 1890 and then after 1930, there was a strong German emigration to countries like the U.S.A. and Germany at the regional level. This was the main reason for which at the censuses of 1992 (fig) and 2002 (fig) from the Birda-Moraviţa Plain there no longer were any villages left where the ethnic German population held the majority. Most villages had an insignificant number of Germans.

Regionally, the specificity of the ethnic mosaic was also completed by the presence of a consistent Hungarian population. These colonisations were carried out either by the state or they were private, taking place on the estates of Hungarian or Austrian nobles (R. Creţan, 1999, p. 115). It should be noted that in 1900, at the entire regional system, there were a few villages with a strong Hungarian element, even if Hungarians did not have an absolute majority. The private colonisations with Hungarians had primarily a strong economic impact on the studied area. This led to the establishment of specific organization forms such as hamlets of workers specialized in rice culture (R. Creţan, 1999, p. 119). Other forms of organization of Hungarians in the Birda- Moraviţa Plain were represented by hodăi[2], Hungarian dwellings, maiere[3] or farms of important owners who had as employees Hungarian peasants and tenants or even people who had a different ethnicity and who were required to learn Hungarian (Gh. Birăescu, 1939, p. 60 apud R. Creţan, 1999, p.120). Among the best known maiere, farms and hodăi present in the analyzed area, we can mention: Maierele Moritz, the Karatsony rice plantation, Hodăile Wekerle, the tobacco plantation etc. (Gh. Birăescu, 1939, p.87).

In 1900 there were villages with Hungarian majority in the southern part of Moraviţa Plain and in the eastern and central parts of the Birda Plain. Most of the Hungarian population from the southern part of the Moraviţa Plain is mainly due to the emigration of native Serbs and the subsequent colonization of Hungarians in two stages (around 1821 and in 1829). In the central and eastern parts of Birda Plain, the

[2] temporary settlements
[3] farms that belonged to land owners

phenomenon of massive colonization was largely based on economic reasons. Count Clary organized one of the most important rice plantations of the Habsburg empire, with the participation of Hungarian families brought to the village. The villages mentioned above preserved their ethnicity until the census of 2002, when, following the Hungarian emigration, these villages became predominantly Romanian.

A Serbian majority can be found in only three villages in the Birda Plain (in the south-west, in the south-central and in the central-east), the number of ethnic Serbs being much smaller in other parts. This majority is the result of the second (1459-1465) and the third (1541) colonization period of Serbians in Banat, the causes of these infiltrations being political. It consisted in trying to defend Hungary from Turkish attacks. After 1930, the Serbs have never held a majority in any village in Birda-Moraviţa Plain.

An interesting phenomenon is found in the central-southern part of the Birda Plain because after the emigration of the Serbians, the area was colonized by Ukrainians, who have held the majority since 2002 until the present day. The Ukrainians arrived and finally settled in the village because of a forest located outside the village. Carpentry work was specific for the Ukrainians.

The colonisations during the Habsburg rule also brought successive waves of Bulgarians who settled in the central-eastern part of the Birda Plain between 1842 and 1846. This is the location where they held the majority in all censuses.

The existence of various ethnic groups in a relatively small area also generated a religious mosaic, but it did not cause major regional conflicts, the ethnic minorities being assimilated by the dominant ethnic group (fig. 2, 3 and 4).

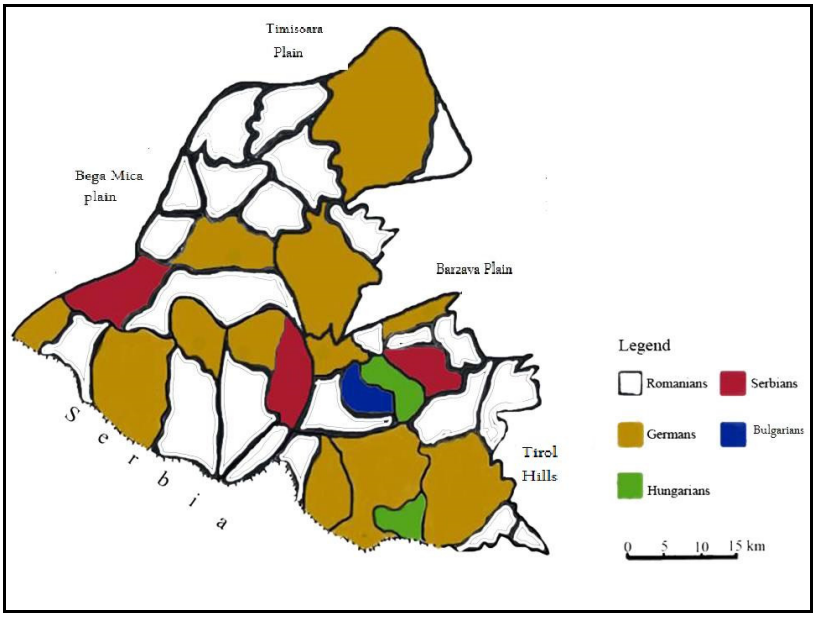


**Fig. 2.** Dominant ethnic groups in Birda-Moraviţa Plain at the 1900 and 1930 censuses
*Source: A. Varga (2002)*

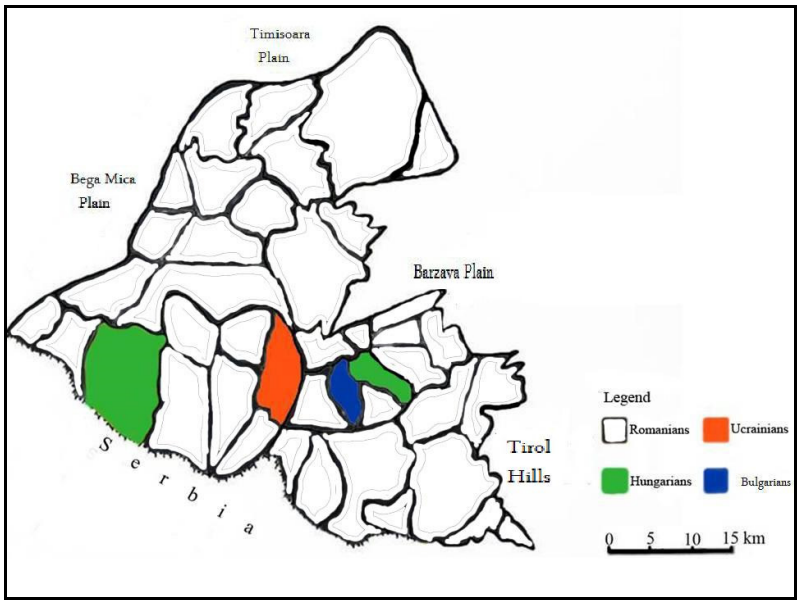


**Fig. 3.** The dominant ethnic groups in Birda-Moravița Plain at the 1992 census.
*Source: A. Varga (2002)*

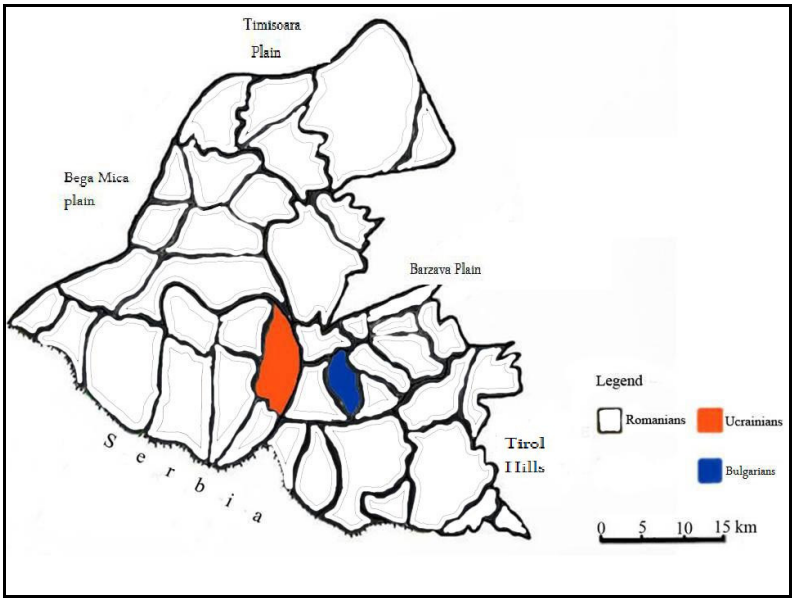


**Fig. 4.** The dominant ethnic groups in Birda-Moravița Plain at the 2002 census
*Source: A. Varga (2002)*

## 5. THE ETHNIC ELEMENT EVALUATION AT MICRO STRUCTURAL LEVEL

The ethnic element evaluation at regional level does not always have certain particularities that generate major differences within the localities. This fact makes it necessary to also analyse in detail the ethnic specificity characteristics at micro regional level.

### *5.1. The Romanian population*

Birda-Moravița plain area is characterized by multiple ethnical structures. However, if we were to analyze the various nationalities recorded now and in the past within this area, we could observe the significant presence of the Romanians.

Starting with the 1880 census, significant Romanian population centres were identified in both Romanian old centres and in the newest ones, with various nationalities. In the 80's we could find, in old Romanian villages such as Jebel and Ghilad, more than 2000 Romanians, more precisely 2671 or 2173. There are also many regions where the population exceeded 1,000 Romanian inhabitants: Banloc, Petroman, Parța, Pădureni, Cebza, Denta.

The evolution of the Romanian population according to the 1880 census can be observed in the figure below.

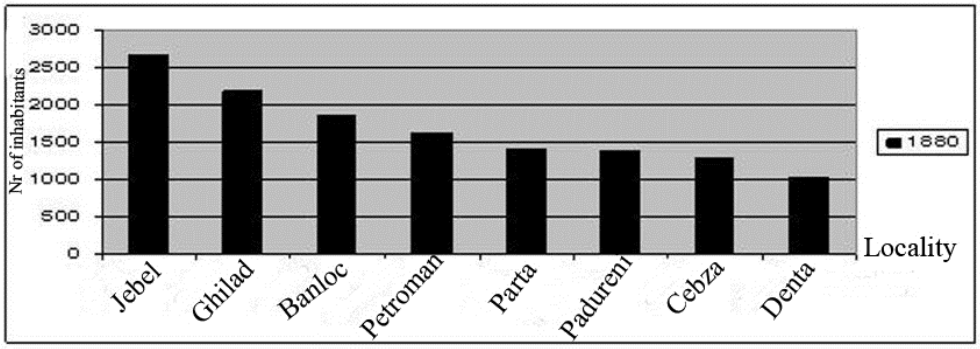


**Fig. 5.** Distribution of the Romanian population at the 1880 census
*Source: Adaptation according to A. Varga (2002)*

Less than 1000 inhabitants were registered in regions such as: Ferendia, Ciacova, Parța, Lățunaș, Livezile, Toager, Macedonia, Cerna, Clopodia, Obad, Gherman (table 1).

According to the 1900 census, the majority was held by Romanians and by the end of the 19th century, regarding the entire Banat area, Romanians were approaching absolute majority, with 600,000 persons (Crețan, 1999, p. 46).

**Table 1**

**Distribution of the Romanians at the 1880 census in communities with less than 1000 persons**

| Community | Ferendia | Ciacova | Partoș | Lățunaș | Livezile | Toager | Macedonia | Cerna | Clopodia | Obad | Gherman |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No. of inhabitants | 991 | 860 | 779 | 768 | 763 | 726 | 682 | 672 | 609 | 525 | 519 |
| Weight (%) | 80.43 | 20.39 | 80.55 | 87.07 | 46.86 | 86.42 | 88.91 | 96.96 | 40.27 | 71.81 | 93.17 |

*Source: A. Varga (2002)*

In 1900, in Ciacova-Deta area, in Deta subfield, there were communities in which the majority population was of Romanian origin: Berecuța (96,9%), Opatița (80,1%). Important numbers of Romanians were also recorded in: Jebel, Ghilad, Petroman, Pădureni (over 1000 Romanians), Cerna, Denta (starting from 1000 and up to 1300) (fig. 6).

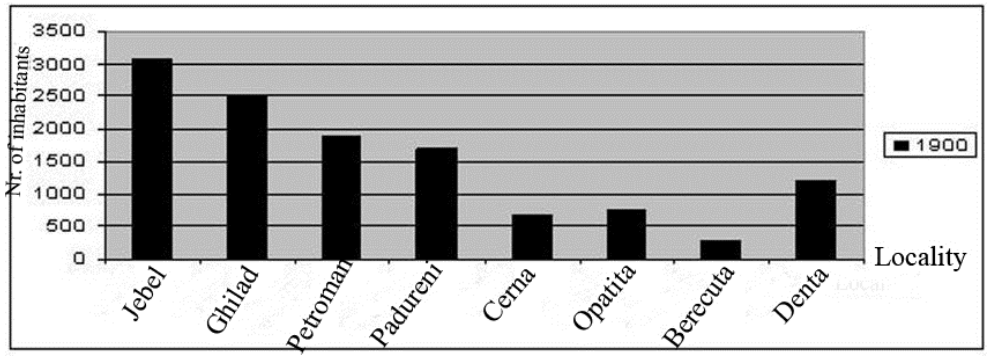


**Fig. 6.** The Romanian population at 1900 census
*Source:Adaptation after A. Varga (2002)*

The 1930 census highlighted a Romanian population growth in most places in Birda-Moravița plain.Therefore, at that time, in the Deta area there were 32 settlements, out of which 12 had an absolute majority of Romanians and only 4 had Romanians in a smaller number. There were over 2000 Romanians in old Romanian villages, such as Jebel, Ghilad, Banloc, with a percentage of around 40.9% (fig. 7).

Other settlements where the Romanian inhabitants prevailed in 1930 were: Berecuța, Gaiu Mic and Gherman (90-100%), Ferendia and Opatița (80-90%), Mănăstire, Folea, Partoș (50-80%), Voiteg (41,4%), Denta (38,9%), Clopodia (37,4%), Birda (33,4%), Sângeorge (33,7%) and Omor (32,6%).

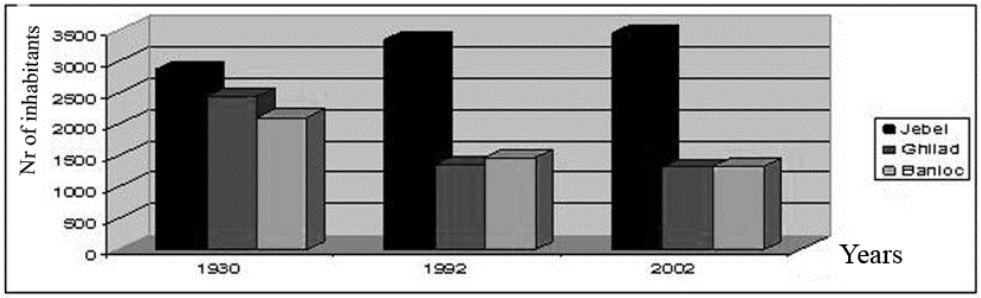


**Fig. 7.** The Romanian population in Jebel, Ghilad and Banloc at the 1930, 1992 and 2002 censuses
*Source: Adaptation after A. Varga (2002)*

Over 1000 persons could be found in both Ciacova area (Cebza, Pădureni, Petroman, Ciacova) and Deta area (Ferendia, Denta) (fig. 8.)

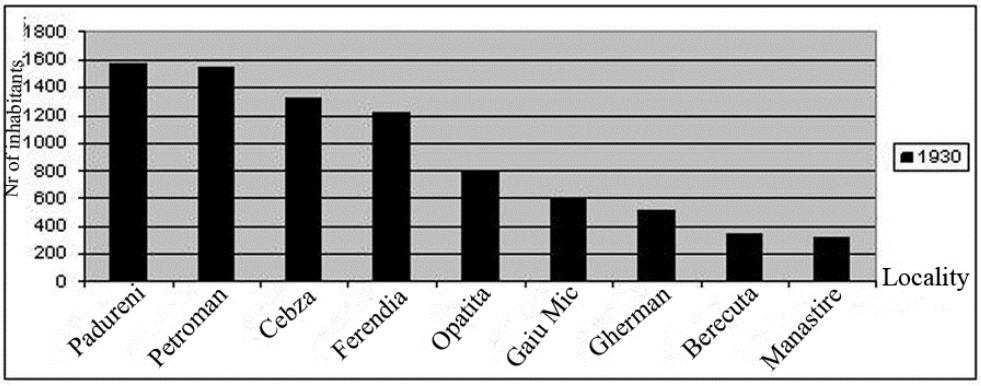


**Fig. 8.** Major Romanian settlements at the 1930 census
*Source:Adaptation after A. Varga (2002)*

Less than 1000 Romanians were registered in Macedonia, Toager, Tolvădia, Clopodia, Folia, Opatița and in Voiteg. The Romanian population registered smaller numbers of inhabitants in Breștea (6 persons), Moravița (53), Ofseniţa (57), Soca (30), Stamora Germană (69), regions dominated by Hungarians or Germans. Due to the high population growth, during this period, significant changes were registered in the ethnical structure, especially in places such as Lăţunaş, Opatița or Omor, where the Romanian population increased by almost 10%.

Significant increases of Romanian population were also registered in Jamu Mare, a commercial and agricultural village. Still, there were decreases in the number of Romanian inhabitants in some places. Such cases can be mentioned in Voiteg (-35.9%), Birda (-10.1%), Sângeorge (-26.6%), Jebel and Petroman. The reason for this decrease is the mass migration of Romanians towards Timişoara.

From the 24 regions belonging to the Ciacova area, 11 had a majority of Romanian population. Among these we mention: Cebza, Macedonia, Pădureni with 90-100% Romanians, Petroman and Toager (80-90%), Ghilad and Obad (50-80%).

If we compare the 1900, 1930 and the 2002 censuses, we can see a significant increase of the Romanian inhabitants in Serbian villages such as Dolat, in the mixed ones (Ciacova - 30,3% and Giera, Gad - 32,8%), or even in German villages (Stamora Germană, Liebling) as seen in fig. 9.

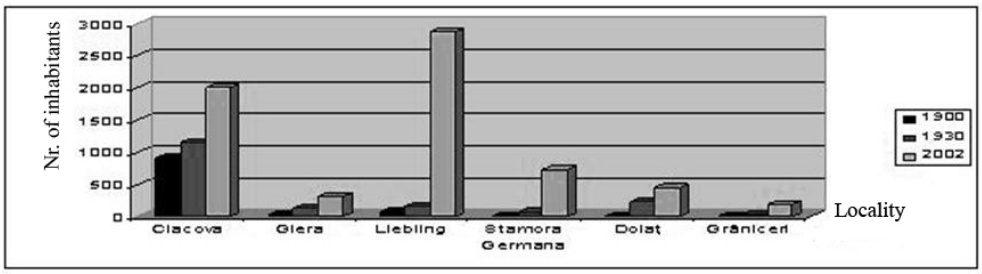


**Fig. 9.** Main settlements that have registered high increases of Romanian population between 1900, 1930 and 2002
*Source: Adaptation after A. Varga (2002)*

### *5.2. National minorities*

#### *5.2.1. The German minority*

In 1880 the number of registered Germans in the regions of Birda-Moravița plain was quite high. Liebling had a majority of German inhabitants. Other significant demographical masses of Germans were also registered in: Deta, Jamu Mare, Ciacova. Villages that had over 1000 Germans were: Moravița, Stamora-Germana, Dolat. Villages that had less than 1000 Germans were: Ofsenița, Voiteg, Grăniceri, Giera (fig. 10).

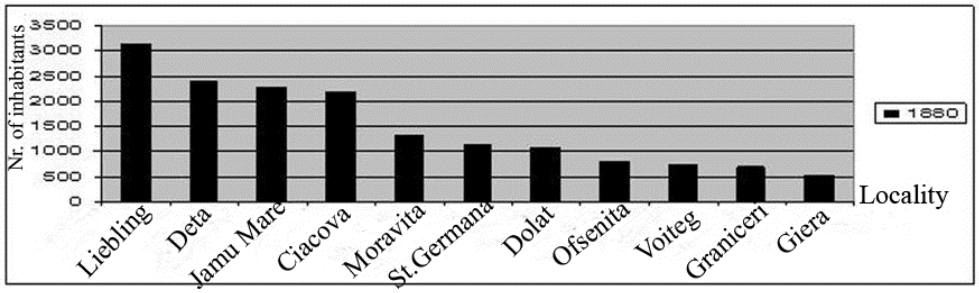


**Fig. 10.** The German population at the 1880 census in settlements with German majority
*Source:Adaptation after A. Varga (2002)*

According to the 1900 census, in Deta area there were settlements with an absolute majority of German population (Stamora-Germana, Jamu Mare, Deta and Voiteg). Still, in Birda the number of Germans was relatively small. In the Ciacova area we can mention Liebling as having only a German population and a majority of Germans in Ciavoş (70.8%), Ciacova and Giera (50-60%) was also observed.

The largest German community was in Liebling, followed by Ciacova (fig. 11).

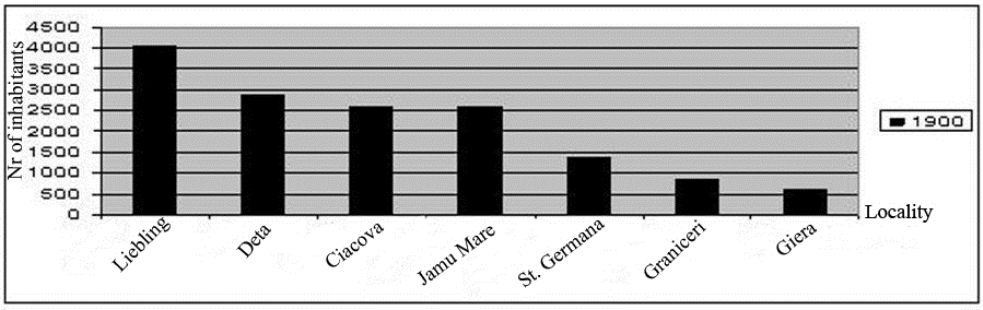


**Fig. 11.** Settlements with German majority in 1900
*Source: Adaptation after A.Varga (2002)*

The largest number of Germans (more than 2800) was registered in Deta, a higher value than in 1880. Very important numbers of Germans (1000-1700) were found in the regions of Stamora-Germana, Moraviţa and Voiteg. Around 100-600 Germans (9-30%) were living in Omor, Clopodia, Ferendia, Dejan, Breştea and Opatiţa.

The 1930 census showed significant changes in Birda-Moraviţa plain, because Jamu Mare and Deta (which in 1900 had an absolute German majority) registered a major decrease of German population. Such a decrease was also registered in the Omor village. Still, there was an increase in Birda (+259). The decrease in the Germans' number is due, especially, to migrations to the U.S.A. between 1900 and 1930.

Very important centres of German population were also recorded in Ciacova, Dolat, Moraviţa, Stamora-Germana and Voiteg. Birda, Ciavoş, Gier, Clopodia and Ofseniţa and registered less than 1000 Germans.

Although at the 1992 census the German balance was quite high in Timiş county, regions in Birda-Moraviţa Plain witnessed a major decline in German population. Thus, Deta, which in 1900 was of German majority (over 2,800 German inhabitants), in 1992 only had around 600 people of German origin. Ciacova, Jebel, Giera, Ghilad, Jamu Mare were also affected by drastic mass decreases in the German population. Compared to other censuses, in 1992 Ciacova had around 220 Germans (compared to over 2000 in early 1900, and about 1700 in 1930). In the same year, Jebel had around 70 Germans compared to 300 in 1900 and 200 in 1930. In Giera, Germans were reduced to 30 persons from 619 in 1900 and 243 in 1930. Ghilad registered, in 1992, a total of 66 Germans compared to 480 in 1900 and 312 in 1930. The demographical evolution of the German population and the drastic decreases in most places is represented in fig. 12.

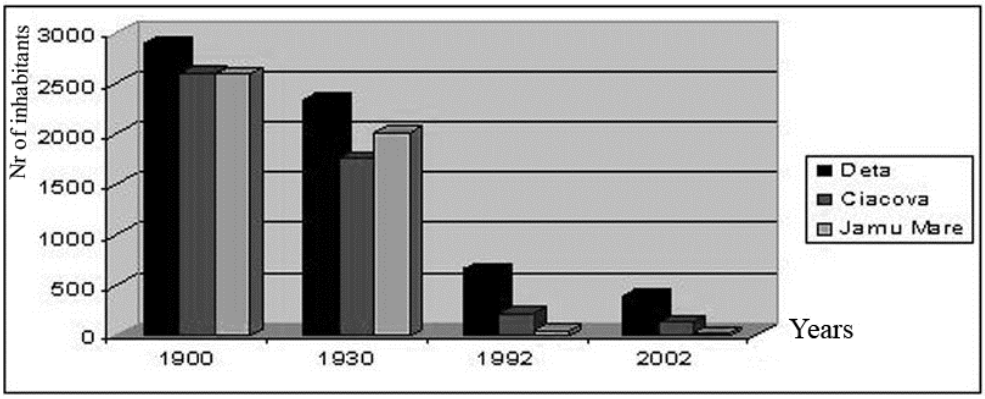


**Fig. 12.** Distribuiton of the German inhabitants in Deta, Ciacova and Jamu Mare at 1900, 1930, 1992 and 2002 censuses
*Source:Adaptation after A. Varga (2002)*

*5.2.2. The Hungarian minority*

The 1880 census registered a very weak presence of the Hungarian minority in the regions of Birda-Moravița plain, without exceeding 500 Hungarians in some places. However, the highest values were present in Dejan, Jebel, Jamu Mare and Deta.

According to the 1900 census, Ciacova-Deta area was one of *"the newest geographical areas inhabited by Hungarians"* (R. Creţan, 1999, p.119), the Deta subarea being one of the most densely Hungarian populated in Banat. Between 1821 and 1828 the first Hungarians were colonized in Dejan and in 1842 in Ghilad, both Romanian villages.

In Ciacova subarea the phenomenon of Hungarisation was not so strong and the Hungarian presence there was primarily due to colonization. However, very important numbers of Hungarians were found in Giera, Ghilad, Ciavoș and Jebel (15-25%), and in Ghilad, Ciacova and Jebel there were more than 500 Hungarians.

In Banloc-Denta area there was a village called Topola, that had Hungarian workers specialized in rice culture (Creţan, R., 1999, p.120). In 1910, the Deta area included several farms, like the rice plantation Karatsony, that was located at Partoș, near Banloc, and had 252 Hungarians, the Wekerle farms from Clopodia with 122 Hungarians, and the Tobacco Garden in Ofseniţa, with 130 Hungarians.

According to the 1930 census, Deta remained the main centre of the Hungarian population (971 persons), followed by Ciacova, Ghilad, Giera, Ciavoș, Jebel. The number of Hungarians (200-500) in Dejan, Omor, Partoș, Ferendia, Folea increased until 1913 and this was mainly due to the employment of Hungarian workers in agriculture outside the village or building new villages.

According to the 1992 census, Ciacova was a centre of Hungarian population, represented by 350 - 500 persons. Hungarians were found also in Giera and Roviniţa Mare, but in smaller numbers.

According to the 2002 census, the Hungarian population has been decreasing, but still had significant concentrations in Deta (1147-19.82%). In Ciacova it had a significant proportion, more precisely 408 persons, equivalent to 7.70%. In Banloc, in 2002, Hungarians were the most numerous of all minorities, representing around 5% of the total 230 persons. The numbers regarding the Hungarian population at 1930, 1992 and 2002 censuses are represented in fig. 13.

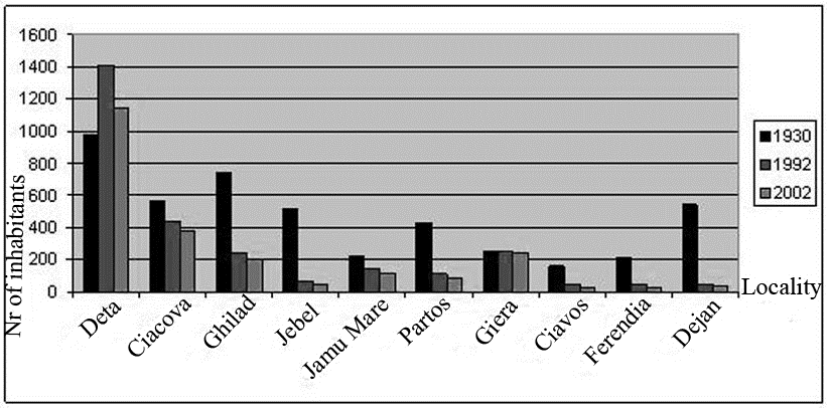


**Fig. 13.** Distribution of the Hungarian population at the 1930, 1992 and 2002 censuses
*Source: Adaptation after A. Varga (2002)*

*5.2.3. The Serbian minority*

The Serbian presence in the whole Banat area is *"the consequence of southern Slavs' migration, they mixed with the native Romanians and, in time, they were assimilated"* (R. Creţan, 1999, p. 141).

According to the 1880 census, Serbians were recorded in insignificant values in Birda-Moraviţa plain, values which did not exceed 1000 persons. However, higher numbers of Serbians were reported in Denta, Ciacova, Gad and Livezile (fig. 14).

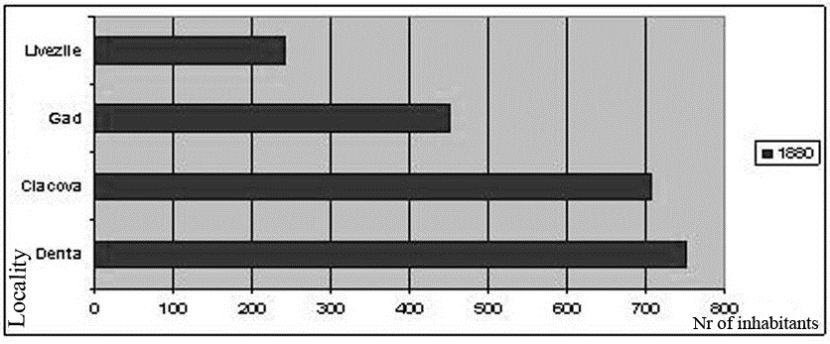


**Fig. 14.** Distribution of the Serbian population in 1880
*Source: Adaptation after A. Varga (2002)*

According to the 1900 census, major centres of Serbian families could be found in the Denta subarea. Although Serbians are found in many places, they are registered in small numbers. Denta was the village with the largest Serbian community, followed by Dejan, Sângeorge, Deta, Gaiu Mic, Partoș, with values from 5% to 25% (table 2).

**Table 2**

**Serbian population in communities with less than 1000 inhabitants in 1900**

| Community | Number of Serbians | Percentage (%) |
|---|---|---|
| Denta | 804 | 24.96 |
| Dejan | 158 | 18.03 |
| Sângeorge | 416 | 65 |
| Deta | 87 | 2.17 |
| Gaiu Mic | 85 | 12.70 |
| Partoș | 80 | 5.38 |

*Source: A. Varga (2002)*

In the subarea of Ciacova, according to the 1930 census, Serbians were found in Gad, Tolvădia, Giera and Ciacova but without forming significant mass population (from 100 to 600 persons). The reason of the Serbian population decrease is due to their migration to Yugoslavia (between 100 and 150 Serbians emigrated from Grăniceri) or towards Timișoara (Serbians from Ciacova). There were almost 2000 Serbians in Deta. Still, there were only two places with Serbian majority, namely Soca and Sângeorge. Besides these villages, a significant demographical Serbian population is found in Denta and Dejan.

There were no significant changes highlighted by the 1992 and 2002 censuses for Birda-Moravița region, the same places maintaining or even decreasing their Serbian mass population, the most important values being registered in Soca (22.17%) and Gad (25.15%). The main concentration of Serbian inhabitants in 1930, 1992 and 2002 is represented in fig. 15.

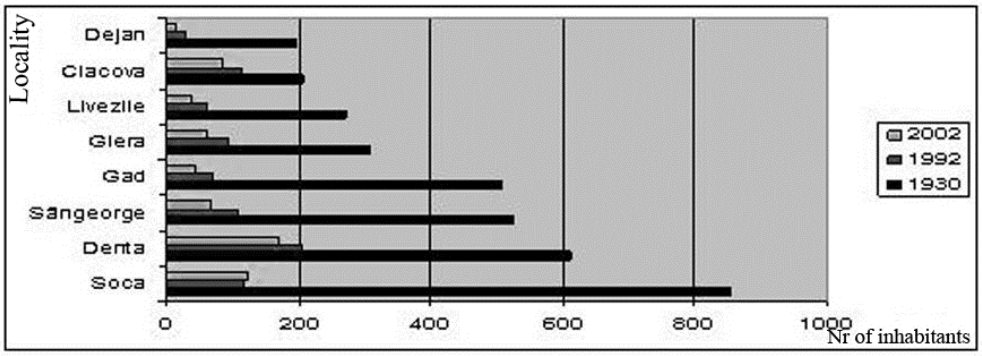


**Fig. 15.** Distribution of Serbian inhabitants by settlements in 1930, 1992 and 2002
*Source: Adaptation after A. Varga (2002)*

The passage from heterogeneity to a relative degree of ethnic homogeneity during the analysed censuses is presented in figure. Thus, the decrease of the German, Hungarian and Serbian inhabitants and the simultaneous increase of Romanian inhabitants becomes evident (fig. 16, 17 and 18).

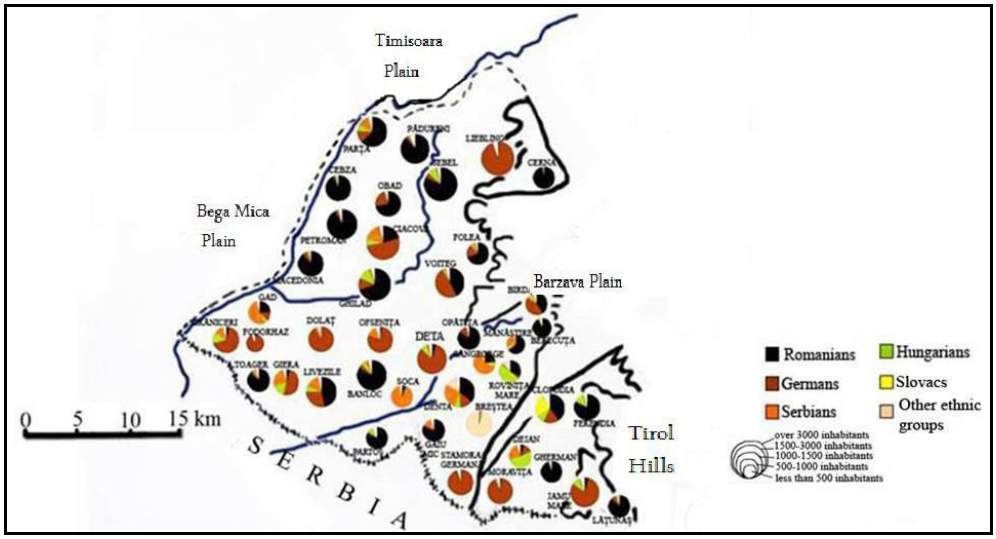


**Fig. 16.** Ethnic structure of settlements in 1880
*Source: A. Varga (2002)*

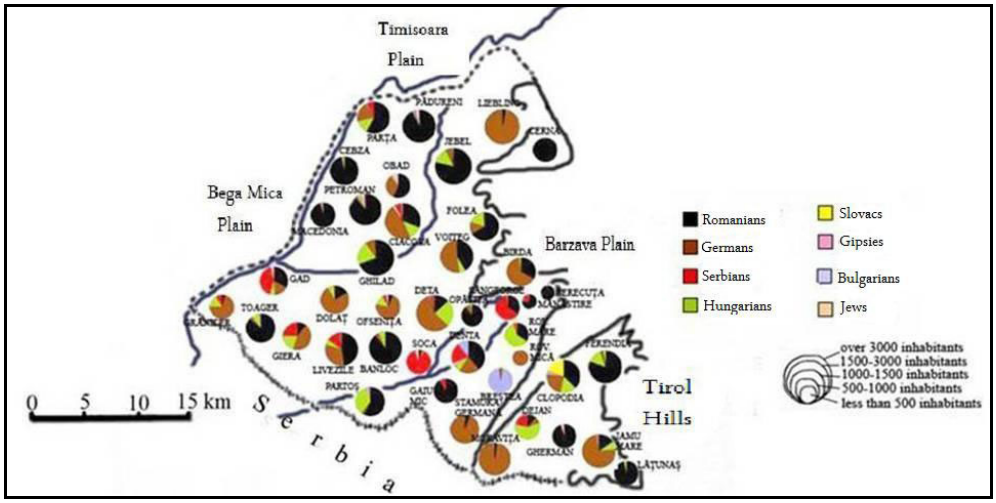


**Fig. 17.** Ethnic structure of settlements in 1930
*Source: A. Varga (2002)*

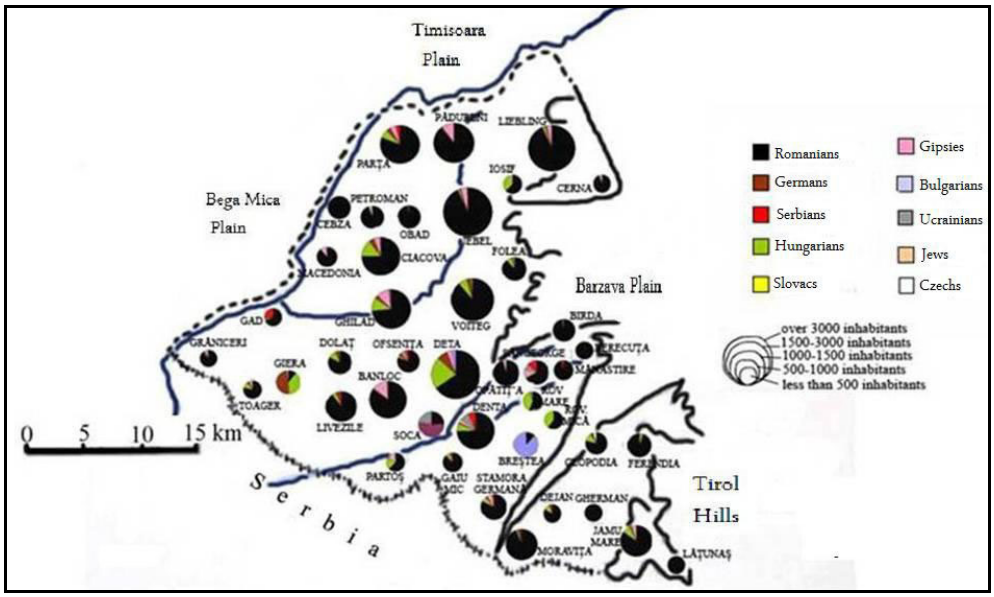


**Fig. 18.** Ethnic structure of settlements in 2002
*Source: A. Varga (2002)*

## 6. CONCLUSIONS

This paper reviewed concepts like ethnicity, ethnic group, social impact, presented in the works of authors such as R. Hartshorne (1950), T. Eriksen (1993), G. de Vos (1975), Elaine Burgess (1978), F. Barth (1969), R. Burge and F. Vanclay (1996), N.C. Taylor, C.H. Bryan and C.G. Goodrich (2004).

By using evaluation methods of the impact generated by the changes in the ethnic phenomenon at regional level, as well as classic analysis, synthesis and comparison methods, the main conclusion is that there was a homogenisation phenomenon of the population in 2002 as compared to 1880, 1900, 1930. The heterogeneous ethnic structure was mainly due to the historic circumstances in which the region was colonized by huge waves of German, Hungarian and Bulgarian population. The communes presented in the article were dominated by German, Hungarian, Serbian or Bulgarian inhabitants.

On the other hand, the increase of the ethnic homogeneity phenomenon that started after the 1990s and that has advanced until nowadays was generated by the massive migrations to other countries and regions. The migration from the village to the city also mobilized an important segment of the Hungarian, Serbian or Bulgarian population.

## REFERENCES


1. Barth, F. (1969), *Ethnic Groups and Boundaries*, Little, Brown & Co., Boston.
2. Burgess, Elaine (1978), *The Resurgence of Ethnicity: Myth or Reality?*, Ethnic and Racial Studies, p. 270.
3. Bir㎠escu, Gh. (1939), *Infiltrările maghiare din secolul al XIX-lea şi depopularea Banatului*, Monitorul Oficial şi Imprim.Stat., Bucureşti.
4. Creţan, R. (1999), *Etnie, confesiune si comportament electoral în Banat. Studiu geografic*, Edit. Universităţii de Vest, Timişoara.
5. Eller, J.D. (1999), *From Culture to Ethnicity to Conflict: An Anthropological Perspective on International Ethnic Conflict,* University of Michigan Press.
6. Eriksen, T. (1993), *Ethnicity and Nationalism. Anthropological Perspectives,* Oxford.
7. Hartshorne, R. (1950), *The functional Approach in Political Geography,* Annals of the Association of American Geographers, vol. 40, New York.
8. Ilie, G. (1930), *Colonizările în Banat în sec.XVIII-XIX,* Analele Banatului, an III, nr. 2-3, Timişoara.
9. Popp, N.M. (1942), *Populaţia Banatului în timpul lui Iosif al II-lea,* Lucrările Institutului de Geografie al Univ. din Cluj, Timişoara.
10. Posea, G. (1997), *Câmpia de Vest a României*, Edit. Fundaţia România de Mâine, Bucureşti.
11. Pounds, N.J.G. (1972), *Political Geography*, 2nd edition, Mc Graw-Hill, New York.
12. Schnapper, D. (1992), *L' identite culturelle*, Anthropos, Paris.
13. Taylor, N.C., Bryan, C.H., Goodrich, C.G. (2004), *Social Assessment: Theory, Process and Techniques*, New York.
14. Vanclay, F. (2002), *Social Impact Assessment*, in Tolba, M. (ed.) *Responding to Global Environmental Change*, Wiley.
15. Vanclay,F. and Burdge, R. (1996), *Social Impact Assessment: A Contribution to the State of the Art Series*, Impact Assessment, Vol 14, Taylor & Francis.
16. Vos, G. (1975), *Ethnic Pluralism: Conflict and Accommodation,* in G. de Vos and Lola Romanucci-Ross (eds.) *Ethnic Identity: Cultural Continuities and Change,* 16, Mayfield Publishing Company, Palo Alto.

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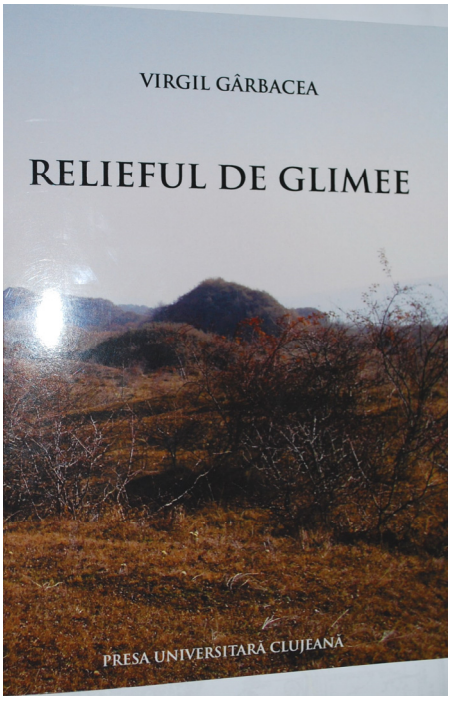
## *BOOK REVIEWS*

### Virgil Gârbacea (2013), *Glimee relief*, Edit. Presa Universitară Clujeană, 258 p.

The work *Glimee relief* of professor Virgil Gârbacea is much more than an event. The arguments could cover, from a journalistic point of view, fifty years of introspection on Transylvanian' slope dynamics, but it wouldn't succeed to value the emotions, the feelings and the enthusiasm of an analyst researcher, who loves the detail and the scientific accuracy of the information, like professor Gârbacea.




Glimee - type landslides from Transylvania have represented for the geomorphologist Virgil Gârbacea a first challenge in the international scientific arena. UIG Congress form New Delhi in 1968 have confirmed for the first time his scientific excellence by accepting the *glimee* term for monticule landslides from Transylvanian Depression, term proposed by the Romanian delegation (Morariu, T., Gârbacea, V).

The work Glimee Relief, structured in 13 chapters, approaches the complex issue of the place of the landslides from Romania, the factors that have a contribution to their genesis, the role of glimee in defining the function and the stability of the slopes, their role in defining the Transylvanian geomorphological landscape, the morphography and morphometry of glimee, glimee' morphodynamics, their age and geographical spreading in Romania, the particular morphodynamics of glimee from the Romanian geomorphosites and the possibility to value the lands with glimee.

The morphodynamics and the morphology of the landslides is analyzed in this study through the production mechanism and age (Tardiglaciar and Holocene), the author made a distinction between the landslides from the Subcarpathians or flysch Carpathians. Remarkable through the content of the terms given to the landslides in Romanian and international geomorphological literature, the work represents a masterpiece for professor Gârbacea's research and for the Cluj-Napoca'geomorphology School among the slopes dynamics and landslides in Transylvanian Depression.

The didactical and scientific exigency of the work can also be expressed by the precision of the quotes (page, line, article, review), but also by the relevant thoughts, as a magister of disciple, among the research results. The author quotes exactly the sources in the research history and arguments the landslides type in sub-chapter 2.3.

It is highly unusual the analysis of the glimee by the position on the slope and absolute altitude, an aspect approached in chapter III. *"Usually, the glimee-type landslides affect half or the superior third of the slope,* the moved masses rarely getting to the rivers that drain the valley". The upper statement is not applying to the landslides from Tăuţ, Fizeş, Daia, Apold, Măgherani, Fânaţele Clujului, Valea Teleacului, Tritenii de Jos, Suatu, Aruncuta, Bozieş, etc., where the landslides bodies (glimee) came to the river bed. Special cases are the landslides which are to be found on water paths (Sâmboieni, Bozieş, Dipşa, Sucutard, Suatu Nou, Romaneşti-Păucea, Ţeline).

The location of glimee in inferior hydrographical basins and the land' mass movements determined by the main river erosion reveals the regressive character of these, the movements begin on the inferior side of the slope and then, advance to the upper part.

The relief evolution by the Holocene glimee-type landslides is, partial, a certifying of the Albercht Penck's (1858-1954) model regarding slopes intersection under anterior surfaces, due to the sliding masses which "determined a lateral movement of the rivers that disturbed the equilibrium of the opposite slopes", according to the author, and to denudation complex (p.31, line 2).

The IV-th chapter emphasizes the morphographical and morphometrical characters of glimee. *Crown crack* marks the slope part in which was exceeded the resistance to encounter when the landslide occurred. The author states that "to each movement that generated a glimee area has a main crown crack", and its form makes the regional difference (Câmpia Transilvaniei, Dealurile Târnavelor, Podişul Hârtibaciului, Podişul Moldovei). Carefully analysis are made among the *sliding surface, the landslide body and the relief of glimee,* the author stating that "relief characters depend on the sliding speed, slope, lithology and strata", p.40. A special attention is given to the rows of landslides, to the longitude and transversal depressions, to the thickness of the sliding masses and to the stability of the glimee-type landslides.

It is to be remarked in the V-th chapter (*Factors an favorable conditions for glimee*) the insistence of the author to establish the possible correlations between the dominant monocline structure, lithology and the frequency of the glimee areas, by "holding together" all the bibliographical resources and over 50 years of experience in investigating the Transylvanian Depression landslides morphology. The conclusions are relevant and constructive because the Neogene deposits (badenians, sarmatians, pannonians) by stratification and lithology are susceptible to mobility in minimum slope, high season differences raining regime and general folds presence. The argument is sustained by the author, based on the analysis of the volcanism, salt, limestone, clay minerals and diagenesis process.

Glimee morphodynamics brings to the reader's attention the mechanism of the movement. The author presents few models from Transylvanian Depression (authors: Mac, I., Irimuş, I.A., Surdeanu,V., Grecu, Floare, Tövissi, I., Matei, I., etc). The form-function dynamics of slopes has originals characteristics among the type difference of glimee landslides and their territorial expression.

The insequent or asequent glimee generate different paths for the geomorphological landscape, which are to be translated through the alignment of the landslides waves, the development of the depressions between landslides waves and, the morphological evolution of these waves and, least but not last the type of agricultural or edilitary exploitation. Next geomorphological processes (ablation, rill and gully erosion, surface erosion, creeping, human exploitation) have a secondary role in the determination of the specific morphology for glimee (chapter VIII).

A provocation, in analysis, is the age of glimee. The author is critical towards the predecessor geomorphology researchers (studies before 1950), which sustained that "massive landslides from our country have been formed in the rainy years, such as 1912- 1913 or 1942". The arguments brought are the pollen analysis made by E.Pop (1952), Morariu, Diaconeasa, Gârbacea (1964), Diaconeasa (1985),

Buz, Cianga, Diaconeasa, Gârbacea, Idu (1986), Meszaros, Moisescu (1991), Pendea (2005) and the determination of the absolute age for the Pădureni landslide (Ţop) through radiocarbon method (Beta Analytic Radiocarbon Dating Laboratory, Miami, Florida), in January 2013. Pollen analysis indicate an age between 127 Ka (Saalian-Eemian paraglaciar, Pendea, 2005) and subboreal (Diaconeasa, 1985 and Buz, Ciangă, Diaconeasa, Gârbacea, Idu, 1986) for the Pădureni landslide (Ţop), while the radiocarbon method, applied to the coal sample situated at a 2,95 m depth, in the swamp from Pădureni, confirms an absolute age for the landslide of 1820 +/- 30 ani BP.

The causes for the formation of glimee are widely analyzed reported to the morpho- climatic conditions from Tardiglaciar and Holocene, but also reported to the neotectonics, seismic, biological conditions (bacterian action), diagenesis processes and cationic change to the pedogenetic horizons.

The work validates without question, in the last chapters *Glimee landslides from Romania* and *Glimee- geographic mosaic*, the experience of these 50 years of research dedicated to Transylvanian glimee. The author presents in detail Transylvanian Depression' glimee, from Saschiz, Saeş, Movile (Podişul Hârtibaciului), Pădureni (Ţop), Bozieş (Câmpia Transilvaniei), Romaneşti-Păuşa (Dealurile Târnavelor); glimee from Gruiul Conţeşti (Piemontul Getic); Centum Monticuli "Suta de Movile", from Ştefăneşti, from Prut' river shore; the landslide from Nehoiu-Borcea, by quoting the sources and their authors, emphasizing the major contribution to the research of the glimee-landslides from Romania.

The last thoughts of the author is for the opportunities to value these areas with glimee, finishing with the suggestion that "if the proposals will be achieved and will be proved as a really useful, this kind of studies could be generalized for other area with glimee from our country".

**IOAN-AUREL IRIMUŞ**

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**Teodorescu, Z. Virgiliu, 2013, *Tiberiu Eremie. Un om de omenie, un demn exemplu de urmat* [*Tiberiu Eremie. An Utterly Humane Man, an Example to Follow*], Bucharest: Editura Agir, 196 p.**

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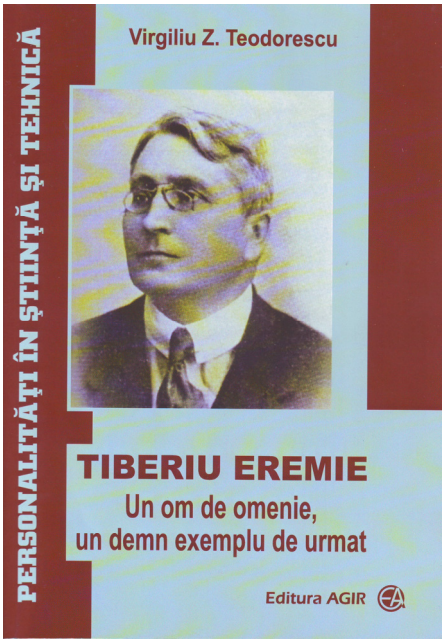
In the series entitled "Personalities in the Field of Science and Technology" published by Agir Press in Bucharest, the tireless researcher and historian Virgil Z. Teodorescu offers us a beautifully accomplished and well documented monograph dedicated to the personality and work of the late Tiberiu Eremie, a renowned construction engineer from the first half of the twentieth century. The book is prefaced by Professor Nicolae Noica, an exegete of our outstanding engineers who, through their technical-urbanistic work, left a prominent legacy in the Romanian cultural space. Bearing the title "Let us not forget them," the preface is a plea for keeping alive, in the public consciousness of the Romanians, the personalities of our technical culture, not forgetting them and/or relegating them to the margins.

The author opens the monograph dedicated to the engineer Tiberiu Eremie with an "Argument," in which he confesses that over the course of his extensive research on the public monuments in Romania, he has often encountered the name of Tiberiu Eremia, which sparked his interest in this prolific constructor. Later, impressed by his professional training, his humaneness, and the multitude and diversity of the constructions he accomplished throughout the Greater Romania, he decided to devote a monograph to him, which led to the publication of in this book. Driven by his belief - namely that the year 2018, marking the centenary of the Great Union, must be one of reflection and analysis, both individual and collective, on what each of us and all of us together have achieved for




the Homeland - the author finds it appropriate to write this book dedicated to Tiberiu Eremia, whom he considers to be a role model, who has done a tremendous amount for his country, as will be shown below.

The entire content of the book is concentrated in the chapter "An utterly humane man," a phrase that comprises, as the author believes, the life and work of the engineer Tiberiu Eremia: his birth and paternal branch, his going to school in Braşov, his attendance of the polytechnic in the country of the Cantons, Switzerland, his career path and his family, the portfolio of his achievements as a constructor, all of these being accompanied by numerous images, archival photographs, civil status records, documents, etc. The volume ends with an ample chapter of "Notes" (pp. 121-195), whereby Professor Teodorescu, with his characteristic scientific thoroughness, provides us with comprehensive "files" on the personalities, facts and buildings mentioned in the book, which lend themselves to a captivating and highly instructive reading given the information they convey.

Tiberiu Eremia was born in the locality Purcăreni, near Braşov, in 1875. His native village is part of a suite of Romanian settlements located inside the Curvature Carpathians, along an extended glacis, interposed between the mountainous frame and the flat plain of Burzenland, which has been favorable to sheep farming. The area includes: Teliu, Budila, Cărpiniş, and then Săcelele, with its seven settlements - Baciu, Turcheş, Cernatu, Satulung, Tărlungeni, Zizin and Purcăreni. His native village was a settlement of hard-working shepherds, known as *mocani*, who had close connections with Wallachia, where they often took their herds, in a perpetual oscillatory transhumance. All these villages, together with those around Bran, had come to have, in the mid-nineteenth century, over 1.5 million sheep in the "homeland," where they also intensely traded dairy and wool products. Like many Romanian families, the parents of Tiberiu Eremie, Dumitru and Suzana Eremie, went into the "homeland", settling as farmers near Râmnicu Sărat, at Măxineni, then at Măicănești and, eventually, at Epureni, in Tutova (present-day Vaslui), where, due to their diligence and relentless effort, they developed a fruitful farming activity. Once established in the "homeland" (1893), the Eremia spouses supported the local community from the Epureni estate, which they had managed to buy, erecting a building for the school, houses for teachers, and supporting the gifted children without financial possibilities.

Tiberiu was the first of five children in the Eremia family (four sons and a daughter) and was born in Purcăreni. He attended the "Andrei Şaguna" Highschool in Braşov, where he proved to be a very diligent student, which is why he was "the prefect of the students"; a photograph from 1893 photos captures the young man with a scarf that defined his status as the best student of the school (p. 21). In the period October 1893-March 1897, he successfully completed courses of the Polytechnic School in Zurich. Once he became an engineer specialized in "bridges and roads," he requested and obtained Romanian citizenship in 1898, settling in the "homeland" and occupying a position in the Ministry of Public Works, under the leadership of the engineer Elie Radu. An adept of the new construction technologies, using reinforced concrete, the young engineer was

entrusted the realization of infrastructure works, such as roads, railways, bridges, dams, and public buildings. His early achievements included the bridge across the river Simila (on Bârlad-Vaslui road), Hangu Bridge on the river Bistrița, the headrace from Ulmi, numerous urbanistic constructions in Ploiești, Pitești and Bucharest. In 1906 he became an entrepreneur and then an associate of the company "Reinforced Concrete and Iron"; later, he founded his own company, "The Engineer Tiberiu Eremie General Technical Enterprises," which became a Romanian company of great renown during the pre-war period.

Among the many buildings that he constructed, let us mention the most representative ones: the Triumphal Arch, the Palace of the Faculty of Law, the "palaces," as they were called at the time, of the companies Imobiliara, Agricola-Fonciera, Adriatica-Trieste, and then of "The Romanian Youth," of the students in medicine, of the Journalists' Union, the Louvre (now Capitol) Hotel, all the emblematic buildings of Bucharest, the Mărășești Mausoleum and countless churches: the Coronation Cathedral in Alba Iulia (incidentally, this great edifice was built in just two years [1921-1922]!, an outstanding technical and organizational feat particularly at the time), the Orthodox Cathedral and St. Nicholas' Church in Cluj, the Orthodox churches in Sighișoara, Orăștie, Blaj, Timișoara, etc. Among the impressive industrial buildings he made, there is IAR- Brașov, the Locomotive Factory in Brăila, the "Ford" plant in Bucharest, as well as numerous railway works: the railway lines linking Bumbești-Jiu, Fieni-Moroeni, etc.

In time, thanks to the quality of the aforementioned buildings, his construction contracting expanded and consolidated, becoming a well-known brand in the country. Like all the Romanian industrialists of his time who asserted themselves based on merit, as were Dumitru Bragadiru, A. Grigoriu, Dumitru Mociorniță, and C. Grigorescu, Tiberiu Eremia founded and sponsored charities, cultural societies, or societies for supporting the deserving youth. After his death in December 1937, he was buried in the Bellu cemetery. In his newspaper *Neamul Românesc*, Nicolae Iorga published the following in his article entitled "A great builder has passed away": "this descendant of the diligent *mocani,* consolidators of the nation and creators of wealth, the element that is most full of initiative among this nation [...]. From one end of the country to another, he built. He worked until his demise with the same supreme satisfaction of well-accomplished work." This is how the great scholar painted the portrait of a true role model!

The text is completed with many suggestive images, some of them rare, as is, for instance, the folk costumes from Purcăreni, the family members of the engineer Eremia, Romanian public and industrial buildings captured at various stages of completion or in various historical eras, such as the Triumphal Arch, Bragadiru Palace (Bucharest), the Palace for Romanian Culture and Literature from Chernivtsi in Bukovina, or the Ford plants (in Bucharest).

The book concludes with numerous "Notes," which are themselves an important source of information, with a high density of - sometimes unpublished - data regarding personalities, public buildings and monuments, cultural and economic societies, etc. the composition of the "Notes" represents a genuine "touchstone" for any researcher, in this case attesting the extensive experience, professionalism and refined exegesis of the septuagenarian Professor Virgil Z. Teodorescu. Moreover, the sheer volume of the "Notes" and the eye for detail are key features of his writings, whether they are books written or edited by him. In this regard, worth mentioning are: *Mihail Eminescu. Simboluri ale cinstirii* (Bucharest: Editura Monitorul Oficial, 2000), *Întru cinstirea lui Ștefan cel Mare* (Bucharest: Editura Economică, 2004), *Un parc centenar: Parcul Carol I* (Bucharest: Editura Muzeului Municipiului București, 2007, with 630 notes), and the third edition of Gheorghe Crutzescu's book *Podul Mogoșoaiei-Povestea unei străzi"* (Editura Biblioteca Bucureștilor, 2011, with 2416 notes!), which he edited. All these lead us to conclude that the author is a fine connoisseur of the elements of the Romanian architectural and biographical heritage.

In conclusion, this is a beautiful monograph dedicated to one of the greatest Romanian construction engineers from Transylvania - Tiberiu Eremia, a model of professional and civic conduct for anyone to follow. Richly illustrated, the book also undertakes a project of educating the gaze, evincing strong pedagogical valences and, what is more, being a work that prevents forgetfulness. I warmly recommend it to the youth, as well as to all those who are passionate about and interested in the inestimably valuable elements of Romanian identity.

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