Spatial Resilience of the Ageing Population in the Romanian Functional Urban Areas

Marinela Istrate, Ionel Muntele, Alexandru Bănică

Abstract—The authors propose the identification, analysis and prognosis of the quantitative and qualitative evolution of the elderly population in the functional urban areas. The present paper takes into account the analysis of some representative indicators (the weight of the elderly population, ageing index, dynamic index of economic ageing of productive population etc.) and the elaboration of an integrated indicator that would help differentiate the population ageing forms in the 48 functional urban areas that were defined based on demographic and social-economic criteria for all large and medium cities in Romania.

Keywords—Ageing, demographic transition, functional urban areas, spatial resilience.

I. INTRODUCTION

A. The Concept of Spatial Resilience

AN emerging concept, sometimes perceived as unclear or not too inclusive, resilience represents "a measure of the persistence of systems and of their abilities to absorb change and disturbance and still maintain the same relationships between populations or state variables" [1].

The spatial component has become essential as the spatial variation of certain factors inside or outside a system influences and is influenced by its resilience to different time and space scales [2]. Part of the elements which induce spatial resilience is related to the internal configurations of the area of interest, namely to the internal organization of the system components and their interactions (the structure of the system), the properties with spatial relevance – size, shape (the morphology of the system), the configuration of the limits (nature, number), the spatial variation of the internal states of the system (succession stages, relevant transitions from the perspective of resilience) or, sometimes, to the characteristics which are specific to the system, partially depending on the space positioning. In equal terms, the external elements have the power to influence the ability to actively adapt from the spatial point of view through the following: the context (background, defined on the scale of spatial analysis which influences the system), mark (the area influenced by the system), connectivity (for this, an important role is played not

Marinela Istrate is with the Department of Geography, University Al. I. Cuza of Iasi, Romania, Bd. Carol I 20A (phone: 0232-201487 e-mail: marinelaistrate75@ahoo.com).

Ionel Muntele is with the Department of Geography, University Al. I. Cuza of Iasi, Romania, Bd. Carol I 20A and Romanian Academy, Iasi Branch, (e-mail: imuntele@yahoo.fr).

Alexandru Bănică is with the Department of Geography, University Al. I. Cuza of Iasi, Romania, Bd. Carol I 20A (e-mail: alexandrubanica@yahoo.com)

only by the accessibility and the fluency of communication, but also by the spatial compartmentalizing - discontinuity or its modular character). The general context shows that certain spatial dynamics generated by regulation mechanisms imposed by spatial configurations, i.e. "spatial subventions" favoured by their position close to certain privileged areas of abundant resources, technical equipment, human potential and so on which could spread the innovations to the interest areas [3]. All these elements should be considered in relation to others, specific to resilience, respectively to the ability of the system to undertake changes, maintaining at the same time the identity, the functionality thresholds of the system, its memory or potential to adapt and learn.

Increasing the spatial resilience requires a better functionality on different levels considering simultaneously their functional overlapping. For this reason, it is (re)produced by repeating the processes on different scales, ensuring there are reserves and premises for an increased safety. Thus, if certain disturbing factors can undermine certain social groups, elements of the technical infrastructure or of the production installations, the whole system is able to reorganize since certain similar functions can be found in other elements of the same type. At the level of the town communities, the resilience represents their ability to anticipate problems, but also the opportunities, to reduce the impact of threats by taking precaution measures, to answer adequately when they take a reshape later [4].

B. Functional Urban Areas in Romania

In urban and regional planning, linking differentiated ability for resilience to functional urban areas (or metropolitan areas, in a broader sense), which are complex systems, could be extremely important in order to make well-grounded decisions. This approach is decisive the more so as cities cannot be considered isolated entities, but urban regions depending on larger areas natural and human resources and also confronting risks striking at larger scale [5]. Only in such context one can analyse the resilience capacity as "the ability of the city to anticipate, to prepare for, respond to and recover from a disturbance" not just as the resistance to shocks [6].

Functional urban areas in the post-communist Romania were spatially induced by liberalization of land market, the "motorization" of population and the trend of axialisation and ex-urbanization of urban functions, of the former advantaging urban communes and those with a favourable position in relation to the transport network [7]. In Romania, the formation of metropolitan areas was officially stated since 2001, when Law no. 351/6.07.2001 defined them as voluntary partnerships between large cities (the capital and the first rank

cities) and the surrounding localities within 30 km distance. On the other hand it is important to analyse the so called "metropolitan realities" [8] i.e. a dynamic co-evolution of metropolises and influence area. Therefore one could delineate the early emergence of functional urban areas in case of Bucharest and around some big cities from western Romania, but also the contradictory evolution in the case of some cities marked by deindustrialization and massive migration of labour force, or, by contrary, the development of large functional areas by absorption of external capital flows and implementation of important projects (residential, trade, research and development facilities).

C. Ageing Features in Romania

During the last 25 years, Romania has witnessed profound social and economic changes and all these could be seen in the differences in the population dynamics and structure. One of the most important changes is population ageing, either referring to an ageing in the upper part of the age pyramid (prolonging the life period and continuously gathering numerous old age generations), or talking about an ageing in the lower part (substantial and long-lasting decrease of the fertility indicators, progressively diminishing the percentage of young population) [9]. At present, in Romania the ageing takes place on top and at the bottom, according to a model specific to most European countries [10]-[12], but deepened by the excessive erosion of the young adult population due to the massive emigration, a situation which definitely requires correction measures (Fig. 1).

In Romania, the vulnerability of replacing the generations was intensified by the arbitrary measures taken in the 1990's, when the retirement for people aged between 50 and 59 was made easier, as it was seen as a way of social management of unemployment, without considering the rather dark demographic perspectives, which had already been delineated since the last century, but especially without considering the risk of taking irreversible decisions. Unlike the countries in the Western Europe which had become prosperous before the ageing tendencies had been seen, Romania is taking a risk to face danger and become an old society from the demographical point of view, before knowing economic prosperity [13]. The age group structure can be considered one of the essential characteristics of a population as it is the result of numerous processes and they take place during a long period of time. It reflects the primary demographic processes (fertility, mortality, migration), being indispensable for creating several assessment indicators for the evolution of the demographic and economic phenomena.
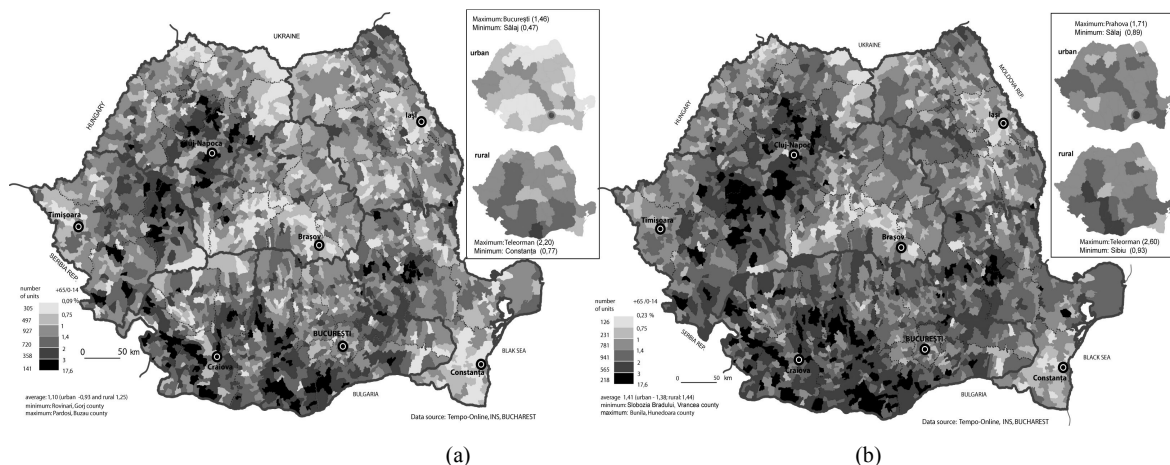

Fig. 1 Ageing index (+65/0-14) in Romania in 2002 (a) and 2011 (b) (Data source: [25])

Even more, the age group structure presents a wide range of psychological and social consequences, as well as cultural and medical and their assessment means there will be involved either optimistic (positive) points of view or negative ones (pessimistic) [14]. The positive evaluation of population ageing highlights the increase in life quality, especially life hope, ensuring a healthy old age and these indicators reflect the economic development, the public services for the old, the education level and cultural maturity of a society [15]. Nevertheless, more frequently, the ageing of the population is regarded more pessimistically, as an economic and social threat, especially when it affects the workforce and the sustainability of the retirement system [16]-[18].

Although it is relatively recent, the ageing process of the Romanian society has evolved in an alert rhythm and the speeding tendencies are obvious, deriving from a decline of fertility combined with the migration of the work force and these affect mainly the young population.

At present, the percentage of the old population (over 65 years old) has grown bigger than that of the young population (16.5% in comparison to 15.5% on 1st of January 2014, values estimated for the population residing in the country), while Romania is already facing numerous economic and social consequences of a population going through a slow but continuous process of ageing [19]. Out of the total of the Romanian old population, 48.4% lives in towns (2.2 million

people) and 51.6% in the countryside (2.3 million people), ageing in the countryside being accompanied by the growing number of females as the life expectancy for the female population is significant (including the life expectancy for 65 years old, which is currently 18 years for women and 14 for men).

An apparently simple assessment of the percentage of young and old people from the total population is rendered more complicated by the reciprocal relations of these two categories, as well as by the relations with other age categories of the population under study. Generated especially by the decrease in fertility and significant increase in life expectancy, as a direct consequence of improvement in the life quality and of the medical progress (its clear effect seen in the decrease of the mortality rates for age groups), the ageing process will undoubtedly strengthen in Romania in the near future [20]. It is estimated that 1 in 5 inhabitants will be older than 65 in 2030 and in 2060 the ratio will be 1 out of 3.At the same time with the change in the age group structure, the towns and the functional areas have witnessed important variations. During the communist years the towns were forced to adopt certain structures and configurations (induced by political decisions), not following an adequate development model, which led to demographic, social and spatial pressure. After the political change in 1989, the towns went through a spontaneous process of reconfiguration, searching a natural equilibrium according to the economic resources [21]. These phenomena are reflected on the age group structure, namely the decrease of young population percentage and the increase of population older than 60. Still, the situation is not similar for the metropolitan areas close to the towns, as most of them developed significantly, changing into residential or service

area, following the model of the market economy and often improving the population structure on age groups.

II. OBJECTIVES

Starting from the aspects presented in the introduction, the authors propose the identification, recovery and estimation of the quantitative and qualitative evolution of the old population from the urban functional areas, in the context of a general evolution disturbed by the effects of the selective international migration but also by the present day signs of a consistent migrating flow between towns and the countryside.

The main objective of this approach is to make an integrated analysis of the population ageing and its effects in the metropolitan areas of the big and middle towns in Romania. Subsequently, we aim to make an analysis of the population resilience of people older than 60 (65) from the point of view of their ability to face the challenges of the current social and economic context. In parallel, we have also studied the major territory disparities from the last 15 years, having noticeable effects on the deepening of the economic and social discrepancies between the Romanian regions. Even though the ageing process is a general phenomenon in Romania, there are spatial differences induced by the social and economic factors which accelerated/diminished the influence of certain vulnerability elements of the demographic structures. The last aim of the approach is to identify the trends of the demographic evolution of the functional areas in towns, whether they overtook or not part of the old population of the towns and if, finally, we could speak about towns which are getting old or about metropolitan areas which are more and more dynamic and younger.
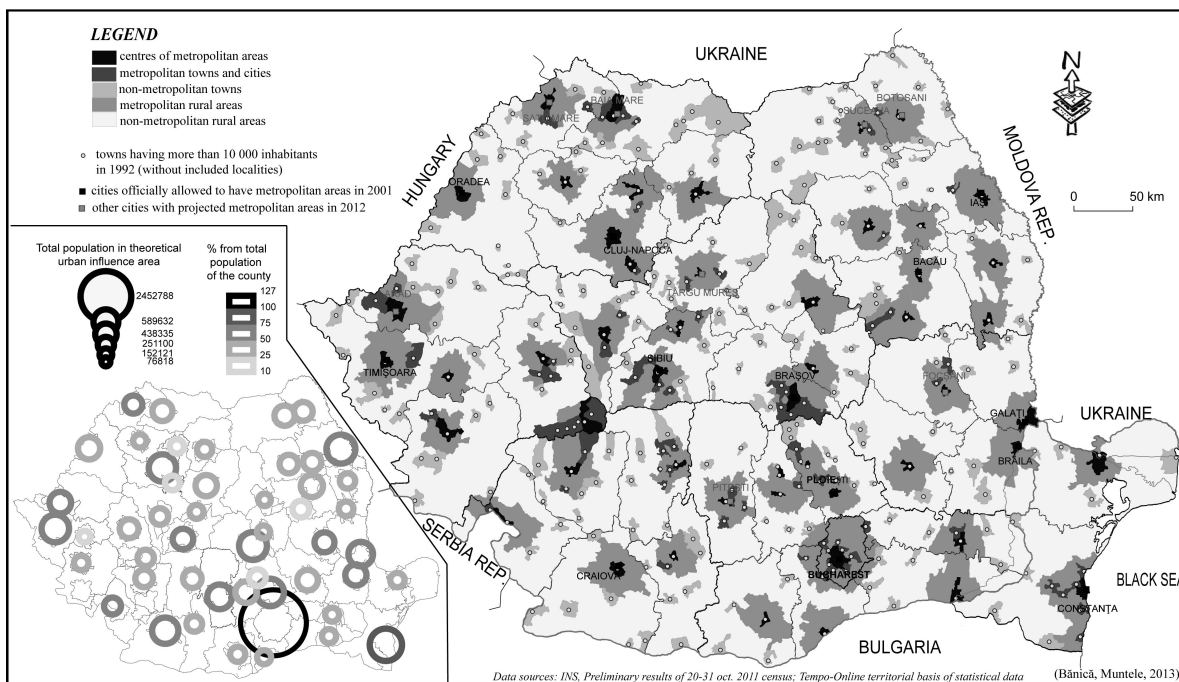

Fig. 2 Urban Functional Areas in Romania (Data source: [25])

III. METHODOLOGY

The first step was to define and delineate the chore-study areas by criteria that meet official requirements for metropolitan areas, but also by additional criteria which might help to identify other possible poles (Fig. 2). There were taken into consideration the functional areas of all cities surpassing 50000 inhabitants and the surrounding territory within a distance of 20 km outside the chore city built-up area where socio-economic relations are stronger if one refers to workforce flows and daily services [7].

The information used was undertaken from data provided by the National Institute of Statistics (Tempo-Online, population census from 2002 and 2011) and the database thus created was correlated to the cartographic support mentioned above. The methodology used to process the information corresponds to a time and space analysis specific to the geographic study of the population and territory. The complexity and importance of the analysis of age group structure of the population can be seen in a rather wide set of methods and techniques used in order to evaluate them [22]-[24].

In this study we have used a series of simple indicators (the percentages for the 0-14 year old, over 60 and over 65 categories) which are easy to interpret and give basic information related to the aspects under study, as well as indicators with a higher degree of complexity (ageing index, dependency indices, Billeter index etc.):

- *Ageing index* (A_i) – the ratio between ageing population that is out of workforce market (P_{65+}) and the young population under 14 (P_{0-14}) (1).

$$A_i = \frac{P_{65+}}{P_{0-14}} \qquad (1)$$

- *Billeter index* (B_i) represents the difference between those under 14 (P_{0-14}) and people over 50(P_{50+}) per 100 persons aged 15 to49 (P_{15-49}).The ageing of a population is more obvious when values are low (negative) (2).

$$B_i = \left[\frac{P_{0-14} - P_{50+}}{P_{15-49}}\right] * 100 \qquad (2)$$

- *Coefficient of inflow* (K_i) expresses the number of people joining the productive age group (P_{10-14}) per 100 people in the productive age (P_{15-64}) (3).

$$K_i = \frac{P_{10-14}}{P_{15-64}} * 100 \qquad (3)$$

- *Coefficient of outflow* (K_o) represents the outflow of 60 – 64 (P_{60-64}).year old from the productive age group (P_{15-64}) into post-productive (4).

$$K_o = \frac{P_{60-64}}{P_{15-64}} * 100 \qquad (4)$$

- *Coefficient of exchange* (K_{exc}) represents the changes in the ratio of "inflow" (P_{10-14}) to "outflow" (P_{50-64}) from the productive age category (5).

$$K_{exc} = \frac{P_{10-14}}{P_{50-64}} * 100 \qquad (5)$$

- *Dynamic index of economic ageing of productive population* (I_{ead}) represents the speed of the ageing process and the characteristic changes for both age categories (some limit groups getting younger alternate with others getting older)(6). The higher the value of I_{ead}, the more accelerated is the process of ageing. If the index had negative value the population is undergoing rejuvenation.

$$I_{ead} = \left[P_{(0-14)t} - P_{(0-14)t+n}\right] + \left[P_{(65+)t+n} - P_{(65+)t}\right] \qquad (6)$$

$P_{(0-14)t}$ – share of population aged 0-14 at the beginning of the study period; $P_{(0-14)t+n}$ – share of population aged 0-14 at the end of the study period; $P_{(65)t+n}$ – share of population aged 65+ at the end of the study period; $P_{(65)t+n}$ – share of population aged 65+ at the beginning of the study period.

- *Index of potential economic support* (I_{pes}) is expressed as the ratio between the population aged 20-64(P_{20-64}) and the population over 65(P_{50+}). It represents the number of active persons for one post-productive person (7).

$$I_{pes} = \frac{P_{20-64}}{P_{65+}} * 100 \qquad (7)$$

The data were standardized and normalized and used within an ascendant hierarchic classification (cluster analysis) in order to obtain typologies regarding the degree of ageing population in every urban functional area. Territorial mapping and interpretation of the above mentioned indicators is able to explain the contribution of spatial component in increasing/decreasing population resilience. This reduces the risk to reach generalizing conclusions that can be obtained when classical indicators of age structures are being applied at national level.

IV. RESULTS

A. Indices and Coefficients of Population Ageing

1. The Percentage of People over 60 in the Metropolitan Areas (Figs. 3 (a) and (b))

In 2002, the average of the percentage of people over 60 was 22.6%. The county towns presented the lower percentage the social and economic stability during the communist period, with a difference between the average towns (with very small of old people, a result of the numerous adult population and values) and the region metropolises (with slightly higher values), a result of the policy to bring them to the same level of development, which imposed the industrialization of the first category. To sum up, 361 urban and rural places (out of the total of 976 which were considered, namely 37%) had less than 20% people older than 60. There is an important number of rural places which fortunately witnessed an important movement of backward migration after 1990, which favoured the maintenance of an increased birth rate up to the present day and consequently, maintaining a rather young population,

especially in the area of the capital and the regional municipalities, as well as close to the middle-sized towns in

the eastern part of the country, favoured by a superior density of the rural population.
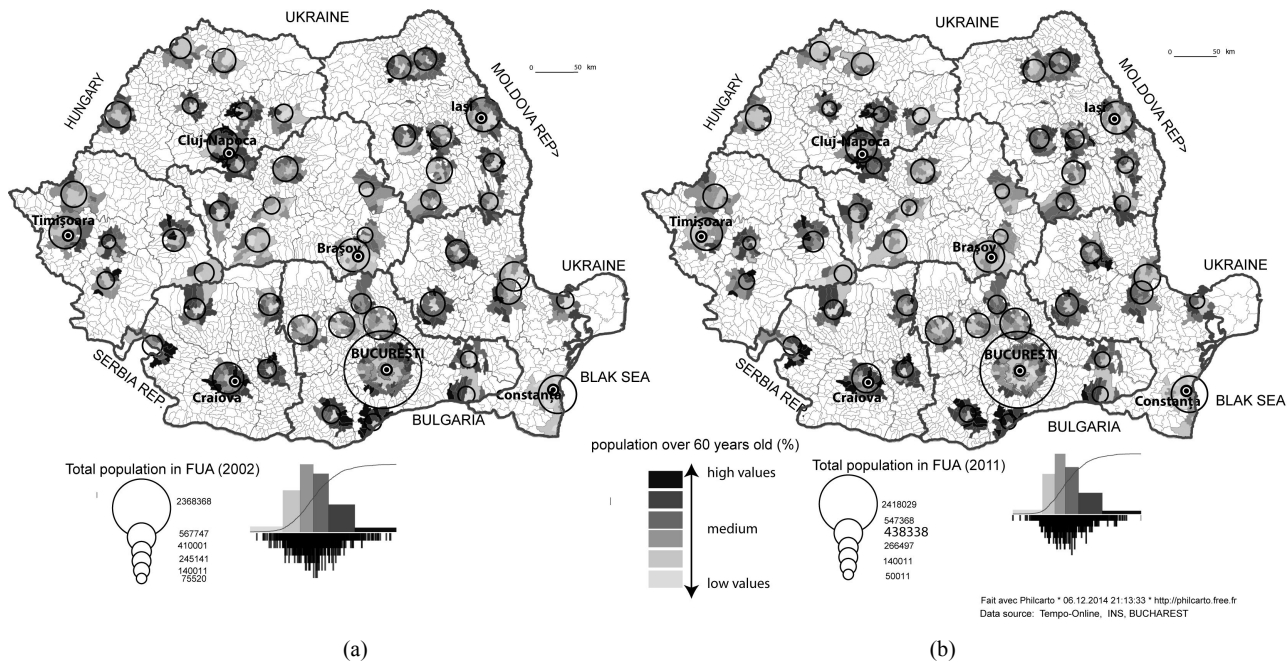

Fig. 3 Share of population aged 60+ in 2002 (a) and 2011 (b) (Data source: [25])

However, there are villages in the metropolitan areas in which the ageing process was already advanced in 2002, especially as a consequence of the small percentage of adult population, massively involved in the rural exodus before 1989. Great percentages, of over 40% for old people were typical for a great number of villages in the south and south-west of the country, regions in which the demographic transition happened earlier (Olt, Giurgiu, Dolj, Mehedinti counties) but also the central and northern part of the country (Cluj county) with a denser town network, early industrialization and consequently presenting an early devitalization of the rural communities, even those near the towns.

In 2011, the average percentage for the population over 60 years old reached 24.2%. Significantly, the youngest town remains, as in 2002, the mining town Rovinari, from Gorj county (from 2.4% to 5.1% population of over 60 years old), developed starting with the 1980's. Only 257 towns and villages registered less than 20% for people under 60 (26.3% from the towns and villages under study), which is an example for the advances made in the ageing process.

We can rank a first group of places in which the ageing process is unclear and which have in common a rapid growth of the adult population percentage after 2002. Keeping a relative balance between the extreme age groups is the effect of the favourable position in relation to the town (and this can

be seen in the case of the big towns – București, Timișoara, Iași etc.) but also of the traditional strong economy, especially in the mountainous area (Brașov, Neamț, Bistrița-Năsăud, Maramureș counties). Many important towns present a percentage below the average for the old people, places in which the positive effects of the migration changes during the last communist period are still in force or some of the small towns specialized in resource exploitation which keep the same favourable age group structure by inertia.

However, many middle-sized and big towns present a real danger of getting old (Table I) – the percentage of the old population has abruptly risen after 2002 while keeping the current rhythm in this changing process shows an aggravation of the ratio between the ages, especially in the towns where the migration flow was massive during the first part of the communist period, as later they lost their attractiveness (we might quote as typical, Brăila, the port on Danube, and Hunedoara, the metallurgical town). But there are countryside villages in which the percentage of old people has frozen on high quotas, over 35%, especially in the south, which shows a chronic ageing and an irreversible deepening of the process during the next period, should we also consider the reduced percentage of young people induced by the early modernization of the demographic behaviour, as an effect of the town proximity.

TABLE I
SHARE OF POPULATION AGED 60+

		number of units	population over 60 years old (2002)	share of population aged 60+ (2002)	population over 60 years old (2011)	share of population aged 60+ (2011)	difference between 2011 and 2002 (%)
1.	**Bucharest**	1	375.845	18,2	415.723	20,1	+ 1,9
	metropolitan area of Bucharest	69	66.948	22,2	73.638	21,2	- 1,0
2.	**regional cities**	6	300.085	14,3	370.891	18,7	+ 4,4
	functional urban areas of regional cities	136	106.038	20,2	120.556	20,4	+ 0,2
3.	**equilibrium cities** (100.000 – 200.000 inhabitants)	22	498.607	13,3	619.956	18,9	+ 5,6
	functional urban areas of equilibrium cities	384	328.854	22,5	339.411	23,7	+ 1,2
4.	**municipalities** (under 100.000 inhabitants)	21	187.107	12,7	240.648	18,9	+ 6,2
	functional urban areas of municipalities	334	257.246	24,3	255.343	26,1	+ 2,2

2. Coefficient of Inflow

The coefficient of inflow represents the percentage of those who are to enter the category of active, productive population. The lower values show a decreased flow of young people. The increase of values is the result of a slightly higher fertility, mainly in the big towns and their surroundings, as a consequence of legal changes regarding the maternity leave and allowances, but also the concentration in the same area of female population aged between 15 and 49. During the whole period under study, the high values show a greater birth rate. For the first year under study (2002), the average of this coefficient was 11.28, but it dropped to only 9.42 in 2011. The values lower than 10 are typical to the outskirt countryside areas in the south and west of the country, presenting a low birth rate. However, some important towns in the same area are included in the same category, including county metropolises (Craiova) for which the 1990's meant a dramatic fall in fertility, proven by the population census in 2002. The high values are specific to the dynamic villages with a very good accessibility, as well as those close to big cities in convergence position (Braşov, Galaţi).

The data offered by the census in 2011 show a significant fall of the values for this indicator, a downturn of the aspect which gets ready to be part of the active life. The discrepancies between east and west remain unchanged, the eastern functional town areas keeping high values, as the measures taken starting from 2004 to encourage birth extended along a changing vitality which before 1989 encouraged a massive internal flow towards the other parts of the country.

3. Coefficient of Outflow

A greater value definitely shows acceleration in the ageing process. The values over the average (9.38) are typical for the small towns working in one industry mainly before 1989 or countryside villages belonging to the outskirts of the big towns, former receptors of active population attracted by the industrial platforms in the area (such as Timişoara, Iaşi or Bacău). The values below the average are typical to the big towns in which the population is rather young but with clear perspectives of ageing: big towns (Bacău, Craiova, Baia Mare) as well as villages in areas which presented high fertility for long periods of time (in counties such as Dâmboviţa, Ialomiţa, Alba, Maramureş). The same trend is noticeable in 2011, with a slightly higher average value (9.69).

4. Coefficient of Exchange

It reveals the changes which take place in the ratio between the population ready to enter the active life (P10–14) and the generation which leaves it (P50- 64). Along the period under study the situation has changed significantly by means of an important fall in the young generation and raise of the adult – old generation (from an average of 43.5% to 33.3%), which proves that the inflow of the young population groups does not compensate for the volume of outflow from the active life (retired people). The most favourable values are registered in big towns, as a sign of a diverse and attractive economy, whereas the most unfavourable appear in the countryside, on the periphery, as a passage to the agricultural area. The vulnerability of these regions is related to the deficiencies inherited from the previous times (a continuous fall of the human resources due to constant ageing and isolation from the catalysing towns) and if to these there has recently been added the phenomenon of countryside movement, then the demographic segment of old people or older adults outside the reproductive demographic area has its influence.

5. Billeter Index

The changes produced in the Romanian society during the last 25 years in demographic, social and economic levels are noticeable in the altered ratios between the different age groups. The smaller the values (more negative), the more are strengthened the trends to ageing.

For 2002 (-35.24 the average value) high discrepancies were noticed in the south-western part of the country, where the demographic transition took place earlier (extreme values of the Billeter Index in towns and villages from Dolj, Caraş-Severin and Gorj counties) in comparison to the north-eastern part, where this process had a delay of approximately two generations, imposing a sort of demographic conservativism in a background of high degree of rural life, with positive values very close to 0 (Table II) (Suceava, Vaslui, Bacău counties).

TABLE II
BILLETER INDEX AND AGEING INDEX (2002 AND 2011)

		number of units	Billeter Index		Ageing Index	
			2002	2011	2002	2011
1.	**Bucharest**	1	- 29,8	- 41,1	1,05	1,1
	metropolitan area of Bucharest	69	- 31,6	- 31,9	0,91	0,90
2.	**regional cities**	6	- 18,9	- 40,1	0,70	1,02
	functional urban areas of regional cities	136	- 25,8	- 30,2	0,77	0,82
3.	**equilibrium cities** (100.000 – 200.000 inhabitants)	22	- 13,7	- 41,9	0,56	0,88
	functional urban areas of equilibrium cities	384	- 31,4	- 41,4	0,87	1,04
4.	**municipalities** (under 100.000 inhabitants)	21	- 12,0	- 42,8	0,51	0,84
	functional urban areas of municipalities	334	- 38,8	- 48,1	0,98	1,18

The difference between the towns and the area of their influence, in 2002 favours the towns due to the much higher percentage of adult population, the values pondering around 0. In 2011, only after a decade, the situation was completely different. The negative values were deeply rooted for both towns and the countryside, after a demographic devitalization due to the lengthening of the late adult limit values (40 – 65 years old) which is characteristic mainly to county municipalities, either important from the regional point of view (Iași, Oradea), or administrative centres of a county (Alba Iulia or Giurgiu for example).

6. Ageing Index

We can notice from the very beginning that all categories of towns and villages under study are close to the average national value for each of the two years taken into consideration; however, the difference, even if they are small, are significant for the evolution trend which underlines the obvious difference between the capital of the country and the metropolitan area on one side, the middle-sized and small towns and their functional areas, on the other side (Table II). For the capital, the ratio between the extreme age groups, very stable in time and close to the unitary value shows the accentuated economic dynamism and the positive role played by the massive investments attracted during the (post)communist period, attractive for the active young population. It cannot be said the same about the other elements of the town system which witness an increase in the value of this indicator, without aggravating the ratios between the extreme ages, even if the Ageing Index slightly went above 1. The ageing process could still be controlled in the big towns if a more dynamic model of fertility had been encouraged, as it happened between 2004 and 2009. The most vulnerable category seems to be that of the villages from the metropolitan areas with a population under 100 000 inhabitants, with more reduced local opportunities, generating a massive flow of migration abroad (especially in the north-east of the country). The rapid coming of age of the demographic structures in these villages is only the preamble of their imminent ageing. Many middle-sized and big towns present a real danger for the ageing of the population – the percentage of the old population has consistently grown after 2007, so that the unit limit between the extreme age groups was clearly overpassed, in the absence of solutions to stop this phenomenon on average term.

7. Dynamic Index of Economic Ageing of Productive Population.

The values estimated for the period between 2002 – 2011 (Table III) show the way in which the differentiated distribution of the investments made during the last 25 years, concentrated in the big towns and especially in the capital, have split the Romanian area, imposing contradictory evolutions: a growing percentage of active adults in the region around București – Ilfov and in the neighbourhood of the regional municipalities, on one side, and an increased speed in ageing in the big and middle-sized towns, on the other. Even though, theoretically, all the regions had equal opportunities to progress and modernization, the differences between the towns got bigger, on the background of worsened traditional relations between the towns and the countryside and the increased mobility of people, which led to a deepened process of ageing. There are registered negative values in 167 towns, with a more frequent distribution in the metropolitan area of the capital or towns such as Timișoara and Oradea, in the west part of the country. Most towns present values between 1 and 7, while extreme values of more than 10 appear in the towns from the regions highly affected by the international migration of the work force (Neamț, Iași, Vaslui, Bacău, Vranceacounties, and so on) or in the case of small mining towns influenced by changes in the activity (Fig. 4).

TABLE III
DYNAMIC INDEX OF ECONOMIC AGEING OF PRODUCTIVE POPULATION

		number of units	lead
1.	**Bucharest**	1	0,60
	metropolitan area of Bucharest	69	0,04
2.	**regional cities**	6	4,45
	functional urban areas of regional cities	136	1,23
3.	**equilibrium cities** (100.000 – 200.000 inhabitants)	22	5,73
	functional urban areas of equilibrium cities	384	2,94
4.	**municipalities** (under 100.000 inhabitants)	21	6,03
	functional urban areas of municipalities	334	3,34

8. Index of Potential Economic Support

From the economic point of view, the quantitative relationship between the active population group and the old population group, post-active. I_{pes} is estimated as the ratio between the age group between 20 – 64 and that of 65 and

older. It represents the number of active people for one inactive person. The massive hiring from big factories (we include here the early retirement as a means of fighting unemployment) led to the increase in the percentage of economic dependency until2002 (the average of this indicator was 3.8), and it later dropped due to the more dynamic economy in the metropolitan areas and consequently to an increased number of employees (3.65 in 2011). The trend is slightly going down for the average and the top values, which confirms the ageing of the population in the metropolitan areas (Fig. 5).

However, for the period under study, we notice that the values remain reduced in the metropolitan areas in the east of the country while those in the west are reinvigorated. We also notice the values above average from the villages which are luckily situated near towns or specialized industrial centres, as well as the exceptions given by a few county municipalities heavily industrialized during the last decades of the communist period (Zalău, Slatina) or other small industrialized centres. An example of a particular case is given by Floreşti village, near Cluj-Napoca, developed as a dwelling-suburb.
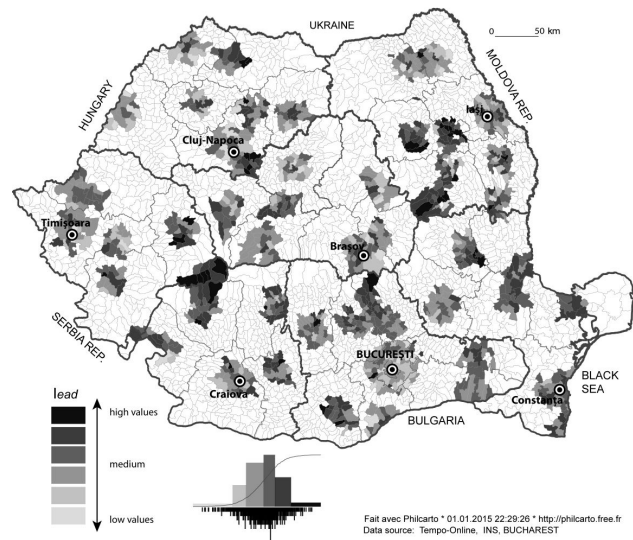

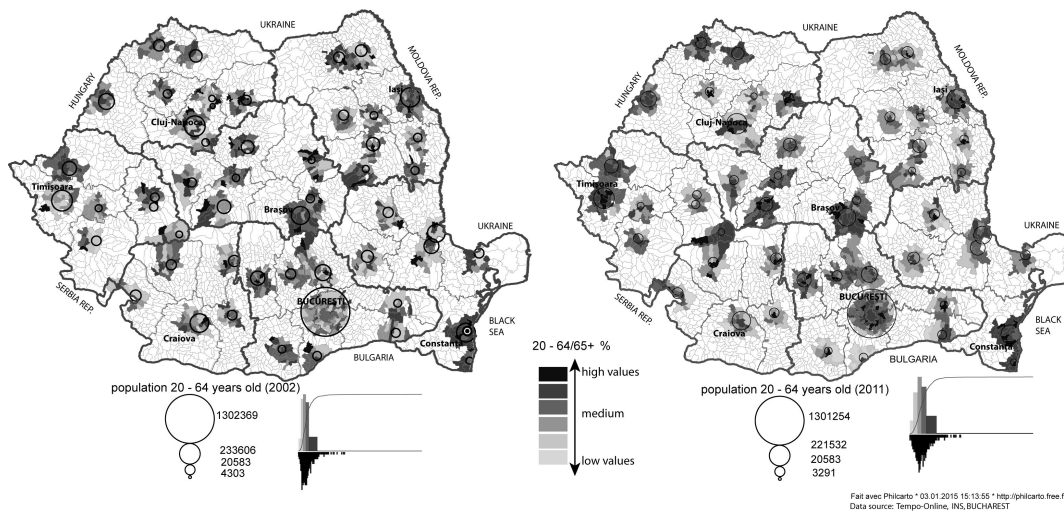Fig. 4 Dynamic index of economic ageing (2002 – 2011) (Data source: [25])

Fig. 5 Index of potential economic support (2002 and 2011) (Data source: [25])

B. Metropolitan Areas Ageing Typology

In order to obtain the final typology we have considered the evolution (the increasing ratio) during the period 2002-2012 of a number of seven indicators whose aggregation method was previously explained. By applying the cluster analysis (the up-going hierarchical classification) there were highlighted the similarities between the local units from all metropolitan areas under study. The five types we have obtained, clearly spread in space, proving the existence of major discrepancies between the centre and the outskirts but also obvious overlapping between the resilience of some regional structures and the demographic vitality while the ageing process has complicated relations with them, closely related to the ability to retain the active population and the intensity of the economic activities.

The chart with the profile types illustrates the strengthening of the population ageing process, started during the communist period, decreased during the 1990's by the reversal of internal migration flows and revitalized after 2002 when the trend is suddenly reversed, by a massive reduction of the young population and an increase of adult population (Fig. 6). The middle-sized and small towns and municipalities (up to 100,000 inhabitants) are rather influenced by this trend, as they face a rapid coming of age of the demographic structures, a preamble of their ageing, especially those who underwent a reverse industrialization process.
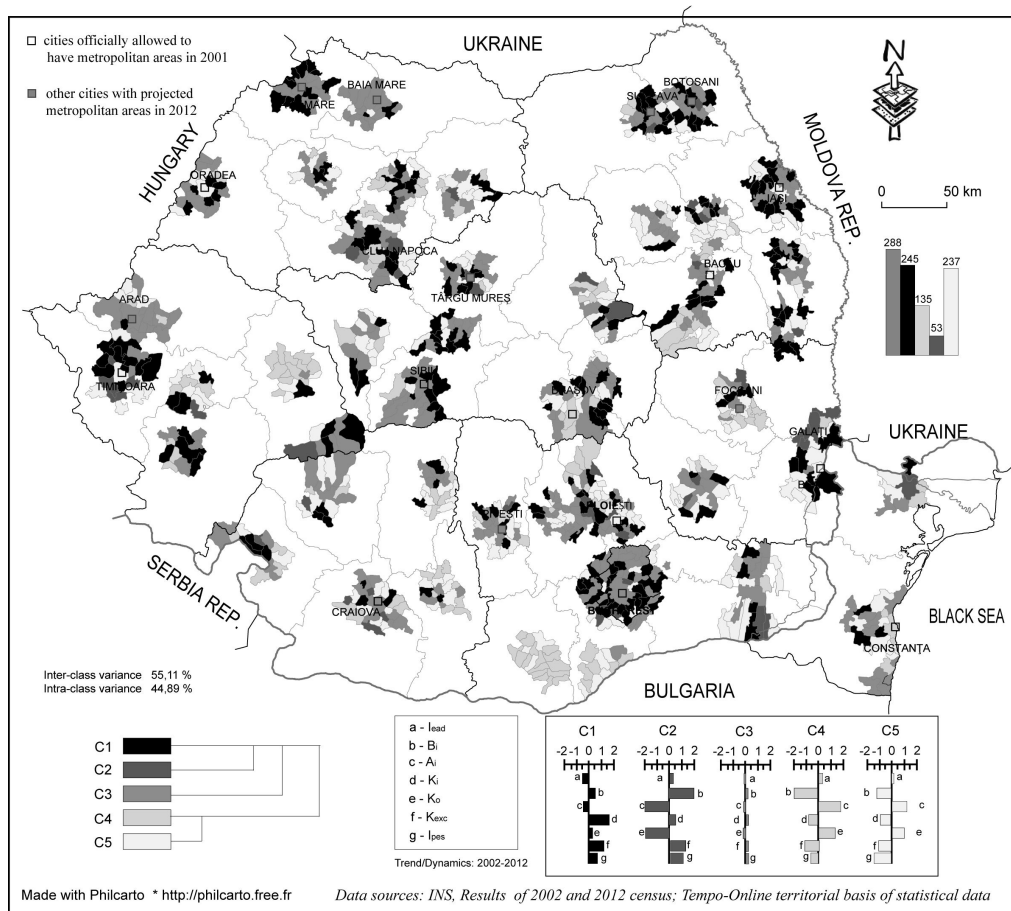
Fig. 6 Metropolitan areas ageing typology (Data source: [25])

Type 1 (C1) – The most dynamic from the demographic point of view, having a good percentage of the exchange between generations and whose young population is able to be part of the local work force and by means of commuting for the whole metropolitan area. The presence of certain units sometimes in the second circle around the main town requires public transport routes in order to diminish the individual transport (which consumes energy and pollutes the environment). The most representative cases in this category are the neighbourhood areas of the important towns in the northern half of the country (Moldova, Transylvania and Banat), where the transfer of human force required the strengthening of relationship between the town and the circles around the centre, while these relations were made more dynamic by the processes of peri-urbanisation, sub-urbanisation and exurbanisation of the industrial units.

Type 2 (C2) –stands out due to its work force reserves in a good (positive) relationship between those who enter and those who leave the workforce market, with an active population able to support the inactive one, but presenting for the moment a reduced participation in the market. In this case there are needed investments in education, new jobs, public transport towards the peri-urban areas. The most typical

examples are the port towns on Lower Danube (Tulcea included) but also areas close to municipalities highly dependent on the big towns (Buzău or MiercureaCiuc).

Type 3 (C3) – the most numerous, includes 288 towns and villages; with values close to the average of the units from the metropolitan areas but with a more vaguely defined behaviour and a high percentage of over 65, nevertheless presenting an inflow of relatively young population having incomes higher than the average and a good percentage of replacement of the old generation with the young one. It is characteristic for the dynamic periurban areas with recently built dwellings, but overlapping rural areas which partially keep their identity. Most of them are rural areas around the pole of big cities which developed quickly more evolved professional structures and were helped by the presence of industrial activities matching the local resources (chemical industry, woodworking industries, energy producing industry). A similar situation is found in the villages with population mostly involved in services (tourism, transport, medical care, social care, so on), helped by the improvement in the infrastructure in education or building wide districts of individual or group dwellings (a phenomenon found mostly around the capital, but also around

Cluj and Timisoara, two of the most dynamic regional metropolises).

Type 4 (C4)–the presence of old people and a great percentage of population which is leaving the work force, mostly in the outskirts of the important metropolitan areas (Cluj, Iași, Craiova), but it is also describing Constanța, the main port in the country. In the case of some middle-sized towns in the south of the country or other towns greatly affected by deindustrialization (Hunedoara), the whole polarised area is included in this category; the imminent devitalization of many villages with such a course might be a barrier in the settling of resilient behaviour of the work force related to the current and future necessities of the old population in continuous growth. As frequent is the geographic disposal of these villages in the areas dependent on the economy associated to the sub-mountainous and mountainous regions.

Type 5 (C5)–It stands out, as opposed to the previous, by the relatively reduced presence of the population over 65 years old (but significantly above the average), integrated in a structure which allows the quicker exchange between the successive generations. It is characteristic to both the suburban and the periurban areas. Because of the process of deindustrialization and economic restructuring, a great number of these towns, mostly of them with an old insertion of urban capital, benefited from the expansion of the dwelling parts as a result of the policy of the so-called closed town (1981 – 1989).

As a whole, we might note that the positive impact of the capital city influences its whole metropolitan area and it has distinct characteristics as regards the analysed functional urban areas and a stable age group structure, still dominated by adults and young people (the only case of sub-group being *adult with rejuvenation*). A similar effect can be noticed in the urban functional areas of the regional municipalities: even if the population is growing old, especially in the crowded central area, the rhythm is slow (*adult with slower ageing*). On the contrary, the middle-sized town, mostly those having less than 100 000 inhabitants, present high values of the variables related to ageing, including in the periurban area in the neighbourhood *(older with slower ageing)*.

V. CONCLUSIONS

The urban functional areas, as they were theoretically defined, have gone through different stages of evolution during the last 25 years, and those which benefited from favourable conditions for the progress of the determining factors in the process of regional development were favoured, namely the infrastructure, the performers (social, economic, political) and the region.

The differences between the age groups from the metropolitan villages are generated, after an empirical analysis, by the infrastructure quality; in post-communist Romania, the level of development of a town or village is not directly proportional to the distance to the great towns, not even in the case of the capital, as the process of urbanization is in an initial stage, facing the break imposed by the excessive centralization of the production forces before 1989. It is

absolutely necessary to develop these intermediary areas, capable of thwarting the extreme effects of urbanization (massive spatial concentration, urban congestion) or of the depopulation of the countryside areas; a de facto manifestation of the continuous urban – rural movement within the functional urban areas which for Romania would bring the equilibrium of the territory dynamics and would ease the discrepancies of economic, social and cultural nature.

The spatial resilience of the metropolitan areas cannot be accomplished only by relations of one-way dependency on the urban factor; equally important are the relations developed between towns and villages and villages and villages, specific to a developed area from the social and economic point of view; however, the urban functional areas do not often act as a unitary body, but, on the contrary, in a disorganized manner, each of the parts following their own logic. It is also the effect of the absence of an official delineation, with rigorous metropolitan areas, but also due to a deficit in area management based on spatial cohesion and cooperation. In this context, the absence of policies to fight the processes which lead to the acceleration of the ageing process, at least in the metropolitan areas, might be the origin of demographic crisis, quasi-generalized, with effects hard to estimate and predict.

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