GIS MATHEMATIC MODEL ANALYZING THE ATTRACTIVENESS OF THE ROMANIAN SETTLEMENTS NETWORK, ASSESSING THE COMPETITIVENESS FACTORS AT NATIONAL LEVEL

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Abstract

The planning activity is essential for territorial development. Cities have a catalytic effect on economic development and on the establishment of functional local networks. The article aims to present the assessment of the economic potential of Romanian localities – for development, stability or decline – by identifying the factors causing such trends. The method used is an innovative one. Thus, for each analysed indicator at locality level, a grouping of values was achieved on 10 intervals, in accordance with the standard scheme for classification on natural breaks (Jencks), obtaining thus 10 groups and for which scores from 1 to 10 have been assessed, in ascending order of values. For each studied domain and each locality, an index was calculated as the average of all scores, weighted by importance coefficients. Similarly, a final attractiveness index at locality level was obtained, as an average of corresponding indexes for all studied domains weighted by their coefficients of importance. Specific indexes calculated for each domain and the final attractiveness index for all localities were translated into thematic GIS maps, by using ARCGIS 10.2.2. and its statistical support. The article was developed based on studies of the project PN 16.10.07.01 - Phase-III: "Analysing the attractiveness of urban and rural localities network as competitive, dynamic and innovative entities, in order to connect to the European network of development poles and corridors" and project 63PED / 2017 - "Innovative model for the territorial planning of a polycentric and balanced settlements network in the context of smart specialization of Romania's cities."

Keywords: *attractiveness; index; mathematical model; domain; maps; LAU2.*

JEL: C22, R11, R12, R23, R42, R58

Introduction

Identifying the factors determining regional competitiveness is a current approach of the European Union when dealing with the spatial planning field. European policies addressing territorial development issues emphasize the connection between concepts like "polycentric development" and "regional competitiveness", "cohesion" and "competitiveness", in order to support the territorial development. Challenges related to competitive metropolitan development have become the subject of extensive academic discussions related to governance (Parkinson, 1997 and 2003; Begg, 1999; Ottgaar et al., 2008; Salet et al., 2003; Healy, 1997). At the same time, the challenges of an intra-urban development already awarded attention in the political debate within the URBAN initiative in the first and second programming period at European level. Based on the Lisbon Agenda 2000, the political debate was focused for several years mainly on competitiveness. Since 2008, the Green Paper on Territorial Cohesion highlighted three aspects of territorial cohesion:

- Concentration and specialization of urban and rural areas - peripheral regions are strengthening regional functional relations;
- Connection by different infrastructures: equipment, ICT (information and communications technology), networks in the knowledge-based economy and research;
- Cooperation at different levels, by a multi-level horizontal and vertical governance.

For several years, the political discussion was moved towards issues related to social and territorial cohesion in order to face the problematic and divergent processes, at least at inter-regional level. Referring to the EU cohesion policy, the Green Paper on Territorial Cohesion is focusing on smart, sustainable and inclusive growth. This initiative is based on the following premises:

- Metropolis have a decisive importance for Europe's competitiveness.
- The connectivity - between highly developed localities, the specialized ones and the metropolitan areas having a good accessibility - is crucial.
- The networks at different geographic scales are linking global markets.
- A good governance and territorial cooperation are vital for the implementation of economic and social cohesion (ESPON 2010).

In terms of territorial development, inclusive growth should be based on urban and regional competitiveness but at the same time, it is considered "... not only economic and social cohesion but also territorial cohesion." (ESPON, 2010). Cities are the engines of regional economy and can be

considered to be a catalyst for creativity and innovation today. Nevertheless, a number of acute problems – such as unemployment and poverty – it occurs here. The various economic/social/cultural/environmental aspects of urban life are closely interlinked and a successful policy in the field of sustainable urban development requires an integrated approach. This approach is of great importance nowadays, given the seriousness of the problems facing our cities (demographic change, the consequences of economic stagnation, the impact of climate change). However, the actual territorial development of the European Union in economic terms can be characterized as a process of metropolisation of the potential zones of economic development that have innovation capacity (Krátke, 2007). The new urban policy will be differently organized through more active involvement of the population, changing the governance of metropolitan areas (Andersen, 2003). Thus, local governance in metropolitan areas will be strongly influenced and shaped by the relationship with the civil society (Feiock, 2004). Metropolisation is a process of attracting new specific activities, jobs and people, relying predominantly on competitiveness. This means that attracting specific metropolitan functions and activities is based on certain assets of cities, usually the strongest, and on their potential, offering specific benefits depending on the area. In this context, metropolitan governance is crucial in terms of territorial development by strengthening competitiveness and attracting new functional specializations. The specific literature treats the big cities metropolitanisation process in accordance with polycentricism studies. Policentricity is currently considered to be a useful tool for spatial planning in order to increase economic competitiveness of cities, social cohesion and environmental sustainability (Davoudi, 2003). A new concept for maximizing the development of metropolitan areas is the "smart specialization" which is an important tool in achieving alternative sustainable development strategies based on research, development and innovation.

In order to achieve the economic development of metropolitan areas, the presence of sustainable development visions and strategies is a must. Initiated by the Government Decision no. 998/2008, the policy focusing on the Romanian growth poles aimed a rapid economic growth by creating jobs and boosting productivity capable to accelerate the development in small and medium towns, as well as in rural areas adjacent to growth poles. To contribute to the economy of the entire region of influence, several categories of urban centres have been defined: 7 growth poles (one for each development region, excepting the Bucharest-Ilfov region) and 13 centres of urban development having regional importance. According to Law. no. 264/2011, for a balanced territorial development around the main urban agglomerations – the capital, the municipalities of the first rank or the county residences – the

local administrative units from these areas may join a voluntary partnership to establish metropolitan areas. The partnership contributes to strengthening the complementarities between these units and decision makers interested in spatial planning. These measures aim at improving the coherence, effectiveness and sustainability of the results obtained in urban development within strategies of integrated development. The Integrated Territorial Investment (ITI) are instruments of territorial development which assume corresponding integrated territorial development strategies, as well as a set of actions that can be implemented. These tools support integrated urban development through a sectoral and multidimensional approach, in that it offers the possibility to **combine** funding by thematic objectives, including the one coming from priority axes or operational programs supported by the ERDF, ESF and CF.

Having all these in mind, the development of a spatial database at the level of local administrative units (LAU2), based on the polycentrism concept and on the concept of "smart cities" in Europe it is necessary especially for the evaluation of the economic situation at all administrative levels and to highlight quantitative and qualitative aspects issues related to national territorial cohesion, balanced development and evolution trends of Romanian localities. This article presents the results obtained by developing and using a mathematical model able to assess the degree of attractiveness of all Romanian localities from a spatial development point of view.

Methodology for evaluating the attractiveness of cities in Romania

The spatial database is developed on a methodology based on: 1) several relevant statistical indicators for specific domains of spatial planning, and on 2) an innovative mathematical solution making an assessment based on standard scheme of classification - Natural breaks (Jenks), presented in the article "Assessment of functional policentricity in Romanian county residence municipalities " (Tache *et al.*, 2016). For each indicator, a grouping of values in 10 intervals was defined, at the LAU 2 level, in accordance with the standard scheme for classification on Natural breaks (Jencks). It was thus obtained a division into 10 groups, assigned with scores of 1 to 10 in an ascending order of values. Jencks's classification based on the clustering by natural values is performed by identifying the breakpoints and by looking the default data patterns. Values are divided into classes according to the boundaries determined by significant jumps from one value to another. If the indicator has a value of 0 to a specific LAU2, the score assigned to this LAU2 for this indicator will always be 0. Therefore, using the statistical software support of ArcGIS 10.2.2, all the values of selected indicators were converted into the scores of groups to which they belong (1,2, ..., 10, possibly 0). Practitioners and experts

in local spatial development have determined the coefficients of importance (weights) for all indicators. For each domain and each administrative unit, a corresponding index was calculated, as the average of scores weighted by the coefficients of importance. Similarly, coefficients of importance (weights) have been given for each domain relevant for the spatial planning activity, and the attractiveness index was calculated at LAU 2 level, as the average of indexes corresponding to these domains, weighted by coefficients of importance.

Thus, for the analysis (at LAU 2 level), the following statistical indicators were analysed, in the following chapters:

Chapter: POPULATION

- Number of population (2015);
- Natural growth (2015);
- Migration growth rate (2015);
- Population evolution 2015/2011;
- Population evolution 2011/2008.

The sociologists from URBAN-INCERC identified 5 significant indicators in order to evaluate the Population chapter. The values of several indicators were computed and transformed in figures from 1 to 10, according to the Jenks Natural breaks classification standard. In order to calculate a final index for the Population chapter, the experts working in the field of spatial planning established weights for each indicator. A final index resulted for each local administrative unit: the lowest value (1,1) belongs to the Intregalde commune (Aba county) and the higher value (7,4) to the Iasi municipality.

Chapter: TRANSPORT

- Accessibility to National/European Roads/Highways;
- Accessibility to railway stations;
- Accessibility to airports;
- Accessibility to ports.

In a similar manner, the institute's experts and spatial planners working in the field of Transport have identified 4 indicators and then calculated a final index for each local administrative unit. According to this ranking, the lowest value of the index is 0 for a number of 991 localities and the highest value is 8.6 for the Constanta municipality.

Chapter: ECONOMY

- Number of employees (2015);
- The evolution of the number of employees 2015/2011;
- Ratio of the number of employees and the population (2015);
- The number of tourist overnight stays in each LAU2 (2015).

For the Economy chapter, few indicators were used, due to the lack of this kind of data for each local administrative unit. According to the

methodology, the experts of the institute assigned weights for each indicator and calculated a final index for the economy chapter. Thus, the lowest resulted value was 0.8 for a number of 64 localities and the higher value was of 8.2 for Bucharest municipality.

Chapter: TECHNICAL INFRASTRUCTURE

- Length of modernized streets relative to total length of streets (2015);
- Water distributed for domestic use (2015);
- Gas distributed for domestic use (2015);
- Length of the sewage system (2015);
- Number of new dwellings reported to the total number of dwellings (2015).

The experts working with technical infrastructures have identified 5 relevant indicators and calculated a final index according to the methodology. A number of 368 localities obtained the value 0, which represents a major problem for Romania. The highest calculated value was 9,5 for the town Popesti-Leordeni.

Chapter: NATURAL CONDITIONS

- LAU 2 area - 2015;
- Forest area (2015);
- The presence of national and natural parks (2015);
- The presence of Biosphere Natural Reserve in the LAU 2 (2015);
- The presence of Ramsar sites in the LAU 2 (2015);
- The presence of SCI or SPA at LAU 2 (2015).

A number of 6 indicators were selected by the experts of the institute, in order to evaluate the chapter referring to natural conditions. According to the methodology and to the selected weights, a final index was calculated for each local administrative unit. The lowest values was 0,5 (for 167 units) and the highest was 5,38 (in Pades commune and in Borsa town).

Chapter: SOCIAL

- Number of Kindergartens (2015);
- Number of schools (2015);
- Number of secondary schools (2015);
- Number of universities (2015);
- Number of students (2015);
- Number of students reported to the size of population (2015);
- Number of hospital beds (2015);
- Number of hospital beds relative to the size of the population (2015);
- Number of local clinics (2015);
- Number of hospitals (2015);
- Number of doctors (2015);

- Number of doctors reported to the size of population (2015);
- Number of medical staff (2015);
- Number of medical staff reported to the size of the population (2015).

At this chapter, very conclusive results were obtained, due to the high number of indicators that were identified. Using the methodology and the weights, the final index for the Social chapter was obtained by the specialists of the institute. The values ranked from 0 (in 5 localities) to 7.85 (in Bucharest municipality and in Cluj-Napoca city).

Chapter: CULTURE

- Number of spectators (2015);
- Number of spectators in 2015 relative to the number of spectators in 2008;
- Number of spectators reported to the size of the population in 2015;
- Number of museum visitors (2015);
- Number of museum visitors in 2015 reported the number of museum visitors in 2008;
- Number of museum visitors reported the size of the population in 2015.

For this chapter, according to the data delivered by the Romanian National Statistical Institute, a number of 2786 localities obtained the value 0 for the final index, Bucharest municipality and Sibiu city obtaining the highest value (8).

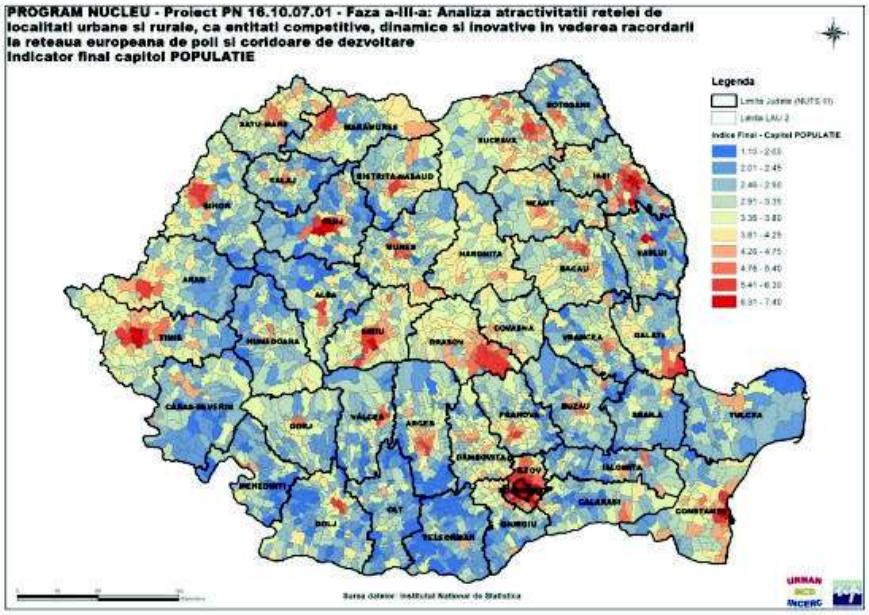
Results and analysis

3.1. Chapter POPULATION. Analysis

In order to make analyses at the Chapter *Population*, the sociologists chose the following weights for the corresponding indicators: Number of population (2015) - 40%, Natural growth of population (2015) - 15%, Migratory growth (2015 – 2011) – 15%, Evolution of population (2015 – 2011) - 20%, Evolution of population (2011 – 2008) - 10%. By using the ARCGIS 10.2.2. Software capabilities and the Jencks's classification based on a natural grouping of the indicators' values, the following cartogram was obtained (Fig. 1):

Analysis of the final indicator for the POPULATION Chapter

Figure 1



As observed, the areas having the higher values of the final index at Population Chapter – meaning a positive assessment – are the following:

- The compact area comprising Bucharest Municipality and Ilfov county, the Northern part of Giurgiu county, the south of Dambovita county and the corridor Bucharest-Ploiesti, having positive trends towards the Braşov municipality;
- The compact area consisting of the western halves of Arad and Timis counties;
- The compact area comprising Sibiu and Brasov counties, the western part of Covasna county, Harghita county and the southern part of Mureş county;
- The corridor Baia Mare - Satu Mare;
- The corridor connecting Bacau and Piatra Neamt municipalities;
- The compact area around Oradea municipality and with an extending trend towards south (Arad municipality) and north (Satu-Mare Municipality);
- The compact area around Cluj-Napoca, Constanța, Iași, Târgu Mureș, Suceava and Piteşti municipalities and partially in the surrounding areas of Craiova, Râmnicu Vâlcea, and Bistrița municipalities.

The areas for which the lowest values at the Population Chapter were obtained – a negative evaluation – are the following:

- The compact area of the Apuseni Mountains and its surroundings (the south-west of Cluj county, the north-western part of Alba county, the eastern part of Arad county, the northern part of Hunedoara county);

- The compact zone of Teleorman county, the south of Argeș county, the east of Olt county and the south-eastern part of Giurgiu county;

- The compact area of north and east parts of Mehedinți county and the western part of Dolj county;

- The compact area of the northern part of Ialomița county, the south of Brăila and Bacău counties;

- The compact area of north county Buzău and the south part of Vrancea county;

- The compact area in east and south-east of Vaslui county with the northern part of Galați county;

- The eastern half of Caraș-Severin county, the east and south areas of Sălaj county, the eastern half of Botoșani county, the western half of Călărași county, the south of Valcea county and a large area of Tulcea county.

The areas having demographic potential are those of large cities or among the development corridors between major cities, as well as the large compact areas such as the Center Region. It was observed that the highest values of the final POPULATION index have the administrative units (LAU 2) surrounding major cities, such as: Florești (Cluj-Napoca), Chiajna, Popești-Leordeni, Bragadiru, Pantelimon, Voluntari (Bucharest), Giroc, Dumbrăvița (Timișoara), Șelimbăr (Sibiu) and Miroslava (Iași). The lowest values at LAU2 level are recorded in compact areas having demographic problems, such as Întregalde or Ceru-Băcăinți in the area of Apuseni Mountains, Măcești de Sus, Seaca de Pădure, Brabova situated in a compact area of Dolj-Mehedinți counties, Slobozia Mândră, Făgețelu and Bărăști of the compact area of Olt, Teleorman, Arges, and Giurgiu counties.

As a conclusion, the major demographic problems are in Muntenia, Transilvania (the Apuseni Mountains and their surroundings), as well as in Caraș-Severin County, in Banat.

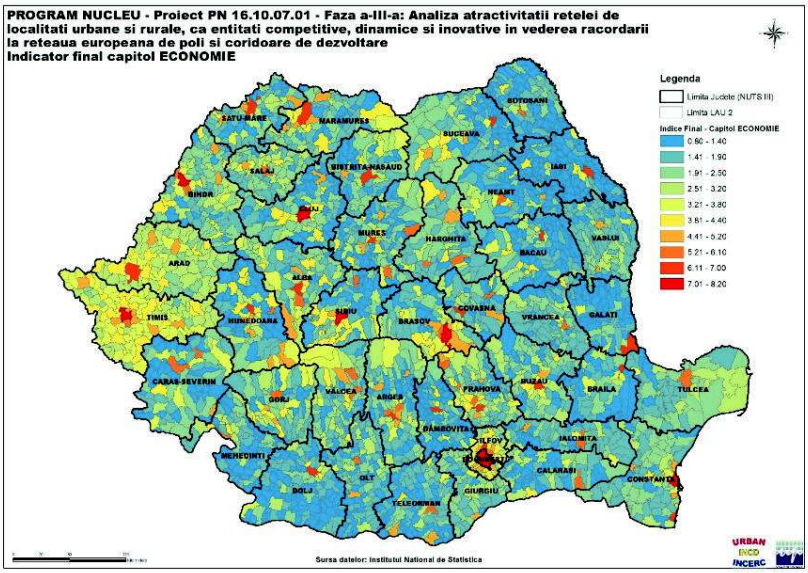
3.2. Chapter ECONOMY. Analysis.

At the ECONOMY Chapter, the economists specialized in spatial planning have chosen the following weights for the analysed indicators: Number of employees (2014) - 35%, Ratio between the number of employees in 2014 in 2011 - 20%, Ratio between the number of employees in 2014 and the number of population in 2014 - 25%, Number of overnight stays - 20%. As in the case of the Population Chapter, the classification of indicators at the Economy chapter was based on the natural grouping of indicators values

(Jencks method) and on the statistical support and capabilities of the ARCGIS 10.2.2. Software. The following cartogram was obtained for the Economy Chapter (Fig. 2):

Analysis of the final indicator for the Chapter Economy

Figure 2



The cartogram shows the areas having high and very high values of the final indicator related to the Economy chapter, which implies a positive assessment:

- The Bucharest-Ilfov region;
- The compact area comprising most of Timis County (excepting the eastern part) and the south-west of Arad county;
- The Sibiu metropolitan area and a future corridor Sibiu - Rm.Vâlcea;
- The area Alba Iulia - Sebeș in Alba county;
- The metropolitan areas Brașov, Ploiești, Oradea, Baia Mare and partly the metropolitan areas of Cluj-Napoca, Târgu Mureș, Constanța, Satu-Mare, București, Buzău cities;
- A compact area composed by the eastern part of Maramureș county and the north-eastern part of Bistrița county.

Areas having low and very low values of the final indicator for the Economy chaptes are the following:

- The compact area consisting of the eastern part of Suceava county,

Botoşani county, Iaşi county, the eastern part of Bacău and Neamț counties, Vaslui county and most of Galaţi county (excepting the southern part);

- The compact area consisting of Mehedinți, Dolj and Olt counties, the southern part of Vâlcea, Gorj and Argeș counties, most of the Dambovița county;

- The compact area comprising Ialomița, Călărași, Brăila and Tulcea counties and a part of the Constanța county;

- The northern part of Buzău county and the southern party of Vrancea county;

- A Compact area from the northern part of Cluj county, the eastern part of Bistrița-Năsăud county, the southern part of Maramureș county;

- Compact areas from Caraș Severin, Hunedoara, Cluj, Sălaj, Satu Mare, Sibiu, Mureș, Covasna and Harghita counties.

As a conclusion, there are two compact areas having high values of the final indicator at the Economy chapter: the Bucharest-Ilfov region and the compact area of Timis and Arad counties. Otherwise there are several metropolitan areas with a high level of final Economy index, around large cities, especially in Transylvania. It is observed a trend for the development of several corridors such as Bucharest – Ploiești - Brașov, Alba Iulia – Sibiu - Pitești, Oradea – Arad - Timișoara, Baia Mare - Satu Mare, Bacău - Piatra Neamț.

Following the situation reflected by the final index obtained for the Population Chapter, the localities (LAU 2 level) surrounding important big cities have also high values of the final index for the Economy Chapter (such as Otopeni, Ghimbav, Mioveni, Bascov, Cristian, Voluntari, Eforie, Sebeș or Giroc localities).

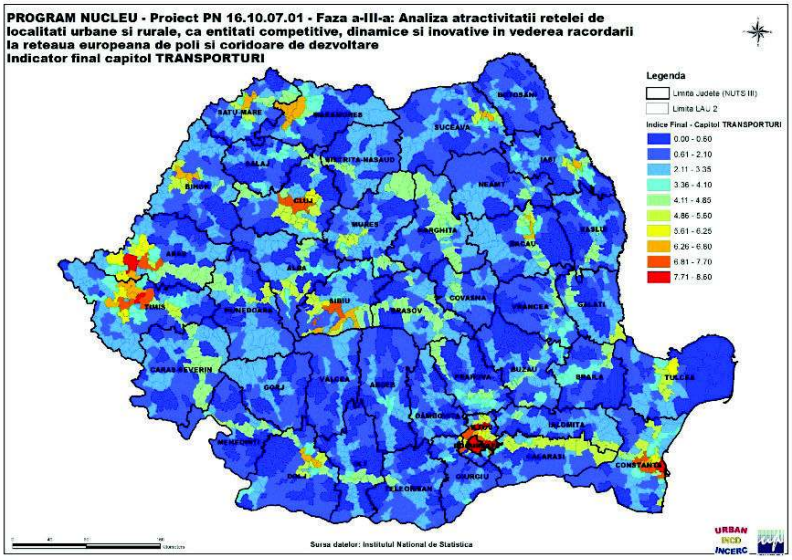
3.3. Chapter Transport. Analysis

In order to make analyses for the Transport Chapter, the experts in mobility issues proposed the following weights for the above-mentioned indicators: localities having access to an airport - 35%, having a port access - 15%, localities with access to national/European roads or highways - 25%, access to railway stations - 25%.

It was thus obtained the following cartogram (Fig. 3):

Analysis of the final indicator for Chapter Transport

Figure 3



Areas with high and very high accessibility are those having access to big airports, in which many passengers are transiting, as in the case of localities situated northern Bucharest, those located in the proximity of Timişoara, Arad city, Cluj-Napoca, Constanța, Târgu Mureș, Iași, Bacău, Craiova, Baia Mare, Satu Mare and Suceava cities.

A relatively high accessibility have the corridor Bucharest - Constanța.

An average accessibility presents those localities located on the rail European corridor no. 4: Arad – Deva – Sibiu – Brașov – Bucharest - Constanța and Timișoara – Lugoj – Caransebeș - Drobeta Turnu Severin – Craiova – Bucharest - Constanța) and on the rail and road European corridor no. 9: Bucharest – Buzău – Ploiești – Focșani – Roman - Iași and Bucharest – Buzău – Focșani - Huși).

An average accessibility have the corridors Sebeș - Alba Iulia - Cluj Napoca - Oradea, Bucharest – Urziceni – Brăila - Galați and Brasov - Sfântu Gheorghe – Miercurea - Topliţa.

The map shows that a poor accessibility have the hilly and mountainous areas and those along the European Danube Corridor no. 7, particularly in the south of Romania.

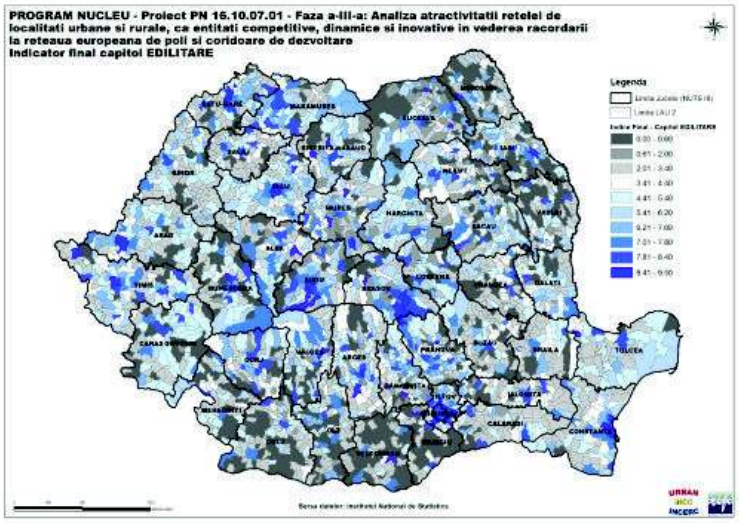
3.4. Chapter Technical Infrastructure. Analysis

To make analyses at the Chapter Technical Infrastructure, the experts gave the following weights for the relevant indicators: Ratio between the

length of modernized streets and the length of total streets - 20%, the amount of water distributed for domestic use - 30%, the gas distributed for domestic use - 10%, the length of the sewerage network - 20% and the ratio of new housing in 2015 in total housing - 20%.
This indicator is particularly relevant for Romanian cities, identifying the areas with large deficiencies in terms of endowments. The following cartogram was obtained (Fig. 4):

Analysis of the final indicator for the Technical Infrastructure Chapter

Figure 4



The areas having high values for final indicator at the Technical Infrastructure Chapter are found in the Bucharest-Ilfov region and in most administrative units belonging to Cluj, Timis, Bihor, Arad, Maramures, Sibiu, Brasov, Harghita, and Prahova counties. Among the localities with the highest value of the final index at this Chapter can be mentioned: Cisnădie (Sibiu), Popeşti-Leordeni (Ilfov), Ştefăneşti (Argeş), Râşnov (Braşov), Tălmaciu (Sibiu) or Ghimbav (Braşov).

Conversely, the final indicator at this chapter is low and very low in many localities belonging to Mehedinți, Dolj, Olt, Teleorman, Giurgiu, Botoşani, Suceava, Iași and Vaslui counties.

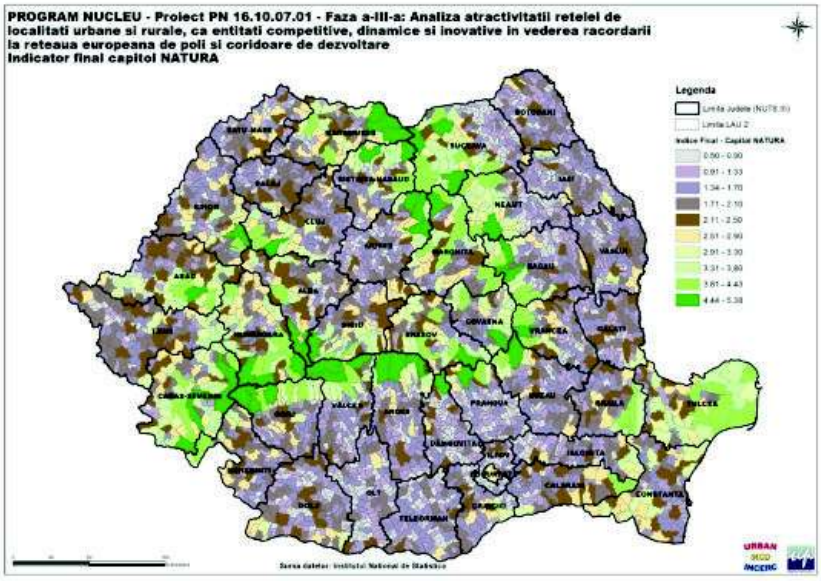
In Romania there are still 368 local administrative units (LAU 2) having no a value of final index zero, indicating that they have not even drinking water supply, most of them beilng located in Teleorman, Dolj, Vaslui and Mehedinți counties.

3.5. Chapter Natural Conditions. Analysis

For the Chapter Natural Conditions, geographers specialized in physical geography have established the following percentages for the studied indicators: The area of the administrative unit (2015) - 30%; The forest area (2015) - 20%; The presence of national/or natural parks (2015) in the locality - 15%; The presence of a biosphere (2015) - 15%; The presence of a Ramsar area (2015) - 12%; The presence of SCI or SPA (2015) - 8%. The resulted cartogram is presented below (Fig. 5):

Analysis of the final indicator for the Natural Conditions Chapter

Figure 5



The final indicator for Natural Conditions reflects the presence of protected natural areas especially in the Carpathian Mountains and in the Danube Delta, in those counties located in the centre of the country.

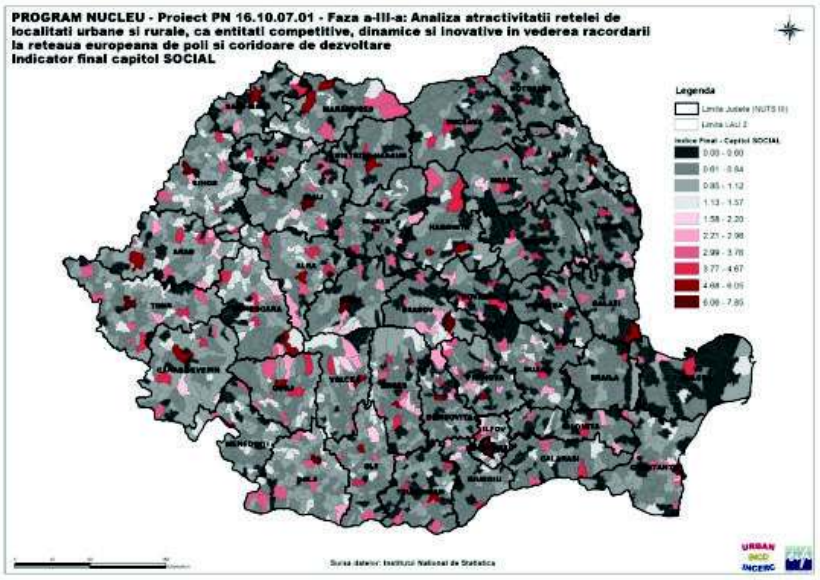
The counties characterized by a low value of the final indicator can be found in the Southern part of the country – such as Olt and Teleorman counties – and in several eastern counties - especially Botoşani County. To maximize the tourism potential of the Danube represents a consequence of this situation, especially under the European Strategy for the Danube.

3.6. Chapter SOCIAL. Analysis

For the Social Chapter, experts in sociology and economic geography explored a significant number of statistical indicators which have been granted the following shares: The number of kindergartens (2015) - 4%, The number of schools (2015) - 4%, The number of secondary schools (2015) - 5%; The number of universities (2015) - 8%; The number of students (2015) - 8%; The number of students reported to the size of the population (2015) - 10%, The number of hospital beds (2015) - 8%, The number of hospital beds relative to the size of the population (2015) - 11%, The number of local clinics (2015) - 4%, The number of hospitals (2015) - 5%; The number of doctors (2015) - 8%; The number of doctors relative to the size of population (2015) - 10%, The number of medical staff (2015) - 6%, The number of medical staff reported to the size of the population (2015) - 8%. Based on these weights, obtain the following cartogram (Fig. 6):

Analysis of the final indicator for the Social Chapter

Figure 6



As expected, the values of the final index for the Social Chapter are high and very high in cities. Among counties with major problems in the social endowment, can be mentioned Tulcea county, followed by the counties of Bacău, Botoșani, Covasna, Mehedinți and Brăila.

Additionally, there are five communes having the final index 0 at this chapter: Ciocârlia in Ialomița county, Bunila and Bătrâna in Hunedoara

county, Brebu Nou in Caraș-Severin county and Mahmudia in Tulcea county. In the coming years, in Tulcea county situation will significantly improve due to the Danube Delta program of integrated territorial investments. The other counties require special programs of development in the social field, financed both from domestic and external funds.

3.7. Chapter CULTURE. Analysis

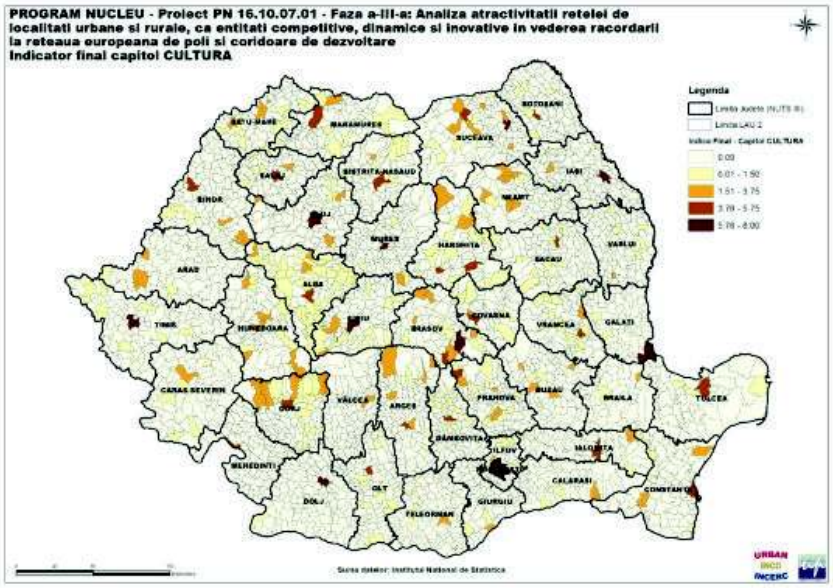
For the Culture Chapter, professionals in urban and spatial planning included six indicators with the following shares: Number of spectators (2015) - 25%; Number of spectators in 2015 relative to the Number of spectators in 2008 - 10%; Number of spectators compared to the size of the population in 2015 - 15%, Number of museum visitors (2015) - 25%; Number of museum visitors in 2015 compared to number of museum visitors in 2008 - 10%; and the number of museum visitors reported to the size of population in 2015 - 15%.

It is noted that the analysis concerning the Culture Chapter is relatively conclusive due to non-inclusion of data on monuments belonging to UNESCO heritage and of architectural monuments of national importance at the level of administrative unit.

The resulted cartogram is presented below (Fig. 7):

Analysis of the final indicator for the Culture Chapter

Figure 7



The map shows that cultural phenomenon is generated in particular by big cities, but also by medium and small towns having ancient cultural traditions. High scores have also the communes that are managing within their territory museums or historical monuments of national importance, such as Bran (Brașov county), Sucevița (Suceava county), Dâmbovicioara (Argeș county) and Sarmizegetusa (Hunedoara county).

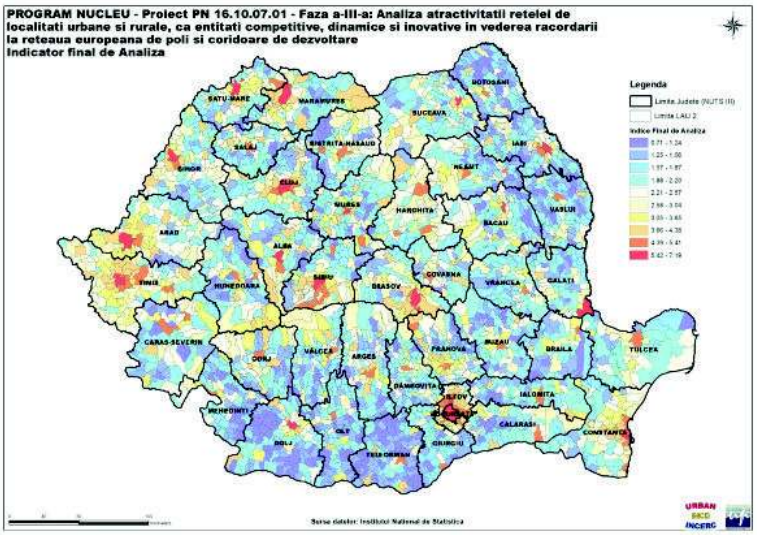
3.8. The final index at LAU 2 level

The final index at LAU2 level was calculated by weighting the values of all indicators previous calculated for all domains. The spatial planning experts have established the following weights: the index for the Population Chapter - 17%, the index for the Transport Chapter - 17%, the index for the Economy Chapter - 28%, the index for the Natural Conditions - 10%, the index for the Utilities Chapter - 10%, the index for the Social Chapter - 10%, the index for the Culture Chapter - 8%.

On the basis of the weighted indices, the map of the final index of development in Romania resulted, at LAU 2 level. The final value of development index was grouped into 10 intervals, according to the Jencks standard classification scheme on Natural breaks. For all the 10 resulted groups, scores from 1 to 10 have been assigned and the following final map (the attractiveness map) was obtained using the ARCGIS 10.2.2. Software (Fig. 8).

Final attractiveness Index at LAU2 level in Romania

Figure 8



This map, showing the attractiveness of Romania's localities, identifies the most important development areas as being mostly in Transylvania and in Bucharest-Ilfov region.

- The Bucharest-Ilfov region has positive influences on adjacent localities, and in the next years is possible to determine the creation of a development axis Bucharest-Ploiești.

- The metropolitan areas of Timisoara and Arad municipalities can be seen as an urban development system, positively influencing the western half of the Timiș county and the western part of the Arad county.

- There is also a big potential of development in the Oradea metropolitan area that may determine a relatively attractive area on the Oradea-Arad axe.

- Metropolitan areas around Baia Mare and Satu Mare municipalities are relatively attractive areas with potential for a future corridor Satu Mare - Baia Mare.

- There is already an attractive corridor Alba Iulia - Sebeș - Sibiu with high development potential. The Sibiu metropolitan area was pretty good outlined, having a trend for development in the south of the county.

- Brasov metropolitan area was also highlighted as an attractive area, as a corridor of development especially on the axis Brașov – Ploiești - Bucharest.

- The Cluj-Napoca metropolitan area is a relatively attractive area, even if it has a high potential of development.

- The Constanța metropolitan area is also a relatively attractive area but with high potential of development on the axis Constanța - Bucharest.

Relatively attractive metropolitan areas, but with high development potential are found around the municipalities of Târgu Mureș, Pitești, Bacău, Craiova, Iași.

Axis with development potential, but still unexploited are those located between the municipalities of Galați and Brăila and between the municipalities of Bacău and Piatra Neamț.

Relatively attractive areas can be considered those located in the northern of Vâlcea and Gorj counties or those located in the northern part of Bistrița Năsăud county and the eastern part of Maramureș county.

Less attractiveness areas are found in several counties from the southern or eastern part of Romania, namely Mehedinți, Dolj, Olt, Teleorman, Giurgiu, Călărași, Ialomița, Brăila, Botoșani. Vaslui counties, but also in localities from Iași, Vrancea, Buzău, Caraș-Severin, Hunedoara, Bistrița-Năsăud, Bacău, and Neamț counties and in the southern part of Vâlcea, Gorj and Argeș counties.

As a conclusion, a big number of localities that were considerate "attractive" have high or relatively high indices calculated for each domain, while the areas with low attractiveness have low or relatively low values of computed indices.

Conclusions

The study was intended to assess the potential of Romanian localities for economic development, stability or decline, as well as to identify the factors determining such trends, on the basis of statistical indicators in evolution and of a GIS system as statistical support.

By comparing the analyses achieved in this research (establishing the final indexes on specific domains involved in territorial planning, as well as the final attractiveness index for Romanian localities) with the analyses achieved 10 years ago within the study "Geo-spatial systems for sustainable development in Romania" (in which territorial analyses at NUTS V level have been made using the ELECTRE method of evaluation), the following conclusions were drawn:

- In terms of the demographic potential, the analysis shows the same strengths and weaknesses as 10 years ago;

- In terms of economic development, it is observing the increasing of disparities between the areas with development potential and the underdeveloped areas. In this context there is a pronounced development around big cities having development potential (Bucharest, Timișoara, Arad, Cluj, Oradea, Sibiu, Brașov cities) and, partly, in areas around the cities of Constanța, Târgu Mureș, Alba Iulia, Iași, Baia Mare, Satu Mare, Craiova. This gap which has widened over the last 10 years is due to foreign investments which were mainly concentrated in Transylvania and Bucharest, as well as to the absorption of EU funds in particular in these areas.

- The absorption of European funds especially in the developed areas is also relevant for the utilities Chapter, for which the difference between these analyses and those achieved 10 years ago demonstrate a consistent rehabilitation in the areas with development potential, while in poor areas the infrastructure was rehabilitated in a slow rhythm.

- The identification of strengths according to intelligent strategies and the state involvement in the reindustrialization of poor regions is the only solution to achieve one of the goals of the European Union, namely the territorial cohesion.

- A better spatial planning help increasing the number of investors and supporting improvements in the field of urban development.

- A long- or medium- term Integrated Metropolitan Strategy can ensure a balanced territorial development.

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