Geographical Location of Depopulation Areas in the Czech Republic and its Dependence on Transport Infrastructure

Part I: Definition, Methodology, and Quantitative Analysis

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ABSTRACT: Location of settlement at important routes of transport was always one of the key factors for its prosperity. However, in the car-oriented world of today the distance factor is not so important for many people and they prefer to live in calm rural areas. Simultaneously, many rural areas in peripheral locations are affected by the emigration of inhabitants and global decay. This study explains how good transport infrastructure should be beneficial for rural areas and how it is in reality in the Czech Republic. The study is a part of a larger work of research, based on component analysis of localization of depopulation areas in the Czech Republic between the years 1869 – 2010. The role of transport is documented not only by the localization of the transport infrastructure, but also by the duration and orientation of commuting to work. Theories and premises are supported by quantitative analysis in all municipalities in the Czech Republic and also by three in-depth case studies, oriented more on qualitative indicators.

KEY WORDS: Transport geography, regional development, depopulation areas, transport infrastructure, mobility.

1 INTRODUCTION

One of the burning problems of current European society is the uneven growth of regions connected with the concentration of development to central areas and the decline of remote, marginal areas. The economy of declining marginal regions is heavily supported by subsidies from development funds, but these costly measures often do not ensure the expected benefits. Marginalization of these regions is a complex social phenomenon related to changes in the lifestyle of the society, as well as to demographic changes, which are only handled with difficulties.

Since this phenomenon is, to a large extent, influenced by geographical characteristics, particularly the parameters of distance and the transport accessibility of these regions from centres, a question arises how transport and transport infrastructure influence such a phenomenon and how they may change it. Factors of economic- and time-demanding commuting to work, accessibility, frequency and quality of public transport, and the density and quality of roads are all factors greatly affecting the everyday reality of life in rural areas. How are then these factors affecting the attractiveness and unattractiveness of a given village or a region? This article aims to answer this question.

2 MARGINALIZATION AND DEPOPULATION IN RURAL AREAS

Marginalization is a phenomenon related to the economic decline of a certain area with a simultaneous decline in the importance of this area for economic and social activities, which lead to its loss of attractiveness as a place of residence or a recreation area (see Drápela, 2010). Marginalization is manifested in many spheres, and Leimgruber (2004) considers the economic, socio-cultural, political, and environmental marginality as crucial. In real life, the developing process of marginalization is manifested in the loss of population in exposed areas, when this loss is caused by both the negative balance of migration, and the natural decrease of population due to population ageing.

The reasons for the marginalization of certain areas are explained differently, e.g., Galante and Sala (1987) maintain, that the marginalization is caused by some certain disadvantages of these regions, taking into account different indicators, which subsequently make them uncompetitive. Andreoli (1992) and Schmidt (1998) then search for the reasons of marginalization in insufficient integration into structures, processes, and systems which are dominant in a given place and time. The position outside the dominating structures and systems is considered in the theory of mainstream (Giddens, 1984), which states that marginalization affects those units which are different from the majority in crucial parameters. Tykkyläinen (1998) then understands the marginalized area as a borderline area of socio-economic activity, i.e., at the edge of the socio-economic system. Mehretu et al. (2002) claim that marginalization may be caused by more different causes, while they distinguish:

- contingent marginality, which is a result of a free market with equal competition, when the negative results of the competition come from competition inequality.
- systemic marginality, effective mainly in totalitarian systems where the hegemonic powers of political and economic apparatus bring about discrepancies in the distribution of social, political, and economic benefits.
- collateral marginality, originating as an unexpected side effect of the process. It is a type of a neighbouring effect, when a member of the majority may be unintentionally marginalized for its closeness to a marginal minority.
- leveraged marginality, which is a result of an intentional process, when the pressure applied by economic players, requiring the highest profits and lowest costs, leads to marginalization.

Whatever reasons for marginalization in a given area, the typical result of this process is the depopulation of the given area (Drápela, 2010). In addition, the gradual loss of population subsequently intensifies the marginalization of such a region and generates other problems caused by the ever decreasing population density. This snowball effect may cause a long-term problematic situation, when such depopulated areas are only attractive concerning inexpensive residency, which attracts particularly underprivileged inhabitants, who in turn have difficulties in finding jobs due to their lower qualification. Therefore, marginalized areas may become regions with low population density with a predominantly underprivileged population and with a poor selection of jobs. To ensure this vision may not come true, it is necessary to reveal the marginalization of a region sufficiently in advance and prevent the depopulation of affected disadvantaged areas.

3 METHODOLOGY

Before introducing the methods used in this study, it is essential to specify more closely the research goals. Although in a dissertation (Drápela, 2010), which was a model for this article, the number of objectives was higher, this article focuses on:

1. delimitating depopulated areas in the Czech Republic in the post-communist era,
2. assessing the significance of the impact of transport infrastructure and commuting times on the current distribution of depopulated areas, and,
3. assessing the significance of transport for the development of marginal areas in the long-term perspective.

The first point includes an indicator of population movement (or the total growth or decrease of a population within an administration unit), where the administration unit used for the analysis was selected to be a municipality, of which there are 6 251 in the Czech Republic. The level of municipalities was selected since it is the most detailed reasonable level on which it is still possible to evaluate quantitatively expressed population growth or decrease. Data would still be available for the level of municipal parts; however, some municipal parts have fewer than 10 inhabitants and thus each small change would have a huge effect in comparison with other values. Therefore, at one step higher level, the municipality was chosen.

The values of the indicator were compared for the decades between individual censuses, taking place in the monitored period in 1991 and 2001; the up-to-date census takes place in March 2011. However, the final from the latest census will only be presented in the following years. The data from the census of people, flats and houses were used for 1991 and 2001, whereas the continuous population evidence was used for 2010. The values of the indicator population movement were assessed in such way that a decrease of population in these decades by more than 15 % was considered as "serious marginalization", a decrease of 5 – 15 % as "important marginalization", and a decrease below 5 % as "mild marginalization". The last mentioned category was not paid so much attention, since, due to generation changes in municipalities, temporary changes of permanent residency of inhabitants, and temporary declines caused by migration, smaller municipalities may easily fall into this category while being virtually non-marginalized.

The other objective, the assessment of the significance of the impact of transport infrastructure and commuting times on the current distribution of depopulated areas, became the initial point for a correlation analysis supplemented by case studies results executed in selected depopulated areas at an even more detailed scale and supported by a socio-geographical survey among the population. The correlation analysis was executed based on data from the census in 2001 and the population movement indicator values were compared with the values of the 17 most relevant indicators concerning education, population size of municipalities, population age structure, employment and unemployment, economic activity, commuting and its time terms. The complete list of indicators is specified in the corresponding chapter.

The correlation analysis results were then compared with qualitative data collected with questionnaire surveys in selected model areas, and with historical and geographical research, which are focused on finding impulses having significantly influenced the development of towns and villages in these regions in the past, regardless of whether positively or negatively. Taking into account the size of the article, it is impossible to present the complete methodology of the qualitative research. Nevertheless, it will be briefly outlined. The case studies were performed in model areas of the Nové Město region, due to its location

representing mountain and foothill regions; the Litenčice region, due to its location representing richer agricultural regions; and the Pelhřimov region, for its special historical development when virtually the whole region was the property of one owner, the order of Premonstratensians, representing a region with a long-term planned population structure.

The questionnaire survey was executed in the above-mentioned model areas with a sample of 100 inhabitants. The questionnaire was focused on both the subjective assessment of transport infrastructure in a given locality, while its objective was to understand the inhabitants' perception and preferences, and the real transport behaviour of the inhabitants, where its structure was very similar to a typical travel survey. In the first part of the survey people answered questions concerning their subjective assessment of the quality and density of the transport infrastructure in the place of their residence, localities which they view as a potential threat to their safety concerning traffic, their preferences and reasons when choosing a mode of transport, satisfaction with public transport services, their quality, routes, frequency and prices; the final open question concerned their recommendations for the further development of transport and transport networks in the locality. The main outcome of this part was a SWOT analysis of the transport situation in the area. The other part of the questionnaire was used as an improvised travel survey when the respondents answered questions concerning their real spatial mobility: why, where, how often, by which transport means, how long, how far, and which way they travel. Subsequently, based on these data, it was possible for each region to compile a set of schemes of a given municipality inhabitants' spatial mobility, which supplements the SWOT analysis based on subjective impressions with an objective perspective.

The results of the historical and geographical research were only marginally used, which were otherwise a substantial part of the dissertation, since it focused rather on different factors, particularly the physio-geographical, ownership, historical, socio-cultural, economic, environmental, or a factor of externalities impact. Within this research, with the use of historical sources, the development of municipalities in model areas from the date of the origin (e.g., already from the 11th century) until today was analysed: number of inhabitants and houses, records of economic activities, rights and privileges, disasters, and intentions of owners-feudalist, etc. up to civic amenities, political decisions having a direct impact on given localities, and public transport. These data were then subjected to a critical assessment of their impact on the development or decline of these municipalities, and the impact of individual factors is illustrated in examples. Regarding the factor of transport, the last 200 years, related to the industrialization and the development of a road and railway network, are taken into account.

4 DEPOPULATION AREAS DEFINITION

As mentioned in the previous chapter, the definition of a depopulation area, i.e., an area with negative values of inhabitant mobility indicators, is completed with threshold values, derived from empirical experience, dividing the set of communities with a decrease of population into three groups: slightly affected by depopulation (a decrease of inhabitants up to 5 %), where this phenomenon is often only of short-term dimensions; significantly affected by depopulation (a decrease of inhabitants between 5 – 15 %); and considerably affected by depopulation (a decrease of inhabitants over 15 %). Attention should thus be aimed at the two latter categories and at their relation to the spatial distribution of main roads.

The situation between 1991 and 2001 is depicted in Figure 1, the period between 2001 and 2010 in Figure 2. The black colour represents the main urban agglomerations, where the most important are Prague agglomeration, with about 1.5 million of inhabitants,

Brno and Ostrava agglomerations, each with 0.5 million of inhabitants. The various shades of grey indicate the population rate.

The Figures show that the spatial distribution of depopulation areas in the Czech Republic depends especially on the distances of these regions from centres. The depopulation areas create something like rings around the main centres, interrupted only at locations where the big centres are not far away from one another. Within this phenomenon, there cannot be seen a considerable influence of the proximity to main roads (e.g., especially motorways) as a factor significantly preventing depopulation. If a road runs in the proximity of a depopulation area, but the communities in direct proximity to the road do not suffer from a decrease of inhabitants it is rather caused by a different land relief, where the road runs through lowlands, whereas the depopulation area is situated in a highland or mountain terrain. In a situation of comparable orographic conditions in areas directly around the road as well as ones farther from it, its positive influence on depopulation is usually not applied. On the contrary, outside these depopulation areas, in areas closer to centres, there exist isolated depopulation units or their clusters that differ from their prosperous surroundings by lower residence attractiveness, which is often caused, besides other reasons, by worse accessibility to the centres, i.e., by parameters of transport network. The transportation factor is thus manifested relatively significantly within the competition between individual communities. However, with regard to the intraregional aspect, the rural areas represent a relatively homogenous area.

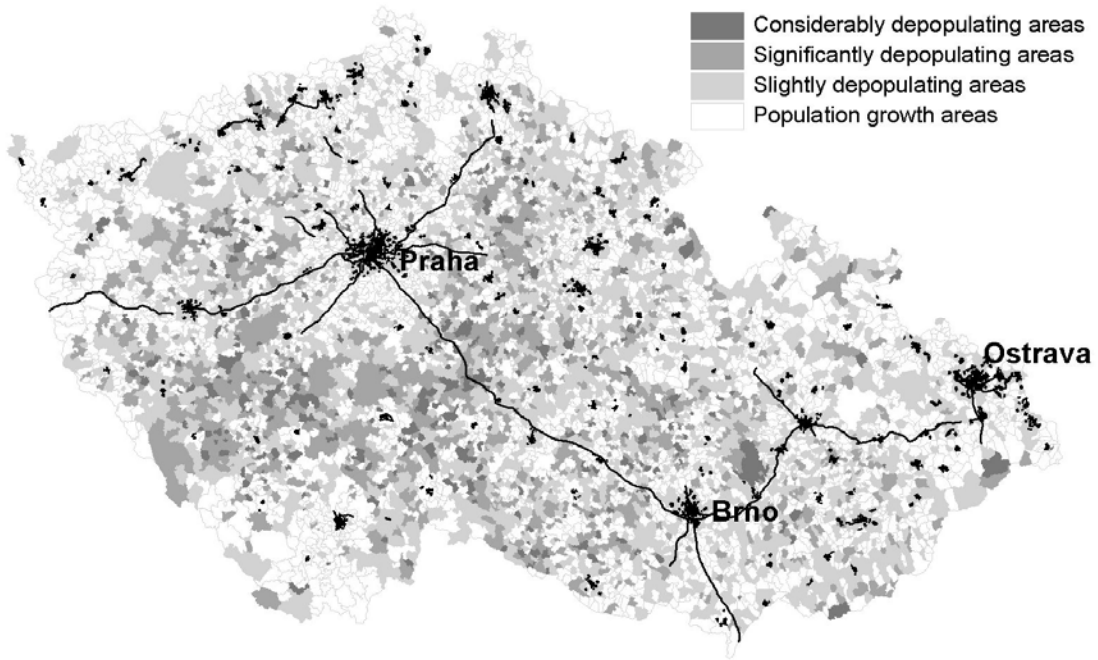

Figure 1: Depopulation areas in the Czech Republic between 1991 and 2001 and their relation to spatial distribution of main roads.

By comparing particular time periods (the survey in the background thesis started already in 1869 with the first population census executed for the Habsburgs' Austrian Empire) we may conclude that both Figures differ mainly by the intensity of continuing depopulation. This is caused by demographical trends going on within the Czech population,

where the period between 1991 and 2001 was a period of historically lowest population growths, while the period between 2001 and 2010 was a time period when the population strong age groups from the 70s of the 20th century were starting to establish families. What is important, though, is that the spatial allocation of depopulation areas has not changed significantly, which can be seen even after comparing data older than 100 years (see Drápela, 2010). The problems of these regions are apparently of a long term character, which is a considerable finding.

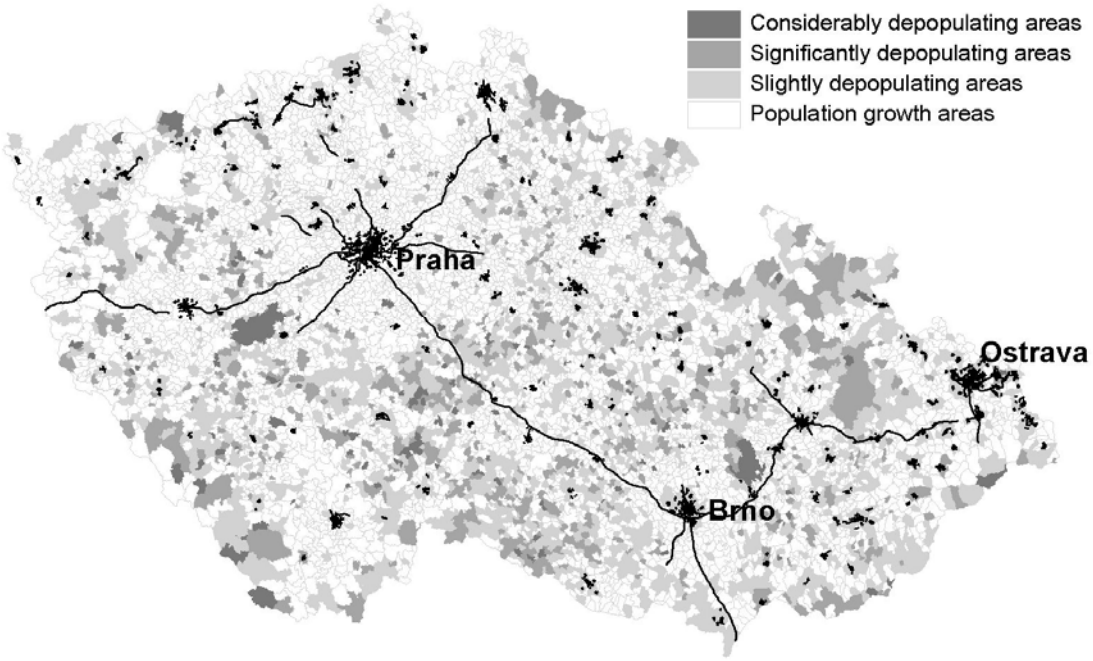

Figure 2: Depopulation areas in the Czech Republic between 2001 and 2010 and their relation to spatial distribution of main roads.

5 CORRELATION ANALYSIS

The complex character of marginalization, manifested by depopulation, results in the impossibility to definitely mark a factor or a group of factors as a cause of the phenomenon. Various factors are mutually interlaced and it is frequently impossible to separate the effects of one factor from another. For example, the land relief and the watercourse network in upland areas often affect the centrality of such location, the leading of main roads, fertility of soil and suchlike. Economic, social, and demographic factors are similarly interwoven. This is why the analysis is focused on revealing the typical features of depopulation areas and it does not judge, for the time being, what is the cause and what is the consequence. The research method applied was a classic correlation and regression (not mentioned in this paper focused only on transport issues), where, in regard to the character of the phenomenon and to the fact that only the similarity of division is studied and not the mutual dependence of variables, indicators with a Pearson correlation

coefficient value ±0.3 were assessed as significantly similar. The following 17 indicators (in the brackets their abbreviations as used in Table 1) have been selected for the analysis:

- the average age of community inhabitants (AverAge),
- proportion of inhabitants aged 0 – 14 of the total number of inhabitants (Inhab_0-14),
- proportion of inhabitants aged 65 and more of the total number of inhabitants (Inhab_65+),
- proportion of inhabitants aged 15 and more with a completed university degree of the total number of inhabitants (Prop_UNI),
- proportion of inhabitants aged 15 and more with a completed university degree, higher technical school or secondary school with maturita (school leaving exam) of the total number of inhabitants aged 15 and more (UNI.HTS.SSm),
- proportion of inhabitants aged 15 and more with elementary or uncompleted elementary education, or with no education of the total number of inhabitants aged 15 and more (EL+without),
- number of inhabitants (InhabNum),
- proportion of persons economically active of the total number of inhabitants (Prop_EA),
- proportion of employed persons of the total number of economically active persons (PropEmp),
- proportion of unemployed persons of the total number of economically active persons (PropUnemp),
- proportion of employers and self-employed persons of the total number of economically active persons (Prop_SelfEmp),
- proportion of economically active persons working in primary sector of the total number of economically active persons (Primer),
- proportion of economically active persons working in tertiary sector of the total number of economically active persons (Tertiar),
- proportion of persons commuting daily to work outside the community from the total number of employed persons (ComDaily),
- proportion of persons commuting out of the district from the total number of employed persons (ComOutDis),
- proportion of persons whose commuting time is 30 min and more of the total number of employed persons (ComTime30+),
- proportion of persons whose commuting time is 60 min and more of the total number of employed persons (ComTime60+).

The results of correlation analysis for individual indicators are shown in Table 1.

Table 1: The values of Pearson correlation coefficients for used indicators and p-values (two tailed probability)

AverAge	-0.43383	0.000000
Inhab_65+	-0.40756	0.000000
Primer	-0.35877	0.000000
EL+without	-0.30840	0.000000
PropUnemp	-0.01534	0.476987
InhabNum	-0.00746	0.739996
ComDaily	0.06532	0.001942
ComTime60+	0.14634	0.000000
ComTime30+	0.15778	0.000000
ComOutDis	0.16705	0.000000
Prop_SelfEmp	0.19317	0.000000
PropEmp	0.20533	0.000000
Prop_EA	0.22204	0.000000
UNI.HTS.SSm	0.29196	0.000000
Prop_UNI	0.33077	0.000000
Tercier	0.36619	0.000000
Inhab_0-14	0.38413	0.000000

Table 1 implies that the most significant features of depopulation are the age structure of inhabitants, branch structure of economy in these areas and education level of inhabitants. The age structure of inhabitants was represented by the following indicators: AverAge (correlation coefficient value -0.43), Inhab_65+ (-0.41) and Inhab_0-14 (0.38). The Pearson correlation coefficient values imply that in the Czech Republic depopulation areas the average age of inhabitants is much higher than in other areas, as well as the proportion of inhabitants at a post-productive age, whereas the proportion of inhabitants at a pre-productive age is significantly lower here. This fact, however, also arises from the characteristics of the inhabitant mobility indicator, formed by mechanical, as well as natural, inhabitant mobility.

The group of indicators reflecting the branch composition of economy is represented by the following indicators: Tertiar (0.37) and Primer (-0.36). Depopulation areas are characterized by a high proportion of employed persons working in agriculture, forestry, and fishing, and, on the contrary, by a low proportion of employed inhabitants working in various branches of services.

The last significantly manifesting group of factors is the education level of inhabitants, represented by the following factors: Prop_UNI (0.33), EL+without (-0.31) and UNI.HTS.SSm (0.29). In depopulation areas there is a lower proportion of inhabitants with higher education levels (especially inhabitants with a completed university degree), and, on the contrary, a higher proportion of inhabitants with lower levels of education or even without any.

We could consider the values of indicators Prop_EA, Prop_Emp and Prop_SelfEmp as showing weak similarities, while the remaining indicators reach values too near to zero to be considered as manifested in any way in depopulation. Somewhat surprisingly, the transportation indicators related to commuting are among them. The ComOutDis indicator shows the highest correlation coefficient values, which is not surprising as these areas

are often situated near administrative boundaries. Commuting behind the boundaries is thus not more time consuming than commuting to a community within the territory of their own district. The time taken by commuting to work is also practically the same as in the areas with a growing number of inhabitants. It can be said that the parameters of commuting from depopulation areas do not differ in any way from the rest of the country. On the contrary, it can be assumed that depopulation areas are less attractive for their inhabitants because of the low number of well-paid job opportunities in perspective branches (see Tertiar, Primer), which causes the drift of educated people towards the centres (see Prop_EDU, ELZS+without) and with regard to the fact that the more educated are mostly young people, the population of such areas gets older (see AverAge, Inhab_65+), and, accordingly, depopulated.

To be continued in next issue.

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