MATHEMATICAL AND GEOGRAPHICAL INVESTIGATIONS OF SOCIAL INFRASTRUCTURE IN RURAL SETTLEMENTS OF BORSOD-ABAÚJ-ZEMPLÉN COUNTY

by

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SUMMARY

At present the problem of the infrastructure level of the settlements in Hungary is at the very centre of scientific interest. It has been verified that as from the 1970ies the infrastructural level of a settlement has determinded both the amount of migration and the tempo of housing development to a large extent. It can influence the decision as to the changing of the working-place and the development of settlements or the settlement pattern.

There are unfavourable processes in this field, too, e.g. a quick population loss of some rural settlements, the depopulation even of some villages, an overcrowding of some others, etc. Understandably there were discussions about the establishment of the basic facilities and about an equal distribution of technical infrastructure on a regional level.

The aim of this paper is to examine the spatial differences that can be found in the level of infrastructure in the rural settlements of Borsod-Abaúj-Zemplén county.

As a result of these investigations the following statements can be made for the 352 rural settlements of the county. More than 40% of them have an infrastructure being in the initial stage of development. Another 40% have a weakly developed infrastructure associated with medium rate public facilities. Only 17% of the rural settlements have medium to better infrastructure, and only 10 dynamically developing settlements can be said to have a suburban type of infrastructure (that is less than 3%).

The study proved the important role of the transport network in developing infrastructure in the case of rural settlements.

The series of maps and the mathematical methods used make it possible to indicate those areas, in which rural settlements which are weakly developed and have lower-level facilities only are most frequent. They are mainly the settlements of the Cserehát Range, the karst areas of Northern Borsod, the Bodrogköz, the Bükk Mountains and the Borsod-Mezöség. We believe that the methodological progress of our work lies in exploring the meaning of the rotated factors and presenting those factors that play leading roles in the formation of a developed infrastructure. (F_1 = the development level of basic facilities, F_2 = the dynamics and quality of housing construction, F_3 = communication level, F_4 = unfavourable residential and communal conditions)

The Borsod-Abaúj-Zemplén county, as a model-area, showed that factor and cluster analyses are suitable for typifying the residental facilities in Hungary or other counties, after making some modifications in the data-bank.

ZUSAMMENFASSUNG

In Ungarn gelangte die infrastrukturelle Versorgung der Siedlungen in den Mittelpunkt des wissenschaftlichen Interesses. Es erwies sich, daß das Niveau der infrastrukturellen Versorgung - besonders von den 70-er Jahren an - das Tempo der Abwanderung der Bevölkerung, und des Wohnungsbaus bestimmt, zum Arbeitsplatzwechsel motivieren kann und letzten Endes auf die Entwicklung der Siedlungen wie des Siedlungsnetzes einen bedeutenden Einfluß ausübt.

In diesem Zusammenhang sind auch ungünstige Prozesse festzustellen (rascher Bevölkerungsverlust in einigen Dorfsiedlungen, Entvölkerung einiger Dörfer, zu hohe Dichte in anderen). Es ist daher durchaus verständlich, daß im Rahmen der Siedlungspolitik in den vergangenen Jahren dem Entwicklungsgrad des Grundnetzes an Einrichtungen und dem regionalen Ausgleich bezüglich der technischen Infrastruktur besonderes viel Augenmerk geschenkt wurde.

Als Ergebnis der Forschungen konnte für 352 Dörfer des Komitates Borsod-Abaúj-Zemplén folgendes festgestellt werden: Über 40 % der Dorfsiedlungen des Komitates verfügen nur über eine Infrastruktur, die in die Anfangsperiode der Entwicklung einzuordnen ist. Etwa 40 % der Siedlungen weisen eine schwach entwickelte Infrastruktur auf, wozu eine mittelmäßige Ausstattung mit öffentlichen Einrichtungen gehört. Bloß 17 % der Dorfsiedlungen haben eine mittelmäßige bzw. entwickelte Infrastruktur, 10 dynamisch entwickelte Siedlungen (weniger als 3 %) haben eine vorstadtmäßige Infrastruktur.

Die Forschung hat die besondere Bedeutung des Verkehrsnetzes für die Entwicklung der Infrastruktur der Dorfsiedlungen bewiesen.

Mit Hilfe von Kartenserien und mathematischen Methoden sind jene Gebiete leicht zu bestimmen in denen Siedlungen mit schwach entwickelter und rückständiger Infrastruktur dicht gehäuft sind. Diese Regionen sind das Gebirge Cserehát, das Karst-Gebiet im Norden, das Zempléni-Gebirge, Hegyköz, Bodrogköz, das Bükk-Gebirge und Borsodi-Mezöség. Die methodische Bedeutung der Arbeit besteht darin, daß die Aussagefähigkeit der rotierten Faktoren bestimmt wird, ferner daß angegeben wird, welche Faktoren eine führende Rolle in der Entwicklung der Infrastruktur haben (z.B. F_1 = Entwicklungsgrad der Grundelemente der Dienstleistungen, F_2 = Dynamik und Austattung des Wohnungsbaus, F_3 = Verkehrslage, F_4 = ungünstige Wohnungs- und Kommunalfaktoren).

Der Versuch im Modellgebiet im Komitat Borsod-Abaúj-Zemplén hat erwiesen, daß die Faktoren- und Clusteranalyse nach gewissen Änderungen in der Datenbank auch für die Erstellung einer Typologie der Infrastrukturausstattung für ganz Ungarn und für andere Komitate anwendbar ist.

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INTRODUCTION

During the past 40 years of socialist development, the goals of national economy have changed considerably and Hungary was transformed into an industrial-agrarian state. These profound changes resulted in a significant increase in the living standards of the population on the whole. Now, society and social politics are facing the task of dealing with disproportions in regional development as well as in the living standards of urban and rural populations.

At present, regional policy pays particular attention to the development of the infrastructure and settlement network. If social infrastructure and communication networks of rural settlements do not develop properly, undesirable phenomena are likely to arise, leading to an out-migration of population from rural areas, to "demographic deformation" of rural settlements, lacks in the agricultural labour force and the formation of problem regions.

The facts mentioned above are of great importance, therefore they are to be considered interesting topics for geographical research.

Our studies focussed on the different regional levels of social infrastructure in rural settlements of Borsod County which has been chosen as a model region for the reasons given below.

2. THE MAIN AIMS OF THE STUDY

A typology of rural settlements of Hungary was elaborated by the author of this paper and P. Beluszky between 1979 and 1981 (BELUSZKY, P. and SIKOS, T.T. 1982a, 1982b, 1983). It could be shown that almost all types or rural settlements of the whole country can be found in Borsod County. As social infrastructure is a basic element of rural settlement development, this typology could be elaborated for this area. Within the the framework of the topic chosen the following problems were studied:

1. A typology of rural settlements of Borsod County was elaborated, based on a methodological concept differing from earlier ones in the calculation of indices and mathematical and statistical methods applied (BELUSZKY, P. and SIKOS, T.T. 1979).

2. A typology of the social infrastructure of rural settlements resulted from factor- and cluster analyses.

3. A data base was compiled providing information on the social infrastructure of rural settlements of Borsod County from different points of view.

4. Functional relationships between the population of rural settlements and indices of the development levels of the social infrastructure were determined.

5. Using factor analyses, factors were extracted and their contributions to the development of social infrastructure in rural settlements of Borsod County were examined (SIKOS, T.T. 1986).

All the calculations were run on a computer of the type IBM 3031 at the Hungarian Academy of Sciences on the basis of the authors's research program.

A great number studies were published by Hungarian scholars recently, investigating primarily public administration and economic problems as well as the stratification and migration of population in rural settlements. In these studies, attention

was focussed on the differentiation in regional development levels and the typology of rural settlements in Hungary. A complex economic and economic-geographical research into the typology of social infrastructure of rural settlements was, however, not carried out yet. Moreover, the application of methods of factor and cluster analyses in the typology of social infrastructure and rural settlements can be regarded as a new concept.

The statistical data base for 1980 and data collected by the Council of Borsod County were valuable sources for the investigations. Research has been carried out first of all by the application of mathematical methods, it involved, however, comparative methods of economic geography and cartography, too.

The type of social infrastructure was determined for 352 rural settlements of Borsod County by making use of cluster analysis. 13 clusters with a maximum homogenity involving 9 subtypes and 5 main types *(Fig. 1)* were found. They are presented below.

3. MAIN TYPES

"1" - represents social infrastructure in an initial stage of development, containing 3 clusters (11, 6, 12). It comprises 40 percent of rural settlements of Borsod County. Most of them are situated in the Northern Borsod Karst, the Highlands of the Cserehát and Zemplén, in regions of the county lying far away from transport routes. The values for the indices of social infrastructure are much lower than the county mean in this initial stage of development.

"2" - denotes little developed social infrastructure and communication networks of medium level. It includes clusters 10, 13, and 7 which constitute 2 subtypes.

This type of social infrastructure is characteristic of almost 40 percent of the rural settlements in Borsod County. The majority of them are large villages and more developed settlements. In general the second main type shows high value for the indices of transport facilities and values for the indices of public utilities and basic services as high as those of the county means. There are significant difference between these two subtypes in the development level of the basic elements of the services. The complex index of basic services (index 3) amounts to 10 points for cluster 10 while these values are 18 and 20 points resp. in clusters 13 and 17 which means that it exceeds the county mean value considerably.

"3" - denotes averagely developed social infrastructure and comprises clusters 8 and 9, with 14 percent of the rural settlements of Borsod County. These dispersed settlements are situated in the highlands, in the industrialized valley of the Sajó river and in the Miskolc agglomeration. Subtypes 8 and 9 of this main type differ in the development level of the transport
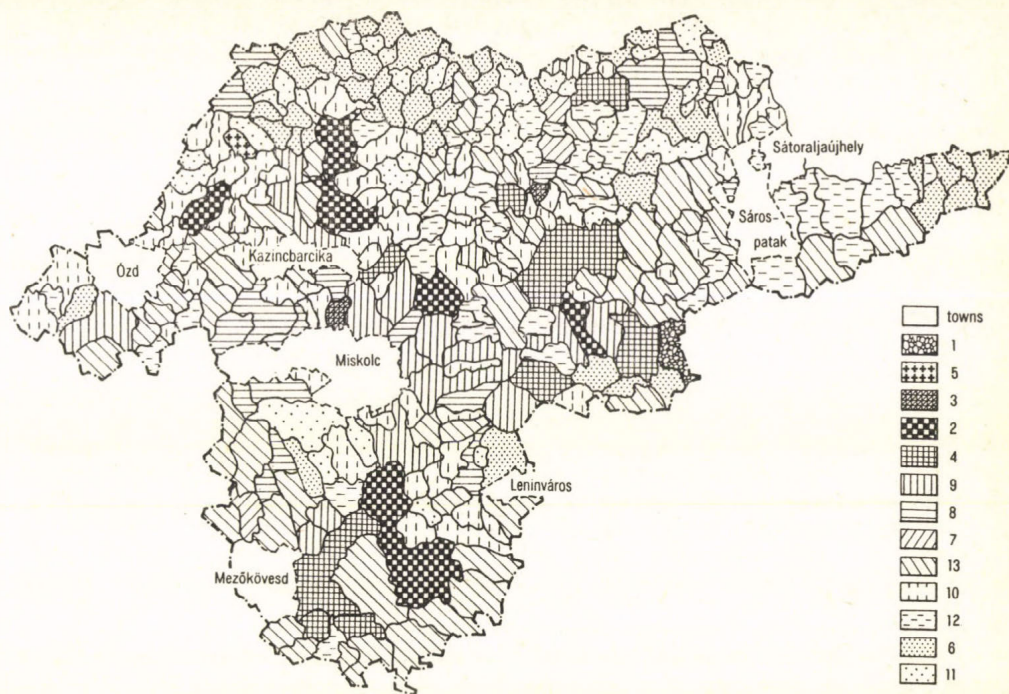
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Fig. 1 Types of social infrastructure in rural settlements of Borsod-
Abauj-Zemplén County in 1980; clusters 1-13

network and tourist services as well as in the level of basic
services.

"4" - shows advanced stage of social infrastructure development
and includes 11 rural settlements in Borsod County arranged
in a mosaic-like pattern in the territory of the county. The
value for the complex index of basic service amounts to 25.5
points which is twice as much as the county mean. Former small
towns, such as Abaújszántó, Gönc, Tállya and Tarcal, belong
to these rural settlements. The indices of the rate of housing,
quality of flats and public utilities are higher than the county
mean. The accessibility of the nearest towns and villages (county
seats) is quite good, though the frequency of services of mass
transport is lower than the mean in the county. Generally
speaking the social infrastructure of this main type provides
favourable living conditions for the rural population.

"5" - For this main type, social infrastructure corresponds
to that of small towns (clusters 2 and 3). 10 rural settlements
of the county belong to it. It involves 4 district seats (Edelény,
Szerencs, Mezöcsát and Encs) as well as 3 former district seats

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(Szikszó, Putnok and Sajószentpéter). Industrial enterprises located in these settlements have a dynamically developing service network. Urban features dominate in the way of life of these settlements. The communication network is well developed. Practically all these settlements are situated along transport routes or not far from then. The social infrastructure of these small towns provides good living conditions for the rural populations which increased 1.5 times during the last 30 years.

In conclusion it is worth mentioning that the indices of the development of social infrastructure frequently exceed the national means. On the other hand research is aware of the fact that in more than 40 percent of the rural settlements of the county social infrastructure is just in an initial stage of development. Moreover, another 40 percent of rural settlements of the county have a badly developed social infrastructure and a public utility network of medium-level only. In only 17 percent of the rural settlements of the county social infrastructure is developed averagely or even in an advanced stage of development, and there are merely 10 dynamically developing rural settlements (less than 3 percent) which can be attributed a social infrastructure of a small towns' type.

The significant role of the transport network in the development of the social infrastructure of rural settlements has been stressed by research findings.

The analysis of map series - reflecting the regional distribution of the indices of the development of social infrastructure - provides a possibility for delimiting regions in which rural settlements having poorly developed or underdeveloped services are accumulated. These settlements are situated mainly in the Cserehát, Northern Borsod Karst, the Highlands of Zemplén and Bükk, Hegyköz, Bodrogköz and Borsodi Mezöség (Fig. 2).

Methodologically, this study is significant mostly for interpreting the information provided by related factors and those facts that can have impacts on the development of social infrastructure. If the data bank for the investigations carried out in Borsod County as a model region is somewhat extended, factor and cluster analyses can be used to elaborate a typology of social infrastructure for either Hungary or other countries.

4. THE MOST IMPORTANT RESULTS

- Types and subtypes as to social infrastructure of rural settlements were determinded.
- Rural settlements and regions having a poorly developed social infrastructure were delimited.
- A data bank covering as many as 200,000 data referring to basic information was compiled and can be applied in other planning tasks.
- A map series has been prepared, illustrating the development of the basic elements of social infrastructure in rural settlements.
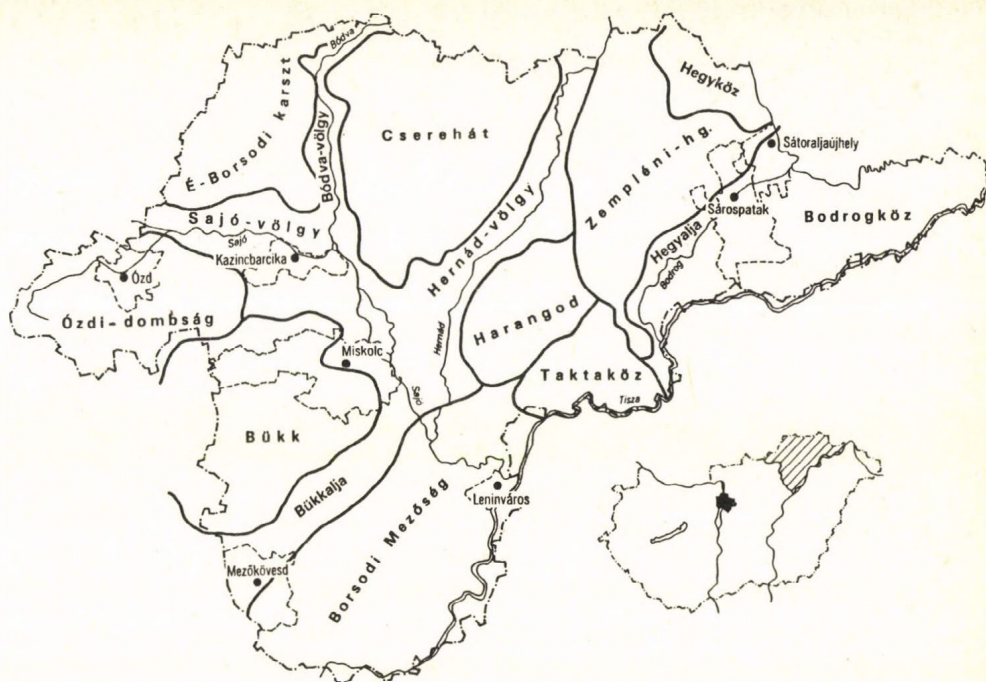
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Fig. 2 Geographical units of Borsod-Abaúj-Zemplén county, Hungary

APPENDIX

INDICES FOR THE INVESTIGATION OF TYPES OF SOCIAL
INFRASTRUCTURE IN BORSOD-ABAÚJ-ZEMPLÉN-COUNTY

Numerical indices used in the analyses (mean and standard devia-
tion in brackets):

A. *Basic institutions in rural settlements*
   1. Size of retail shops in 1979, m² (364 m²; 631 m²);
   2. Per capita value of consumer goods' turnover in retail
      trade in 1979 (3001,- Ft; 4584,- Ft);
   3. Network of basic services in 1980 (12.1 points; 8.0 points);
   4. Number of workers in small scale industry in 1979 (11.3
      persons, 15.9 persons);
   5. Places in nurseries per 100 children of 0-3 years in 1980
      (1.3 places, 5.9 places);
   6. Places in kindergartens per 100 children of 3-6 years
      in 1980 (33.5 places, 44.0 places);
   7. Number of consulting hours in 1979 (0.9 hrs.; 3.9 hrs.);

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B. *Characteristics of flats and basic services in rural settlements*
    8. Proportion of flats built after in 1980 (52.5 percent; 15.9 percent);
    9. Proportion of flats built between 1970 and 1979 in 1980 (13.9 percent, 8.5 percent);
   10. Proportion of one-room flats in 1980 (26.5 percent; 10.2 percent);
   11. Proportion of residential buildings having more than one storey in 1980 (0.3 percent; 1.7 percent);
   12. Number of flats with bathrooms or lavatories per 100 flats in 1980 (26.4 percent, 15.3 percent);
C. *Provision of rural communities with public utilities*
   13. Proportion of flats supplied with electricity in 1980 (96.9 percent; 2.9 percent);
   14. Proportion of flats with water mains in 1980 (21.7 percent, 14.9 percent);
   15. Proportion of flats with gas mains in 1980 (53.3 percent, 14.8 percent);
   16. Proportion of flats connected to a sewage system in 1980 (23.9 percent, 15.4 percent);
   17. Per capita electricity consumption in 1980 (kwh) (805.8 kwh; 281.2 kwh);

D. *Transport network characteristics of rural communities*
   18. Transport network in 1980 (4.5 points, 2.6 points);
   19. Accessibility (in minutes) of nearest town or village (district seat) by most rapid means of transport in 1980 (40.3 min.; 27.4 min.);
   20. Frequency of transport to towns in 1980 (81.2/week, 89.2/week);

E *Educational and cultural characteristics of rural communities*
   21. Number of school rooms in elementary schools in 1979 (4.8 school rooms; 6.1 school rooms);
   22. Number of pupils in elementary schools in 1979 (153 pupils 228 pupils);
   23. Number of students in secondary schools in 1979 (13 students, 147 students);
   24. Proportion of those 15 years or older finishing 8 years of elementary school in 1980 (52.0 percent, 8.9 percent);
   25. Proportion of those 18 years or older having finished secondary school in 1980 (9.6 percent; 4.3 percent);
   26. Number of volumes per libraries in 1979 (3968.4 volumes; 6784.2 volumes).

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