

## **Structural and Regional Transformation of Network Infrastructure in Hungary after the End of Communism**

### **Introduction**

The PhD thesis examines the directions of the development of network infrastructure in Hungary after 1990 and primarily examines the reasons and consequences of this development, primarily looking at its effect on the settlement system and regional development. The paper deals with the regional and structural, occasionally organizational and legal, aspects of this transformation, endeavoring to introduce the regional structure of network infrastructure. The analyses were conducted according to economic sectors and covered several levels of the public administration, including settlement, county and regional levels.

### **Problem Raising**

The modification of the communication network may be measured in decades. A few years are too short a period to observe the changes in regional processes. However, the years following the end of communism in Hungary brought about so profound socio-economic changes that their regional imprint could be observed within a decade: differences in the standard of living increased, and so did the role played by Budapest in the country. The economic map of Hungary was upset. The fall of communism changed the participants in regional development and a significant reduction and structural-regional transformation in the economy was witnessed. The sudden appearance and advance of the private economy was also spectacular.

Network infrastructure has played a major role in this transformation. Neither joining the European Union, nor advancing the economy may be realized without the development of network infrastructure. Therefore the design and understanding of the system of interactions within network infrastructure are very important, and special attention has to be paid to the rapid transformation and Hungarian socio-economic and regional peculiarities. Rational devel-

opment, be it sectorized or regional, may only be realized with a thorough knowledge of the above.

## **Research Objective**

Reviewing publications in connection with the topic, I tried to examine the selected field of studies from a new point of view, for instance, several, previously unpublished thematic maps were created with the use of data from the Hungarian Central Statistical Office (KSH). Several analyses were conducted with respect to economic sectors, but I found further motivation in the fact that no publication has been available on network infrastructure as a whole. György Kőszegfalvi and Tamás T. Síkos categorized settlements according to their infrastructural development, while Tamás Fleischer analyzed interactions between transport infrastructure and regional processes. These two methods of analysis were combined in the present work.

All in all, the objectives included the introduction of a more illustrative mapping system different from previous practice, which would better facilitate decision-making. Another objective was the analysis of the system of interactions within a network infrastructure, with special emphasis on the rapidly changing socio-economic background. The need for the development of a stereostructural model and the formulation of previously unpublished statements and proposals arose in connection to the objectives.

## **Thesis Structure and Research Methodology**

The first part of the thesis examines the sectors of network infrastructure: transportation, telecommunications, energy and water management. A detailed list of already realized developments is provided for each sector and development projects to be started in the future are also mentioned, reflecting the actual trends and strategies in the given sector and regional development as a whole.

Sector analyses are for the most part based on statistical data and maps generated from these data. Data are provided in multiple levels in order to provide a more detailed picture of

regional and non-regional – e.g. associated with settlement categories – differences. In order to promote comparative analyses, a unified representation was the main governing factor during the processing of maps. The use of maps with lists of settlements made the representation of smaller micro regions possible in order to provide a more accurate picture of the directions and dynamics of regional development.

The chapter discussing transportation introduces the analysis of connection systems as a unique methodological element. The indication of legal and ownership backgrounds was necessary in the chapters dealing with telecommunications and water management.

The acquirement and use of professional literature during the analyses was also a governing factor. Research methodology was enriched by methods such as visits on location and personal interviews, which play an ever-increasing role in today's planning practices, such as community planning or simply social participation in the planning process.

Part two deals with the interaction system of network infrastructure. A separate chapter discusses the regional projection of social problems, economic transformation, the restructuring of ownership relations and their effects. The peripheries characteristic to a given region or a settlement category are also introduced. The chapter, as a summary of statements made about sectors and as an analysis of interactions, describes differences in infrastructure based on the location of regions, analyses the possible reasons and carries out the same procedure for settlement categories. Complementing the stereostructural delineation of György Kőszegfalvi, József Nemes Nagy and János Rechnitzer, a new stereostructural map is introduced, which examines the relationships between economic and infrastructural development differences, based on static and dynamic indicators of network infrastructure.

In the last chapter, the stated objectives and achieved results as well as principles and statements formulated during the research are listed.

**THESES**

(Statements in Connection with New Scientific Results)

**Thesis 1**

**On the introduction of a map containing data in relation to the national average and the modification systems of indicators.**

**Thesis text:**

**1.a.**

**A map based on new methodology is introduced, enabling the comparison of databases with different contents. The development (stereostructural) model of network infrastructure was prepared with the use of this map.**

**The introduction of a map with a different methodology is necessary, enabling the comparison of databases with different contents.**

**1.b.**

**The correction of indicator systems shed light to the weaknesses of the parameters of access to the public road system, replaced by the analysis of the intensity of connection systems. This method describes the changes of accessibility as a basis of a developed economy.**

**1.c.**

**It was discovered with the examination of settlements connected to the natural gas network that development among settlements in this field was more significant in the Transdanubian Region.**

**1.d.**

**The indicator of main pipeline length with reference to population size has to be introduced into the process of analysis in order to enable the calculation of differences between investment and operating costs.**

Decision-making requires maps that are easy to understand, peruse and are free of complicated statistical calculations, because they make decision-making easier and provide easily “visible” and unambiguous results. Today, when regional approach is a fundamental principle in planning, this is especially important as each examined field is accompanied with the indicators of several sectors, each with its own parameters and indicator systems, rendering unified interpretation impossible. This problem was bridged with the creation of maps defining data in relation to the national average. Such maps were accepted for use by KSH.

Several factors may hide behind data and different socio-economic relations may produce similar results, therefore the conduction of personal interviews and visits on location are also important tasks. Personal interviews shed light to the fact that, for example, one important reason behind the development of cable television networks was the cultivation of ethnic cultures and languages.

The correction and sometimes explanation of the currently used indicator system was deemed necessary as they sometimes created distortions. Attention was drawn to such a distortion in the field of access to the public road system.

The examination of the connection system and construction of traffic within the settlement network was conducted with the use of timetables. This kind of analysis was carried out with the examination of accessibility of cities of county rank, the mapping of “white areas”, the stereostructure of network elements (blind settlements, feeder lines) and commuting traffic.

During the examination of natural gas consumption through public works, the analysis of settlements connected directly to the natural gas network showed that development among such settlements was more significant in the Transdanubian region.

Another newly introduced indicator is line length with relation to population size, which was used in many sectors. However, attention was drawn to the fact that a decrease in the number of inhabitants and apartments may be witnessed in several villages, especially in small and extremely small villages. A consequence of this fact is that apartment and infrastructural indicators show improvement even without real development investments.

The professional literature calculates the differences in public works with the ratio of connected apartments. The newly introduced indicators showing the relationship with the national average are more suitable to identify developed regions. The examination of the volume

of change and its regional distribution showed that significant development usually took place in small settlements, yet their regional distribution was very diffused.

## **Thesis 2**

### **On the significance of differences between settlement categories**

#### **Thesis Text:**

##### **2.a.**

**Settlements in the country were categorized according to their rate and level of development, based on the newly introduced indicator system and the stereostructural model assembled with the use of these indicators.**

##### **2.b.**

**Using data and maps edited by my own method I was able to demonstrate that the differences in network infrastructure are more significant between settlement categories than on a regional level. I have demonstrated that the reasons for differences in the level of development of the infrastructure may be traced back to differences in urbanization.**

The socio-economic split experienced in the country is a frequently discussed topic; several essays deal with the backwardness of Northern Hungary and the Great Hungarian Plain. Public thinking also uses the stereotype of a developed West and a backward East. Unfortunately, the exaggerated communication of this stereotype masks the presence of another, equally important, quality slope, that observed between settlement categories within the regional organization. I have been able to demonstrate in the paper with data and maps edited with my own method that the differences in network infrastructure are more significant between settlement categories than on a regional level.

The thesis paper points to the fact that in spite of development investments, small settlements have to deal with significantly worse provision of telephone lines, sewage systems, the level of mail services have been constantly dropping and the lack of accessibility continuously hinders economic development.

In search for the reasons of this backwardness, I underlined deficiencies evolved through history, disadvantages emerging through the transformation of the agricultural sector and the approach of efficiency in regional developments owing to insufficient resources.

In case the quality differences increase, a stronger migration drive will be a possible danger, and the prolongation of a disadvantaged competitive situation will result in an even steeper quality slope.

The following statements were made in connection with the thesis:

- Data and maps demonstrate that an increase in settlement size improves telecommunications infrastructure and provisions, while a more dynamic development of smaller settlements will gradually close the telecommunications gap. However, settlements with a small number of inhabitants may suffer a significant disadvantage in the field of postal services if the sector is rationalized.
- I have been able to demonstrate with the analysis of connection systems that it is weak between regional centers in comparison with their role, and this connection is realized in part with the mediation of the capital. Deteriorating technological parameters of feeder railway lines have had an adverse effect on the bottom segment of the settlement hierarchy, namely, villages.
- With the examination of regional differences, it may be stated that the differences in development of the two major parts of the country is best perceptible in the settlement category of small towns. Small towns in the Eastern part of Hungary mainly lag behind in the aspects of accessibility and sewage system availability. A smaller lag may also be witnessed in the field of telecommunications.

### **Thesis 3**

#### **On the Development Differences between Sectors of the Economy**

##### **Thesis Text:**

**The examination of the rate of development of different network infrastructure sectors demonstrated that the most dynamically developing sector in the economy was that of telecommunications. The analysis of connection systems demonstrated the insufficiency of the transportation system. Significant differences evolved between the two sectors with regards to the volume and direction of development.**

The thesis paper examined the possible reasons for these differences: different ownership relationships and market positions were identified. With reference to the application of the concession law, I drew attention to the fact that different potentials for development and results may be achieved with the application of the same legal background (Hungarian Telecommunications Ltd., highways M1 and M5)

### **Thesis 4**

#### **On the establishment of a development (stereostructural) model and the identification of types of development**

##### **Thesis Text:**

**The knowledge of the former line of development of the region/settlement is important in the definition of directions of development both in the fields of regional and settlement improvement. This knowledge is fundamental for setting further objectives, formulating concepts and associated strategies. The development model of network infrastructure has been prepared, the settlements were categorized according to their level and rate development.**

Static and dynamic data were separately listed using the data contained in the prepared maps. Settlements were put into the following categories with the use of these data:

1. Breaking away: Budapest and the more populated cities, except the “socialist” cities and cities suffering a significant decrease in economic potential.
2. Pulling up: settlements of an urban character with a favorable geo-potential, such as the settlements within the commuter belt of the capital city, medium towns along the Western border, basically mono-functional small towns focusing on one successful sector: spa towns or towns promoting greenfield investments, mainly enterprises in machine industry or service-commercial sectors.
3. Falling back: socialist cities and cities suffering a significant decrease in economic potential.
4. Lagging behind: villages in peripheral areas, small villages.

		<b>Rate of development of network infrastructure</b>	
		+	-
<b>Level of development of network infrastructure</b>	+	Breaking away	Falling back
	-	Pulling up	Lagging behind

The rate and level of development were examined at all sectors. The development (stereosstructural) model is the result of the summary of these assays.

However, several statements were made in connection with the analysis of sectoral developments.

Examining the priorities of developments in the transportation system, investments within the route network were categorized according to the geographical location of the route segment and its role played, and I pointed to the fact that “the mono-centric feature of the transportation network became more significant as a result of developments”. Transport infrastructure underwent more significant development in economically more advanced regions than in less advanced ones.

The observation in the development of public works sewage systems is that it may be associated with commuter belts on the one hand and tourist-recreational and environmentally protected areas on the other.

By examining the provision of cable television networks, I came to the conclusion that significant development took place in regions and settlements inhabited by ethnic minorities.

## **Thesis 5**

### **On the Interaction between Individual Sectors**

#### **Thesis Text:**

**I concluded in my thesis paper that the development of network infrastructure is a regional rather than sector interest. I have demonstrated the system of interactions between technological infrastructure and its social-economic-environmental location and I pointed to the fact that the two may not be separated. Regional balance may only be established and maintained with the provision of a balance within this system of interactions.**

The paper lists the following thesis-like statements as a result of my examinations:

- In the field of the length of sewage network per capita, the main emphasis is given to areas with major environmental values. These areas typically give home to settlements with medium- or small-sized population. Due to the protection of environmental values, sewage system in these areas is usually fully developed.
- The ownership structure of network infrastructure systems may determine the development of a given socio-economic regional unit. This may be important in areas where several companies with foreign interest have divided part or all of the market. Different behavior on the market in these areas may result in significant differences, while the possibility of state intervention is very limited. Excessive ownership concentration also does not favor the development of market conditions (monopoly situation).
- The transfer of public works ownership to local governments created significant economic, ownership and operational problems.
- Development in the economy brought about the transformation of connection systems. The transport connection system of settlements in a disadvantaged

situation following transformation of the economy deteriorated the most. Commuter traffic and public passenger transport dropped back most significantly in these areas. These regions did not receive sufficient support, because it was spent on stimulating developed areas, for example, the improvement of the connection systems of the western part of the country.

In addition to the statements listed above, I demonstrated that the change in energy sources had a major impact on the formation of the stereostructure of the economy and infrastructure. The appearance of nuclear energy fundamentally transformed the energy network and altered international connection systems as well.

Although the rate of migration was not examined, available data and Western European examples point to the conclusion that infrastructural developments may have an impact on the ability of a settlement to keep its population.

## **Thesis 6**

### **On area (regional) development and the methodology of (area) organization and development**

#### **Thesis Text:**

##### **6.a.**

**I demonstrated through several examples in my thesis paper that the regional interactions of circumstantial factors of the economic area – social, natural and artificial environment –, the rate of development of the given sector and the possibilities and limits of development have to be taken into account in the event of the realization of sector investments. No high-standard organizational and development projects may be carried out without the application of community planning. The preparation of a sociological study has to be included among the compulsory work phases.**

##### **6.b.**

**The fundamental objective of regional development is the mitigation of regional differences. A regional development policy may promote this objective most efficiently with the realization of a rational, diversified development.**

The following statements were made in connection to the thesis in my paper:

- The regional development model preferred by the political leadership decisively affects the geographical location of investments.
- The harmonization of infrastructure with economic development has to be set as the long-term objective. The first shift of infrastructure development in this direction occurred in the second half of the last decade: at regional level, it meant the priority of developing the Great Hungarian Plain, at settlement level, it meant the spreading of the supply (service) type of local government model.
- I have demonstrated that due to the principle of efficiency, investments often focused on areas where a quick profit could be realized rather than focusing on areas where the need arose for the stimulation of the economy.
- With the examination of the development of the natural gas and telephone networks, I demonstrated that diversified development acted towards equilibrium.

Previous studies underlined the follower aspect of infrastructure. Local development at major settlements today is mostly characterized by a supply-oriented settlement development approach, thus infrastructure in these settlements is anticipatory (supply-oriented) rather than follower, thus its development at the level of settlements is starting to go beyond the follower aspect.

New investments do not necessarily result in the acceleration of productivity growth, which is demonstrated by the development of natural gas and telephone networks of rural areas.

An often quoted economic argument is that infrastructural development promotes regional development only if it supports fundamental regional trends, otherwise the effective utilization of the infrastructure will not follow. This view was decisive in practice until the mid-1990's. The fundamental objective of regional development is the promotion of regional harmonization, thus regional development trends, as I have demonstrated, may have an opposite direction. And closing up disadvantaged settlements is the key to socio-economic development both at regional and settlement network levels.

## **Conclusion**

The PhD thesis paper describes network infrastructure developments after the end of communism in Hungary and presents their social and economic interactions from an aspect different from previous studies written in this topic. The development (stereostructural) model of network infrastructure was designed. The preparation and application of this model in regional organization and development projects is advisable.

The paper described the interaction system of network infrastructure: the rapid transformation of industry and economy, the reorganization of the settlement network, the appearance and rapid development of new settlement structures, the settlement clusters, commuter belts and township regions closely interact with network infrastructure.

The essay did not have the objective of qualifying development concepts or stating new development priorities, however attention was drawn to several previously not or not strongly pronounced facts and processes.

The new research methodology appearing in the thesis, with easy-to-manipulate data and maps yielding new results, is easy to fit into the present regional organization and development planning system.

## **Publications:**

### Articles

A történelmi településszerkezet fellazulása (2003)

*Értékmentő 6. szám pp 6-7*

Transport Connection Systems of the Transdanubian Region with Reference to Joining the European Union (2004)

*Hungarian Electronic Journal of Sciences (<http://heja.sze.hu>) – Architecture Section 12p.*

Településszerkezet és városi közlekedés összefüggései (2004)

*PTE FI – Közlemények a Földrajzi Intézetből –*

Transformation of Energy Management after the End Of Communism (2004)

*Hungarian Electronic Journal of Sciences (<http://heja.sze.hu>) – Architecture Section 10p.*

Soproni lakóterületek fejlődése (2004)

*Magyar Építőipar*

Sopron tömegközlekedése 1945-1990 között (2004)

*Soproni Szemle*

### Works of non-publication value:

Útmutató építkezőknek – Őrség (második, javított kiadás 2003, Szerzők: Dr. Winkler Gábor, Kottmayer Tibor, Oszvald Ferenc Nándor, Hadas László, Somfalvi György)

Őrség Nemzeti Park

Az Őrség településszerkezete (2004)

Őrség Nemzeti Park - CD

A kistérség-fejlesztés lehetőségei Vas megyében (1998)

*Kőszeg, Körmend, Óriszentpéter November 1-3.*

Sopron infrastrukturális viszonyai és térszerkezete (1999)

*Geográfus Doktoranduszok IV. Országos Konferenciájának Kiadványa SZTE Szeged*

Egységes épületszerkezetek az európai éghajlati viszonyok tükrében, avagy kétségek az egységről c. előadás. (1999) (társszerző: Szabó Péter)

*XXIV. Épületszerkezettani Konferencia Kiadványa, Győr*

A közlekedési kapcsolatok és a regionális fejlődés (2000)

*SE Doktori Iskola.*

Településszerkezet és közlekedés. (2000)

*Geográfus Doktoranduszok V. Országos Konferenciájának Kiadványa. Miskolc, október*

A Nyugat-Dunántúli régió belső és külső közlekedési kapcsolatai (2000)

*Tavaszi Szél Doktoranduszok Országos Konferenciája. Gödöllő, április*

A kistérség fogalma - A kistérség-fejlesztés lehetőségei. (2002)

*BME Urbanisztika Intézet április 22.*

Az Őrségi építészeti hagyományok továbbélésének lehetőségei a mai építészetben. (2003)

*Természetesen – Őrség Konferencia, szeptember 15*

Sopron közlekedési rendszerének vizsgálata (1997)

*PTE TTK Településföldrajzi és Urbanisztikai Tanszék diplomamunka*

Településfejlődés és tömegközlekedés (2002)

*BME Urbanisztikai Intézet szakmérnöki diplomamunka*

FERENC NÁNDOR OSZVALD:

---

Structural and Regional transformation of Network Infrastructure In Hungary after the End of Communism

THESIS LEAFLET

---