

## MULTI-SCALE ANALYSIS OF THE DEMOGRAPHIC EVOLUTION IN THE APUSENI MOUNTAINS BETWEEN 1880 AND 2008

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**ABSTRACT** – In the following paper aims at studying the evolution of the population size in the Apuseni Mountains during 1880 – 2008, on different spatial scales. From the second half of the 20th century, the area has recorded a continual decrease of the demographic potential, accompanied by the deterioration of the age group structures because of the increase of the migratory effect. Following the same downward trend, different subregional evolutions determined by social and economic factors can be highlighted on the LAU1 scale (counties) and at the scale of three altitudinal-delimited areas (as the expression of the increasing limitations of natural agrarian factors). At the LAU2 scale (communes and towns), on the same decreasing trend, positive dynamic of the population appears in some towns of the area. However, we found the most diverse evolutions at the settlement level. In this study, we cover the demographic evolution of the villages that are commune centres and villages with population below 50 residents. Both categories highlight spatial and functional transformations that have occurred and are to take place in the rural mountain.

**Key words:** multi-scale analysis, demographic decline, regional disparities, spatial and functional transformations

### INTRODUCTION

Known in geographic literature as the most populated mountains of Romania, the same as an economically under-developed area, the Apuseni Mountains have been an area characterized by an outward population flux over the last century and half. In time, this has led to a real demographic decline that has been locally equivalent with depopulation and associated with the deterioration of the population structure. The study “Demographic risk in the Apuseni Mountains” analyses the present state of fact (using 2002 census data) by highlighting the vulnerabilities of the regional system. Those are: high ageing and economic dependency indexes all over the region; high feminization index for the group age of over 60 years old, especially in the mining areas; low level of minimal utilities per locality (schools, commercial, religious unities, etc.) in the upper basin of the Arieş River (Surd V., et al., 2007, pp. 89-94).

Both the diachronic and the multi-spatial scale analysis of the population that we propose in this study provides an extra accuracy and points out causalities and trends with spatial and functional impact. For this study, we have used bibliographical sources for the population evolution up to 1956, statistical data from the 1956 and 2002 censuses, and 1990 to 2008 series of yearly data from NIS (National Institute of Statistics). The analysis scales will be:

- the Apuseni Mountains region;
- six county areas with partial territory in the Apuseni Mountains (to which we will refer to as the Alba, Arad, Bihor, Cluj, Hunedoara and the Sălaj Apuseni);
- three areas marked by increasing limitations of natural agrarian factors: a peripheral area, the official mountain area, and the over 800m altitude communes area;
- 167 administrative units, LAU2 in accordance with the EU nomenclature (for calculation accuracy reasons we will analyse the commune of Negreni in Cluj county – founded in 2002 – with the commune of Ciucea to which it formerly belonged, and Treznea

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commune in Sălaj County with the commune of Agrij, from which it was separated in 1995);

- the village and town level: the settlements that are commune or town centres and the villages that recorded less than 50 residents at the 2002 census.

The phenomena captured by using the multi-scale analysis are regional demographic decline, subregional disparities and spatial and functional transformations triggered by the dynamics of the population.

### REGIONAL DEMOGRAPHIC DECLINE

On January 1, 2008, the population of the Apuseni Mountains barely passed 500,000 (504.891 residents), representing 2.35% of Romania's population. This value represents 93% of the population registered in 1880 and only 71% of that from 1941, when the area reached its maximum demographic peak (709,014 residents). In the analyzed period, the population has grown almost continuously until the census in 1941 (with a noticed syncope in the 1920 census, caused by the First World War), followed by a declining trend already visible in the 1956 census that continues to this day. From 1956 to 2008, the Apuseni Mountains have lost over a quarter of their population (27%), making it an annual rate of -0.5%. After 1990, a demographic decrease appears at the national level too, but in the Apuseni Mountains, the rate doubled: -15% compared to -7.25%.

Given the population decrease caused by the reduced birth rates that have appeared in the West European states in the second half of the last century that Romania has been experiencing since 1990, the high rate of population decline in the Apuseni Mountains is mostly the cause of massive migrations. Although this mountain area has long been a population source for the neighbouring and even far away regions, until the last mid-century, the natural increment surpassed the negative migratory increment and insured a strong increase of the mountain population.

The massive industrialization of the towns located in the area and especially of the big cities situated in the mountain outskirts, as well as the forced collectivization of agriculture in the marginal depressions after 1960 were the events that attracted the high rise in the migratory deficit. The migration did not just affect the size of the population directly, but also contributed to the strong deterioration of the age group structure in the mountain area (most of the people that migrated were able-bodied ones, thus affecting the procreating stock of the communities they were leaving). This way, the aging structure of the population determined the continuous reduction of the natural increment that becomes negative in 1980, 20 years earlier than the national one.

**Table 1.** Values of demographic increase in the Apuseni Mountains at the beginning and at the end of the 20<sup>th</sup> century (according to Beuran N. et al., 1980-1985) and in the 1990-2007 period (based upon the statistical data from NIS, Tempo-online, 2009)

	1901 - 1910	1966 - 1980	1990 - 2007
Natural increase (‰)	9,8	4,8	-6,1
Migratory increase (‰)	-2,4	-8,2	-3,2
Total increase (‰)	7,4	-3,4	-9,3

After 1990, other radical economic and social transformations occurred in Romania and affected the Apuseni Mountains area, too. The transition to the market economy strongly affects the great slow performing industrial units and gives birth to high rates of unemployment and early retirement. The land reform (by dismantling the collective farms and giving back the land to the previous owners) attracts towards the village and agriculture not only those interested in this economic domain, but also many of the laid off and retired of the great dying industries back to a subsistence agriculture. As a result, a decrease in the migratory increment appears, and actually, a positive increment was registered between 2002 and 2005 on the regional level, and starting with 1994 in the Arad Apuseni, with 1998 in the Hunedoara Apuseni and with 2003 in the Cluj Apuseni. Even so, the

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age group structure strongly affected by the long period of negative natural increment and continuous emigration (25 % of the total population are 60 years old and over compared to the national average of 19 %) make impossible to change the declining trend, at least on medium term.

The demographic decline has more important consequences than the size reduction of the population. According to Michel Bassand, one's region high and prolonged migratory deficit leads to a "vicious circle of underdevelopment". The demographic decline eventually leads to the erosion of regional identities that amplifies through its two consequences: the acceleration of the resident exodus, and the dismantling of the communities. This accentuates the inherent problems of the disfavoured areas: economic regression, political dependence and cultural marginalization, often accompanied by the degradation and atrophy of the cultural and ecological heritage of the region (Bassand M., 1984, quoted by Plăiaș I., 1994, p. 103).

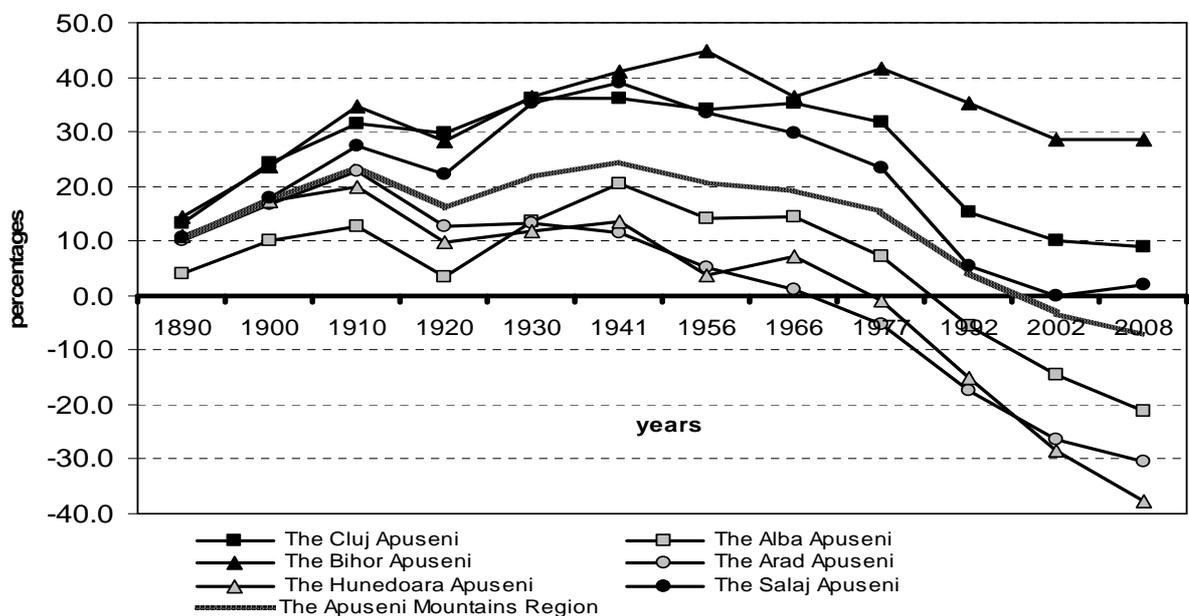
**SUBREGIONAL DISPARITIES**

Compared to the regional situation, which reflects a medial status, depending on certain physical-geographic or social-economic factors, the evolution of the Apuseni population has some spatial differentiations.

*Evolution in county zones*

In county mountain areas (LAU1), we can see different times for the population decrease to start, from the early 20<sup>th</sup> century (the Arad and the Hunedoara Apuseni), to dynamics similar to the regional level (the Alba and Sălaj Apuseni) and to late decreasing start for Bihor and Cluj areas. Following the population curves on the chart, we see that three county areas have less population in 2008 than they had in 1880, with the lines intersecting the 1880 value axis in 1996 for Hunedoara (whose population in 2008 is nearly 40 % lower than in 1880), 1977 for Arad and 1992 for Alba. The Bihor mountain area registered the best evolution.

We can explain these major variations by the differences in the agrarian potential and the industrial development in the county, but also by the distinct demographic behaviour.



**Figure 1.** The evolution of the Apuseni Mountains population divided by mountain areas belonging to counties (adaptation from Varga E. Arpad, 2008 and statistical data from the NIS)

For instance, in the case of the Arad Apuseni, we primarily distinguish the negative demographic behaviour of the rural population with deep roots in the past that consists of limiting the number of children per family to one, two at most, in order to protect the family land from splitting

between inheritors (Beuran N. et al., 1980-1984). The demographic decline in the Arad Apuseni was also assisted by the strong migration in the years following the agriculture collectivization (after 1962). This process led to an excess of workforce that had to migrate to the region's cities and outwards the mountain area due to the lack of industrial activity in the rural (Oancea Cl., 2002, p. 70). The accentuated negative dynamics of Hunedoara county is also due to the overlapping of a negative natural increment (owing to the expansion of child limitation demographic behaviour to this mountain area, too) over a migratory deficit (Beuran N. et al., 1980-1984). The last was caused by the better economic development of the bordering areas and by the physical geographical conditions that are more restrictive to agriculture than the ones in Arad County. In these conditions, the Hunedoara Apuseni had the most aged population structure of the entire Apuseni Mountains: 14% youth, 58% adults, and 28% elders.

On the other hand, the maintenance of better equilibrium between the natural increment and the migratory increment over a longer period, but also the stronger reply to the pro-natal legislative measures adopted in 1968 and visible in the 1977 census were the causes for Bihor's better situation (Beuran N. et al., 1980-1985). This demographic equilibrium also translates into a younger age group structure of the population, the youngest of the entire analyzed mountain region: 18% youth, 59% adults, and 22% elders (in 2002).

### *Evolution in LAU2*

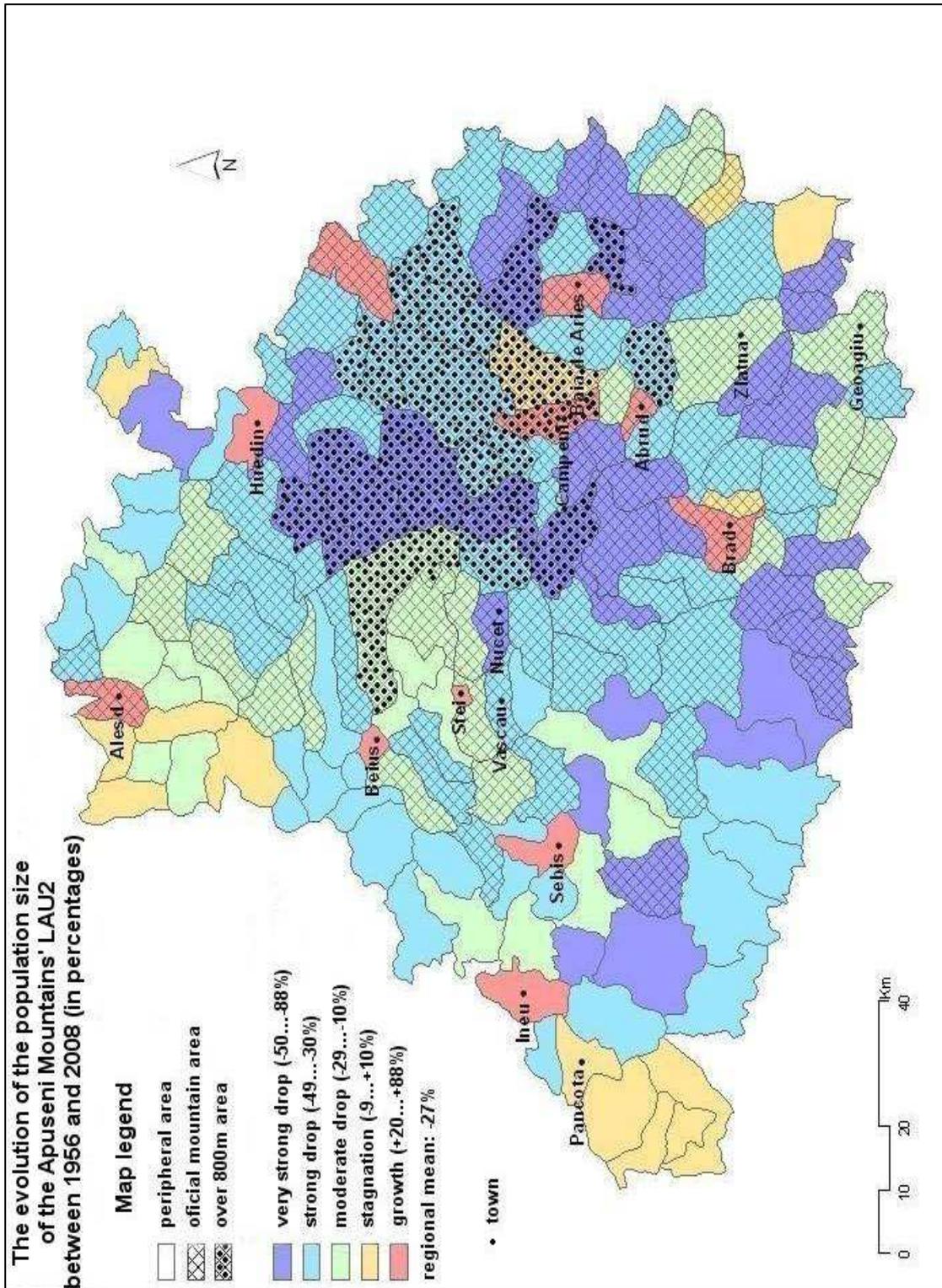
At the commune and town level, the situation is even more differentiated. Some communes reached their demographic peaks at the beginning of the 20<sup>th</sup> century without ever recovering: Chişindia, Păuliş (Arad County), Bucium (Alba County) in 1900, Blandiana (Alba County), Vârfurile (Arad County) in 1910, Sohodol (Alba County), Sâncraiu, Mănăstireni (Cluj County) in 1930, etc. Other administrative units have seen continuous increase (especially the urban units) or variations of the population depending on economic factors (e.g. mining areas where the demographic evolution follows the different rhythms of the extracting industry: Baia de Arieş, Roşia Montană in the Alba County, Vaşcău, Nucet in the Bihor County etc.). In general, most communes in a county area follow the area's trend (most of the communes in Arad and Hunedoara have reached their demographic peaks in 1910, and the ones in Bihor between 1941 and 1956).

The same as the regional and county situation for the period of 1956-2008, most territorial-administrative units have registered a regression of the population size. The majority of the analyzed units dropped over 10% (85% of the total number of LAU2), a quarter of them losing half or more of their population registered in 1956. Nearly half of those units that have dropped over 50% of their population are from the Alba Apuseni, area that counted the most massive population loss (-28.1%). A group of nine communes from Hunedoara County follows, among them the one with the highest decrease in the whole mountain area: Bulzeştii de Sus (-88%). Other such high declining administrative units appear in the Arad Apuseni (seven units) and Cluj Apuseni (five units). Just like in the county situation, the Bihor's LAU2 fare the best, with only one 50% drop in Nucet (-76%), tied to the reduction in uranium exploitation.

We can explain the dramatic situations presented above by the aging structure of the population: most of the above-mentioned communes having an elder population that surpassed 30 or even 40% of the total population in the 2002 census.

Still, there are administrative units that have stalled or even had a positive evolution in this period. From 167 administrative units, we notice eleven (6.6%) that have registered an increase of more than 20% (there is no commune with 11-19% increase). Most of them are towns, except for Gilău, where the hydro-energetic works present in its territory and the role as a supra communal centre ensured its 50.4% increase. In those cases, the industrialization (that attracted migrants from the neighbouring rural communes) and the service polarization (that are usually derived from their older roles as fairs) were the positive elements that explain the demographic growth: Aleşd +88%, Brad +63%; Beiuş +63%, Ştei +44%, Huedin +43%, Sebiş +35%, Ineu +35% Abrud +32%, Baia de Arieş +29%, Câmpeni +24%).

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**Figure 2.** The evolution of the Apuseni Mountains population on a LAU2 scale (adaptation after the 1956 census and NIS Tempo-online (2009) statistical data)

There are also townships that have dropped during this interval. Because they had only one industrial specialization, those townships recorded a decrease in population due to the reduction of mining activity: Nucet (-76%), Vașcău (-39%) and Zlatna (-12%). Geoagiu (-23%), which became a town only in 2001, actually shows the evolution of a rural commune (whose settlement structure and most functions it even kept).

Between the two major types of dynamics class (positive and negative), we noticed a stagnation class (14 units - 8.3% of the total), which includes the administrative units that have varied within modest limits (-9 to +10%). In the first row, their peripheral position is noticeable, usually benefiting by the complementary mountain and hill resources: the vine growing areas in the Zarand glaciis and in the southeast mountainside, and one group of communes west of the Vad-Borod Depression, around the town of Aleșd. Other rural administrative units that fit into this stationary dynamics category are situated near towns, and benefit by their industrial development: Crișcior, next to Brad, Bistra, next to Câmpeni and the already-mentioned group of communes close to Aleșd.

### *Evolution in altitudinal zones*

The main occupation of most of the residents living in the Apuseni Mountains is agriculture, an activity that the natural mountain conditions strongly influence. In order to apprehend those restrictive agricultural conditions on the population dynamics, we have chosen to observe its evolution in three areas with distinct physical and geographical characteristics. The official mountain area includes 99 communes from the Apuseni Mountains that have been declared as mountainous by Law no. 347 of 2004 (because of their natural restrictions to modern agriculture due to altitude and declivity). Within it, we have followed a sub-area formed by twenty communes and the town of Câmpeni, all with more than 75% of their surface above 800 m altitude (according to the categorization system established by Plăiaș I., 1994, p. 283). We will refer to them as “the high area”. The third area we call peripheral is made of 68 administrative units lying on low mountains and in the western depression, areas with a medium-low altitude (for spatial distribution see figure 2).

As we can see in table 2, during the period between 1880 and 2008, the peripheral area and the official mountain area presented a similar evolution to the Apuseni Mountains region. In the case of the high area, a significant difference appears. The population increase continued here until the 1966 census and registered double rates compared to other areas (after 1930). Afterwards, quick decrease followed. Ioan Plăiaș explains this situation through the fact that in this area regional migration was slow at the beginning, due to a later contact of the population with the urban environment, and a later realization of the differences in the quality of life (Plăiaș I., 1994, p. 98). The growing phenomenon was also sustained by a higher natural increment from 1981 to 1990, the above-mentioned author finds that the natural increment has always been negative in the group of the Apuseni communes situated between 400 and 1000 m altitude, but always positive for the subgroup of communes situated above 800 m altitude. However, as the same author notices, in this very area the burst of emigration phenomenon in 1990 was so much stronger as living conditions were worst and the chance to leave the area before the political event of 1989 quite limited. The value of the migratory increment registered in 1990 was -52 ‰ in high communes, compared to -28 ‰ for the communes between 400 and 1000 m altitude (Plăiaș I., 1994, pp. 97-98). Our calculations for the following period (1990-2007) show a persistent high difference between the average migratory increment at the regional level and that of the higher area (-3.2 ‰, respectively, -14.8‰), but also emphasize the lower natural decrease of -3.8 ‰ compared to -6.1 ‰, the regional mean. This traditionally higher natural increment led to the preservation of an age group structure that is slightly better than the regional average with one percent more youth and fewer elders, 18% youth, 58% adults, and 24% elders, respectively.

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**Table 2.** *The evolution of the Apuseni Mountains population in accordance to the agricultural limitations of the natural factors- percentage variations compared to the 1880 population (the population number recorded in each area in 1880 = 100).*

Area Year	Apuseni Mountains Region	Official mountain area	Communes above 800 m altitude	Peripheral area
1890	110	109	106	112
1900	119	117	112	122
1910	128	126	125	132
1920	121	118	112	123
1930	126	126	138	127
1941	131	132	154	130
1956	127	128	156	127
1966	125	126	157	123
1977	119	119	139	120
1992	105	103	113	108
2002	97	93	102	101
2008	93	88	98	100

*Adaptation from Varga E. Arpad, 2008, and NIS data (Tempo-online, 2009)*

#### LOCAL SPATIAL AND FUNCTIONAL TRANSFORMATIONS

The evolution at the village and town levels appears even more differentiated than was at commune level, stretching from spectacular increases to the disappearance of some settlements. Because of the important spatial and functional transformations that their demographic evolution can trigger, we paid more attention to two main kinds of settlements: commune and town centres, and villages with less than 50 residents.

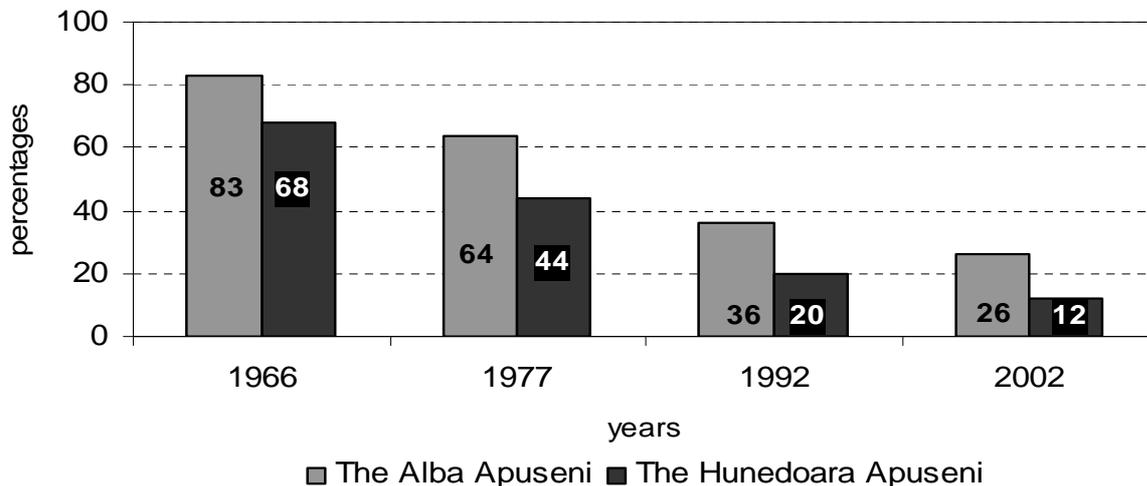
The polarization induced by administrative and service functions of the communes and township centres (in some cases doubled by industrial functions) usually reflects in demographic growth. In the case of the Apuseni Mountains, where after 1956, the demographic decline is the rule, this situation appears only in 29 cases out of 167 administrative units, most of them towns and supra-communal centres or villages with industrial development. However, between the 1956 and the 2002 censuses, most of the villages that serve as commune centres (80% of them) see a proportional demographic increase compared to the other villages of the commune, even if in absolute numbers the population decreased. This shows us a fortification of their position compared to the other villages in the communes. The phenomenon is noticeable in variable proportions. Stationary dynamics appears in 13% of the commune centres (e.g. Ighiu, Intregalde, Mărgău, Hășmaș, etc.). Other units gained only few percentages (Arieșeni from 3% to 5%, Lupșa from 16% to 19%, Râșca from 56% to 58%, Vârfurile from 23% to 27%, etc.) while some indicated an evident polarization dynamic (e.g. Bistra from 14% to 39%; Certeju de Sus from 18% to 47%, Dezna from 36% to 60%, etc.). The last category includes towns that attracted the population out of the town's component villages, or rural industrial centres.

In the present paper, we had to mention a special situation for the commune centres in the upper Arieș Basin. There, the demographic size of administrative centres and the percentage of their population in the commune's total population are very small, often not even reaching 10%. The very slow proportional increase over the last fifty years of those centres (most of them with 0-3%) is due to the specific territorial wide house dispersal that is the main way to exploit the mountain space. Here, the valleys (where the commune centres are located) were only access ways and administrative links to the extern world. The real life and most activities were located on the mountain slopes and interflaves in the very small, scattered villages named here "*crânguri*".

The second category under consideration includes the villages with 50 residents or less. In the region 222 such settlements were registered in the 2002 census, nearly all of them in Alba County (181 villages representing 35% of all villages in the Alba Apuseni) and Hunedoara County (30 villages, 15% of all villages in the Hunedoara Apuseni). As the soil resources are limited in the mountains, these very small villages represented a very suited form of traditional agricultural exploitation of the mountain space. Nowadays, geographic literature describes them as settlements that will certainly disappear due to the aging population and the lack of basic utilities: roads, electrical power, schools (Cocean, P., 2004, p. 63; Boțan, C. N., 2008, pp. 395-398).

However, by analyzing, at the time of the censuses, the percentage of the population living in the villages that have less than 50 residents in 2002 compared to the population of the same villages in 1956 (the year when most of these small settlements were declared villages), we can see a difference between the counties as regards the decrease rhythm. In short, the ones in the Alba Apuseni decrease slower, thus maintaining their viability for a longer period. This is due to different functions and different weight that these villages have in the communes they belong to. While very small villages in the Hunedoara Apuseni are usually few or even unique in the commune, in the Alba Apuseni these ones and the villages with 50 to 200 residents are the majority and they represent the basis of the territorial occupation.

This important difference leads to different functional and spatial impact of the local demographic decline. The disappearance of the very small villages in the Hunedoara Apuseni would not essentially affect the organization or the way the mountain space functions in that county. Nevertheless, the situation is different for the same type of settlements in the Alba County. In order to show the importance of these structures within the commune, we give some examples: in 2002, 17 out of the 30 villages of the Bucium commune had less than 50 residents each, and the same was the case in nine of the 10 villages in Ceru-Băcăinți, 13 out of 21 villages in Mogoș, 18 of the 39 in Vidra (two of which had no residents in 2002), etc. Their imminent disappearance would lead to a strong diminishment of the populated space that would be limited at the valleys and low depressions, while the mountain becomes desert.



**Figure 3.** *The inter-census evolution of the proportional weight of the population number in villages with less than 50 residents (in the 2002 census) compared to their population in 1956*

As agriculture decline, functional transformations can help perpetuate some of the small villages. This is the case of the recent “substitution” phenomenon of the rural population with secondary residents that has been noticed after 1990 in the Gilău-Muntele Mare area in the Cluj Apuseni.

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The tourist function replaces the traditional agricultural one, but with dramatic changes in the rhythms and aspect of the settlement (Drăgan M., 2009, p. 66).

### CONCLUSIONS

Over the last century, the size of the population living in the Apuseni Mountains has registered almost null final balance (the demographic decline after 1941 counter-balanced the first half period of continuous increase), but important changes in the group age structure occurred. Nowadays, the rapid aging and diminishing of population represents a vulnerability of the area, accentuating its peripheral character and leading to its ever-stronger dependence to the central areas outside the mountain.

The multi-scale analysis highlighted regional disparities: the very vulnerable areas with population declining fast through ageing and migration (the Hunedoara and the Alba Apuseni, the area of the communes situated over 800 m altitude), but also areas with a less negative or even positive dynamic (the Bihor Apuseni, most township, peripheral area). Those differences proceeded from different agricultural potential, different agricultural and industrial strategies over the time and different demographic behaviour.

Demographic evolutions at the local scale can trigger spatial and functional transformations. Spatially, regression of the occupied territory and loses in landscape maintenance can be waited suite to the imminent disappearance of some scattered settlements. Functionally, over the last half-century, we can observe the increase of the polarization within the settlement system by the increasing in proportional weight of the settlements with administrative function, and recent passage from the agrarian to tourist function in some villages due to the implantation of the secondary residences.

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