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BUILT INFRASTRUCTURE DISPARITIES IN ROMANIA

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ABSTRACT - Our paper focuses on built infrastructure disparities in Romania, especially on: the drinking water supply, the sewage system, the gas supply, the thermic energy, the telephone, and the public roads networks. We used statistical data from the 2003 Statistic Annual of Romania and we made our research using quantitative methods as well as calculating certain disparity indices (e.g. Hirschmann–Herfindahl Index, the Dual Index) in order to show the interregional disparity increase/decrease.

Key words: infrastructure, disparities, territorial structure, development.

INTRODUCTION

Infrastructure is a significant territorial development and planning factor as it influences all aspects concerning the economy, the settlements, the living standards and, generally, the territorial development level. Regional development disfunctions are basically caused by the absence of the economic, the informational, the built, and the transport infrastructure or, if they exist, they are either inappropriate or inefficient, or they do not observe the European standards. The Romanian Ministry for Development and Prognosis proposes the following solution and action target: infrastructure development and modernisation (Benedek 2003: 232–233.). Infrastructural development is the main issue for the settlements where the built infrastructure and the territorial planning has social and economic significance as it defines the urban living standards, conveniences, and hygiene (Lăzărescu 1977: 159.).

Infrastructure is the main issue also for the development of settlements. That is why the inefficient treatment of settlement nuclei and problem solving are the main functions of development. The built infrastructure disparities among settlements are more and more obvious. Similarly, a discrepancy between the urban and the rural development level may be noticed, rural settlements being characterised by old infrastructure. Therefore, the main difference as far as settlements are concerned is an infrastructure matter both for the present and for the future.

Basic infrastructure is extremely important for settlement development. *Basic infrastructure* consists of households, medical centres, capacities to provide basic food and consumables, and social work. Among the public utility services, we mention the drinking water supply, the electricity and telephone networks (Rechnitzer ed. 1994: 179.). This *basic infrastructure* is necessary for the urban settlements. But *social* (polyclinics), *cultural* (secondary schools, high-schools), *financial* (banks and other financial institutions), and *commercial infrastructure* (markets, supermarkets, etc.) is also important. In case of urban settlements, these institutions ensure the relationships with the rural settlements in their *hinterland*.

The importance of infrastructure for settlements is emphasized in Romania's territorial planning. Law no. 351/2001 concerning settlement development stipulates the infrastructure conditions in the urban and the rural areas (especially for the communal centres).

Our paper focuses on the Romanian infrastructure development as a territorial development resource for the urban and the rural settlements. We focus especially on the built infrastructure which is the most important for the functioning and influence of a certain territory: the drinking water supply network, the sewage system, the thermic energy supply network, the gas supply network, the public roads, and telephone networks.

THE DRINKING WATER SUPPLY NETWORK

This is one of the most important issues for hygienic living and production. The water supply needs of the settlements depend on households, the public sector, trade, and industrial needs, etc. (Surd coord. 2005: 281–284). Water use depends on its qualitative (drinking) features. Its organoleptic, physical, chemical, biological, and bacteriological qualities are particularly important for the water that the population uses (Lăzărescu 1977: 160).

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The water supply in Romania does not meet demand. At the end of 2003 the total length of the drinking water supply network was 42,263 km, but this represents only 25.3 % of the settlements, those which are connected to the public network. This percentage was higher for the urban settlements, almost all of them getting their drinking water from the public distribution network, but the percentage was much lower in the rural area. During the last decade, the water supply network extended, especially in the rural area, and this phenomenon became more visible when Romania could get pre- EU accession funds. At half way of the SAPARD implementation programme (2000–2003), 19.3% of the funds were directed towards rural infrastructure development (the following were a priority: the drinking water supply and the sewage networks, the building and modernisation of public roads).

Analysing the territorial structure of the drinking water supply network in Romania (figure 1) we noticed that the most developed was in the Bucharest area and Ilfov County. It was sure that this high value was deformed by the small territory of the county and by the network extension in Bucharest. Otherwise, Ilfov County, without Bucharest, had values under the average of Romania (8.5 km/ 100 km^2). The opposite situation exists in the following counties: Suceava, Covasna, Caraş-Severin, Dolj, Teleorman, and Giurgiu (less than 10 km/ 100 km^2). The difference between the two poles (Bucharest – Giurgiu) was of 103 times, and the average deviation from Romania's average (*standard deviation*) was 70. We included the other counties into three development areas: the above-the-average developed area (Cluj, Braşov, Prahova, Argeş, and Constanța – the industrialized counties with higher development indices and significant population density), the average developed area (the western counties of Romania, Iaşi, and the counties of Eastern Muntenia), and the-under-the- average development area (Central Transylvania, Moldavia, and Southern Muntenia).

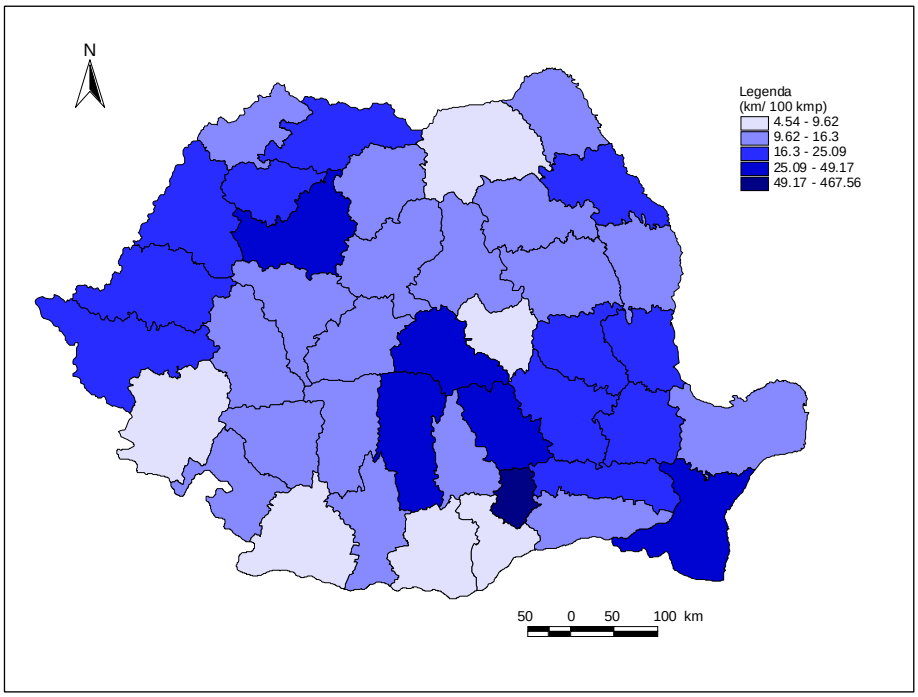


Figure 1. *The density of the drinking water supply network in the counties of Romania*

If we analyze the settlements connected to the drinking water supply network, the highest percentage is in Ilfov County (71 % of the total number of settlements) followed by Maramureş (70 %) (although its density was around Romania's average. In Maramureş County the communes of Dragomireşti, Rozavlea, Bârsana, Săcălăşeni, Fărcaşa, Salsig, and Ulmeni participated in SAPARD projects for the modernisation of the infrastructure and they obtained a total of 6.1 billion Euros for building a drinking water supply network, for the development of the sewage network, and for the purification of the used water. In addition, in Maramureş County, the density and the number of settlements were very low as compared to other counties.

In Giurgiu County, only 4.5 % of the settlements had a drinking water supply network (especially the towns and the municipiums) and six rural settlements were connected to this network.

THE SEWAGE NETWORK

This infrastructure element is closely connected to the drinking water supply network. In most cases, the settlement was the first to build the sewage infrastructure (sewage, the cleaning water station). Therefore, the calculated correlation between the drinking water supply network density and the density of the sewage network was 0.998. Although this value showed a significant relationship between the two, the territorial

structure of the sewage network was different from that of the drinking water supply (figure 2). That led us to the conclusion that in most settlements, the drinking water supply system (consisting of several "steps" – water collection, storage and transport, water distribution, the collection of the used water, purification, and discharge) was only partially built and thus had low functionality and efficiency.

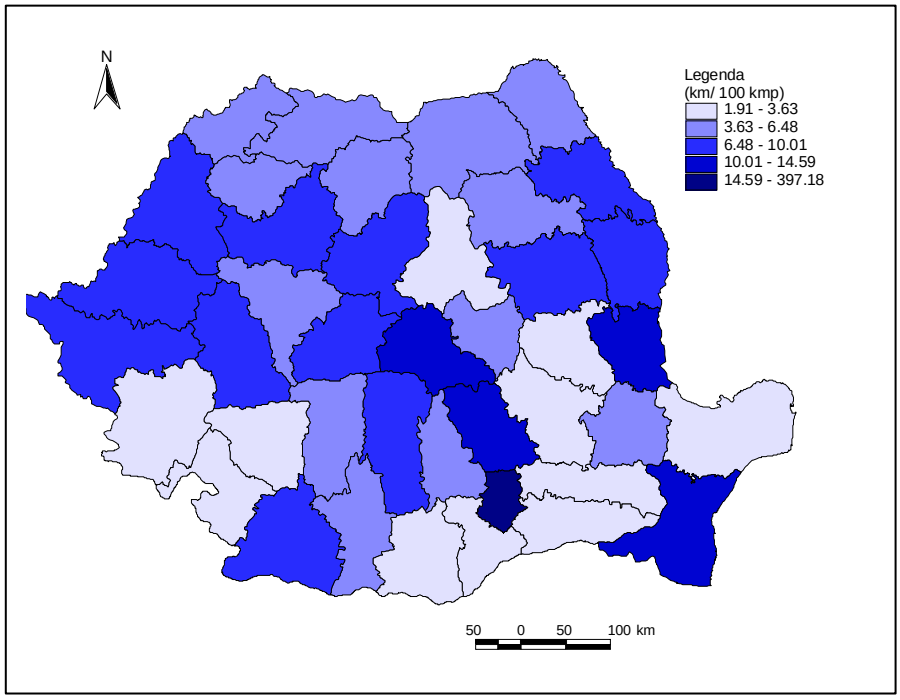


Figure 2. *The density of the sewage network in the counties of Romania*

In 2003 the sewage pipes were 17,183 km long and they met the demands of 688 settlements. The small number of settlements connected to sewage pipes (5.21 % of the settlements) showed that a significant disfunction of settlements was the fact that the used water was not collected into a unitary system and the collecting pipes led to drinking water pollution and waste. This aspect was mentioned in the Romanian National Plan for Territorial Planning, Section II. Water (Law 171/1997). This law identified 28 areas having important drinking water supplies and sewage deficiencies, which included almost all the urban settlements of Romania. This was a serious problem in the rural area as well, as opportunities to improve the situation were scarce over there. Despite the SAPARD funds offering the financial solution to this problem, the communes that won such funding were not able to accomplish the projects because they lacked their own funds.

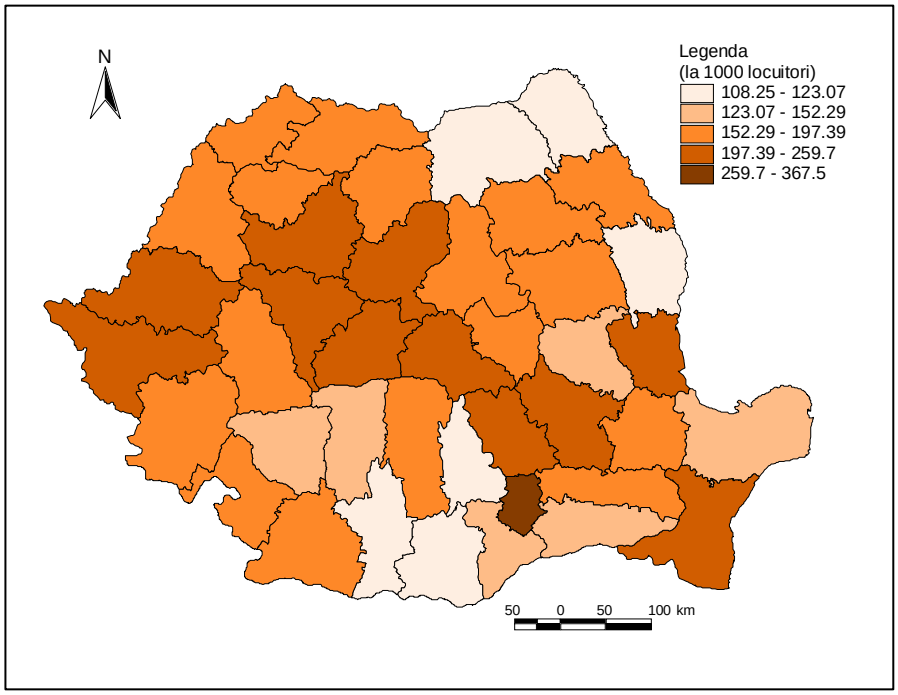
Going back to the territorial structure of the density of the sewage network (km/ 100 km^2) for the counties of Romania, we noticed three development classes: 1. Bucharest, 2. the Centre and the West of Romania, 3. the South and the South-East of Romania. Bucharest was followed by highly industrialised counties (Prahova, Braşov, Galaţi, and Constanţa), as well as by the Transylvanian and the Moldavian counties (except Harghita and Vrancea). The least developed ones were: Caraş-Severin, Mehedinţi, Gorj, Teleorman, Giurgiu, Călăraşi, Ialomiţa, Buzău, and Tulcea. The difference between the maximum (Bucharest) and the minimum (Tulcea) values was 207 times.

GAS AND THERMIC ENERGY DISTRIBUTION NETWORKS

Urban heating was one of the most important problems for territorial planning meeting civilized and hygienic standards of living (Lăzărescu ed. 1977: 168). In the urban area, during the socialist period, the old equipment was replaced by modern and centralised heating distribution systems. Nevertheless, the percentage of settlements with central heating was very small and they concentrated mostly in the urban area (186). Methane was normaly used for heating (the correlation between the settlements benefiting from central heating and the density of gas pipes was very high: 0.986). In some cases processed coal and oil derivates were used.

Romania has important quantities of methane especially in the Transylvanian Depression (south and north of the Mureş at Puini, Zau de Câmpie, Luduş, Şincai, Bazna, Nadeş, etc.). Beside these, natural gas from oil reserves lie outside the Carpathian chain, in the Prahova - Dâmboviţa oil reserve area (Măneşti, Finta, Moreni, Hulubeşti, etc.). That was why the highest density of gas distribution network is a characteristic of these areas which were also the starting point for ramifications all over Romania. Besides Bucharest, where the network was on a small territory and thus has a very high density, Mureş County also has a high density (42.8 km / 100 km^2). It is here that most of the gas wells and distribution points for the other regions of Romania lie. In this county the percentage of settlements connected to the gas distribution

network is very high (54 % as compared to the other counties where the average is only 8 %). The same situation characterizes Sibiu County (57 % of the settlements), which also has gas reserves. It was interesting that in Prahova County, despite its dense distribution network (38.3 km/ 100 km^2), only 18.1 % of the settlements were connected to the gas distribution network.



The territorial structure of the density of the natural gas network (figure 3) has an almost concentric distribution: the most dense areas are in the central region of Romania, and towards the periphery, the density decreases even to less than 1 km/ 100 km^2 (e.g. in Giurgiu, Teleorman, Tulcea, Mehedinți Counties – the last one had no settlement recorded to this network). Among the high density counties and the low developed ones, an average density area appeared.

Figure 3. *The density of the gas distribution network in the counties of Romania*

THE TELEPHONE NETWORK

The telephone network is an important element of the communication infrastructure and of economic and social development. In this paper we took into account only the fixed telephone network, the monopoly of the RomTelecom Society in Romania. During the transition period, this society was the subject of privatisation and, thus, part of its actions were transferred to a foreign investor. As the market economy developed, more private societies appeared, spreading a new communication technology – mobile services. This new technology conquered the market rapidly so that the mobile services users exceeded the fixed telephone network (7,065 thousands as compared to 4,330 thousands).

Telephone line access evolved in the last decade reaching 199.2 lines per 1,000 inhabitants. This value situates our country below the European average which was more than 300 lines per 1,000 inhabitants (an average of 326 lines/ 1,000 inhabitants) in 2000. Moreover, Western Europe was on top, as Germany, Norway, Sweden, Denmark, and France had over 500 lines/1,000 inhabitants. The values of Romania were characteristic of Eastern Europe.

During the last ten years, the fast development of the telephone network was dependent on the large volume of investment for its extension and modernisation. Therefore, the development disparities between the Romanian counties were permanently decreasing: in 1975, the Hirschman–Herfindahl Index was 0.169; in 2002 it was 0.058.

The territorial structure of the telephone network (figure 4) showed that the capital of Romania was on the first place. We noticed a more developed stripe on the west – south-east direction where the following counties lie Timiş, Arad, Cluj, Alba, Sibiu, Mureş, Braşov, Prahova, Buzău, Galați, and Constanța. Their values are around the average or exceed it. This area functioned as a limit that divided Romania into two almost symmetrical parts. To the north and to the south of the limit several not so developed counties were situated, while the periphery was characterised by the minimum values in Romania: Suceava, Botoşani (in the north), Vaslui (in the east), and Olt, Teleorman, Dâmbovița (in the south).

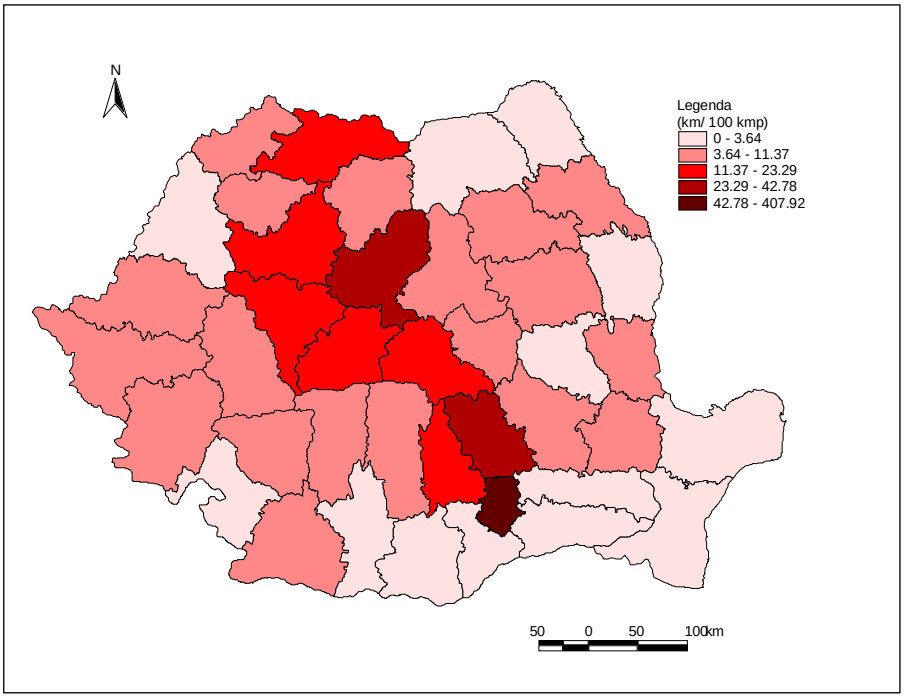


Figure 4. *The density of the fixed telephone network*

The difference between the minimum value (Teleorman, 108) and the maximum one (Bucharest, 367) was not as significant as in the case of the drinking water supply network. The important extension of the telephone network showed that telecommunication was among the inhabitants' main necessities and it was no longer a luxury (as at the beginning of the 20th century when it appeared). More and more people afforded it. Similarly, the network growth was by far not as expensive as the development of public utilities which suffered because shortages or lack of funding.

THE PUBLIC ROAD NETWORK

Roads are a complex of building for transport. Without discussing the technical details of roads (Surd coord. 2005: 184–272) we may say that ensuring satisfactory conditions for traffic depends on the built infrastructure of the respective road (Lăzărescu 1977:179–180.)

The development level of the communication infrastructure influences most of the capital, people and goods fluxes as well their intensity (Benedek 2003: 161). Therefore, their development is a priority. That was why, the first section of the Romanian National Plan for Territorial Planning (PATN, Section I, Law 71/1996) focused on the lines of communication. This law had four chapters according to the transport type. In the chapter on road transport, the following objectives were set: highways, express ways, national roads, and bridges. These sections were necessary in order to reach European standards where the road network is very developed (the highways and the express ways were little represented in Romania). This is easy to notice if we analyze the standard of living in Western European countries taking into account the number of cars per 1,000 inhabitants (Italy 591, France 564, Austria 536, Germany 529, whereas in Romania there were 154 cars/ 1,000 inhabitants).

The public roads of Romania are 79,001 km long and they are divided into two categories: national roads (which are important at the national level) and county and communal roads. The first category represents 19% of the total public road network, the remaining 81% represent county, communal, and local roads. 90% of the roads from the first category are modernised, the other 10% only have a thin cover. As far county and communal roads are concerned, the situation is the opposite (only 10% are modernised, 30% have a thin cover, and 60% have no cover at al). Of the total length, half is not modernised and necessitates improvement.

The public road density in Romania is 33.1 km/ 100 km^2. Disparities between counties are obvious, but not too significant. The maximum value (46.7) exceeds three times the minimum (14.9). The territorial structure (figure 5) shows that Bucharest and Ilfov sector have the longest routes per 100 km^2. That is because the centralising function of the capital: all roads start and end in Bucharest.

After the capital agglomeration area, the second place in this hierarchy belongs to the neighbouring counties forming a west-east direction ring (Argeş, Dâmboviţa, Prahova, and Buzău). Another two areas are on the same development level, and they are north-south oriented: the West Transylvanian – North Oltenia area (Sălaj, Cluj, Alba, Hunedoara, and Gorj counties) and the East Moldavia area (Botoşani, Iaşi, and Vaslui counties). These two have always been transit areas between the big historical regions of Romania and the

urban settlements and consequently, their road network has been developed for centuries (between Transylvania and Crişana, between Transylvania and Muntenia, between Muntenia and Moldavia, between Moldavia and Bucovina, etc.).

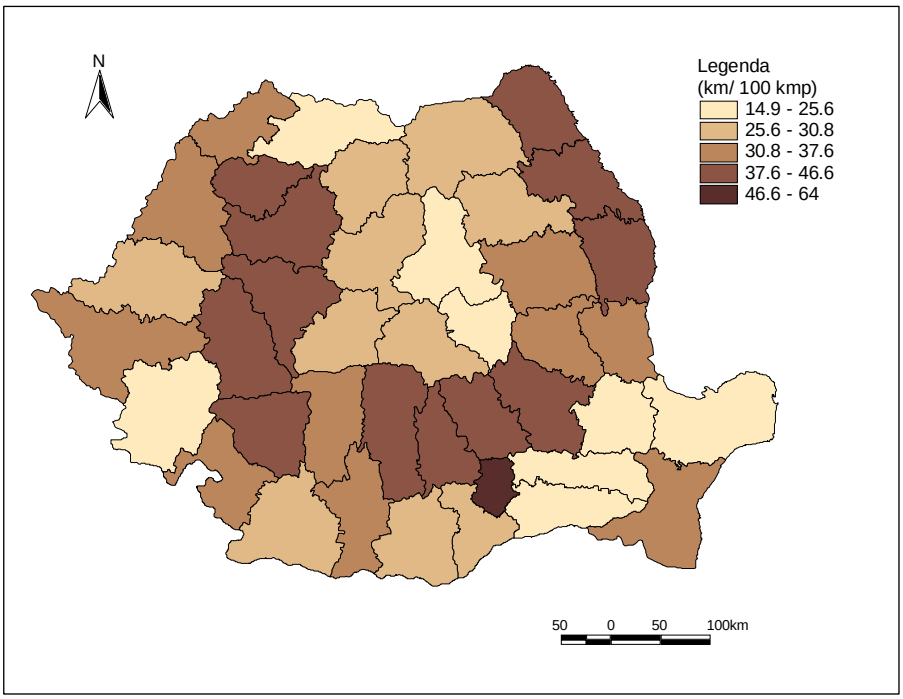


Figure 5. *The density of the public roads network in the counties of Romania*

The counties having the least developed infrastructure were those where natural conditions were restrictive: the mountainous and the delta areas. Similarly, in the Romanian Plain, the Bărăgan area, especially the structure of the settlements network determines the low density (the large agricultural area and the low density of settlements). The other counties have values around the average of Romania.

CONCLUSIONS

In the Romania of the 1990s, we noticed the increase of interregional disparity from the economic and social perspective. This was a consequence of Romania's transition to a market economy. The increase of the centre-periphery inequality was likely to appear. As far as the harmonisation and the homogenisation of the infrastructure was concerned, the built infrastructure was not going to be a disparity generation factor.

In 2003, the built infrastructure was still (and still is) unevenly distributed. In order to prove this, we used disparity indices: the Dual Index and the Hirschman–Herfindahl Index. Values showed that disparities were moderate and decreasing as compared to the previous years.

Table 1. *Disparity indices*

	Hirschman–Herfindahl Index	**Dual Index (Éltető–Frigyes)**
The density of the drinking water supply network	0.030	9.29
The density of the gas distribution network	0.048	13.99
The density of the sewage network	0.037	62.63
The density of the fixed telephone network	0.055	6.69
The density of the railway network	0.029	2.62
The density of the public roads network	0.026	1.52

In order to determine the most important factors influencing the diversity of the infrastructure elements, we correlated the infrastructure indices to population, and to the urbanisation degree (see results in table 2).

Table 2. *Correlations to infrastructure indicators*

Correlated index	Population	Urbanisation index
The density of the drinking water supply network	0.879	0.509
The density of the gas distribution network	0.876	0.511
The density of the sewage network	0.873	0.499
The density of the fixed telephone network	0.867	0.535
The density of the railway network	0.873	0.264
The density of the public roads network	0.637	0.214

We discovered significant correlations between the population density and the infrastructure indicators. The relationship with the urbanisation degree was significant only in some cases for the indicators having high values in the urban area: drinking water supply and sewerage networks, gas supply network and telecommunications. We concluded that most of the counties hosting big urban centres, developed industry and having a better developed economy (see economic disparities in Popescu C., 2003) had better developed infrastructure.

In the first part of our paper, we grouped counties according to several elements and infrastructure indicators, and in the end we classified the counties using cluster analysis starting from 6 indices (SPSS programme – *cluster analysis*). We used cluster analysis for a multi-dimensional classification. Mathematically, it consisted of the calculation of distance between different points (as a measure of similarity).

In our analysis we established four clusters according to the similarity indicator and consequently, according to development levels. Bucharest was one cluster, as all indicators were present there. The other four clusters were the following:

Cluster 1: Ilfov County and Bucharest Municipium

Cluster 2: Constanța, Galați, Buzău, Prahova, Braşov, Sibiu, Mureş, Cluj, Alba, Arad, and Timiş

Cluster 3: Iaşi, Neamț, Bacău, Brăila, Vrancea, Argeş, Ialomița, Dolj, Mehedinți, Caraş-Severin, Hunedoara, Bihor, Bistrița-Năsăud, Maramureş, Satu Mare, Sălaj, Covasna, and Harghita

Cluster 4: Botoşani, Suceava, Vaslui, Tulcea, Călăraşi, Dâmbovița, Giurgiu, Teleorman, Gorj, Olt, and Vâlcea.

Firstly, we discussed the importance of the built infrastructure for the settlement/urban development. After identifying the development clusters, our question was: “Did they take infrastructure into account when they declared the new urban settlements?”. This question was more interesting in case of the Suceava County, one of the least developed ones, but also the county that fulfilled the urban requirements for eight settlements in the previous years.

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