# DEVELOPMENT OF SETTLEMENTS OF HUNGARIAN CENTRAL DANUBE REGION IN 2010 AND IN 2020 BASED ON THE COMPLEX ECONOMIC INDEX

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**Abstract:** Geographic disparity and the resulting unequal development is a fundamental tenet of our everyday lives, and is undoubtedly one of the most important and researched categories in spatial economics. This can be observed in particular in international spatial research trends, as it is clear from the research on the spatial economy in Europe that the EU enlargement process is revealing endogenous contexts that can influence the reduction of geo-spatial disparities and provide strategic directions for solving problems. The issue of the growing contrast between centre and periphery has also rewritten the dimension of urban and rural areas, so that the concentration of population and the emergence of economic and service centres have laid the foundations for new development directions. Based on these findings, the study investigated a complex set of issues and their interrelationships, with the focus on the municipalities of the Central Danube Region. In the course of the analysis, the changes in the economy in 10 years between 2010 and 2020 were analysed by exploring the economic competitiveness and the situation of the region under study. The indicators used for the study were defined on the basis of the results of academic works analysing economic development along similar axes. In addition to the interconnectedness of the changes and the lessons to be drawn from geographical development, the authors also identified the potential for future economic development, including the identification of the high spatial economic leverage of the economic centre, the underdeveloped situation of settlements located further from the regional centre, and the development of economic indicators in the region. In our opinion, the present analysis could be beneficial for the future regional development of the settlements in the economic zone and for the region as a whole. Our future objective is to carry out analyses and strategic planning for the development of the territory.

**Keywords:** regional economy, regional competitiveness, economic zone, Central Danube Region.

## Introduction

The increase in territorial disparities is undoubtedly a global phenomenon, so it can be argued that the differences created by spatial structural changes have a major impact on the competitiveness of a given territory. In view of this, governments are formulating the reduction of territorial disparities as a strategic goal to be achieved [1-3], as this is, among other things, a determining factor for long-term economic development and the basis for local competitiveness. These factors are also an important element in the elaboration of strategic development directions, since, in addition to the centre-periphery dependency relations formulated in the international space, they can also be determinants of the local space [4; 5]. In the centre-periphery relations, several spatial relations determine the properties of the types, on the basis of which three types can be distinguished:

- the geographic centre-periphery system, whose core is influenced by the spatial division of each geographical element, where the mathematical centre-boundary concept pair is used to identify the meaning of the theory. Here, the centre is typically defined as a place of distinction, while the periphery is an outer, peripheral zone. In this meaning, the centre is the point that is closest to the other points in the area as a whole, while the periphery is the location of the furthest points. In this case, it can be formulated that the point in the central position is generally the least costly to reach all other points in the area;
- the developmental (economic) centre-periphery relationship, with the economic development dichotomy at its heart. Geographically speaking, centres are identified with developed regions and peripheries with underdeveloped regions. Closely linked to this meaning is the system of internal structural differences between the centres and the peripheries;
- the power-centre-periphery relationship, the essence of which is the imbalance of power, power and interests between the two poles. In this model, the centre-periphery relationship is linked to the social mechanisms and institutions that operate it.

It is clear from all this that the centre-periphery model is a dynamically changing system, as all three relations have a multi-level relationship in meaning. On this basis, a place, an economic unit, a social group or an institution that play a central role at a given territorial level may even be peripheral

in another system of relations, since global changes can also affect local systems in a decisive way [6-8]. Of course, alongside these, the authors cannot forget the economic perspective, which is also decisively influenced by social, behavioural and political contexts, as development in spatial contexts can be geographically shaped by human activities and their social interactions. Social development shapes the geo-spatial structure on the one hand, and the system of geographical relations influences development processes on the other. Understanding development as a series of innovations, it is important to distinguish it from growth, as development does not always imply changes in growth indicators [9-11]. In examining all these interrelationships, the question arises (taking into account the changes in innovation, economic and social conditions of development): what are the factors that can help peripheral regions to progress and develop, thus helping them „break out" of their disadvantaged situation? According to the findings of the international literature, in addition to taking advantage of global cooperation, the inclusion in the changes of the international labour market and comprehensive infrastructure development may be the answer to long-term development [12-14].

At the same time, it is clear that the development of the regions is not only a matter of their own determination, but that the strategic instruments of the European Union's rural policy are also a major factor, alongside the support policies of the governments of the individual nation states. It can therefore be concluded that the main task of regional development is to achieve a more even distribution of resources between the various regions of a country, to reduce the social and economic disparities between the capital and the countryside, between centres and peripheries, to regenerate the residential environment and to strengthen the economic fabric. All this makes it clear that increasing regional competitiveness is a key issue for the regions [15; 16].

Before presenting the material and methodology, the authors consider it necessary to describe the territorial delimitation of the research, the geographical location of the area constituted by the settlements studied.

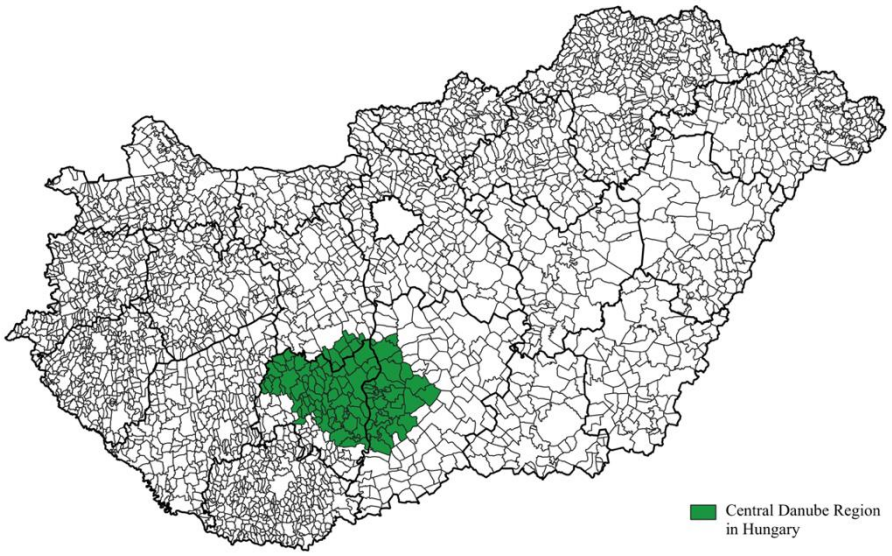


Fig. 1. **Central Danube Region in Hungary**

The area of the study was designated by the Hungarian Parliament in 2020 [17]. The Central Danube Region, comprising 99 settlements, has become one of the newest priority development zones of Hungary (Figure 1). It is important to note that the fact that Hungary's only nuclear power plant (Paks) is located in this area, which plays a key strategic role in the national economy, as it accounts for more than 40% of Hungary's electricity production, it has played an important role in the region's designation. In view of this, the region's overall social and national economic role is indisputable.

## Materials and methods

In the case of the indicators included in the study, the authors followed the indicator systems defined on the basis of the experience of international regional studies, so the authors analysed the following

indicators, according to the data of the Hungarian Central Statistical Office [18]: total permanent population (thousand people); active age (15-64 yrs.) population as a percentage of total permanent population (%); income tax payers as a percentage of the active age (15-64 yrs.) population (%); unemployment rate (%); jobseekers as a percentage of all unemployed (%); annual taxable income per permanent resident (thousand HUF/person/year); annual taxable income per taxpayer (thousand HUF/person/year); number of enterprises per 100 permanent inhabitants (number).

The authors have carried out normalisation of the indicators used, and from this a complex indicator has been defined for all 99 settlements (for 2010 and 2020):

$$fa_{i,j} = \frac{fa_{i,j} - \min\left(fa_{i,j}\right)}{\max\left(fa_{i,j}\right) - \min\left(fa_{i,j}\right)} * 100$$

where $fa_{i,j}$ – normalised basic indicator;
$\min(fa_{i,j})$ – minimum value of the basic indicators;
$\max(fa_{i,j})$ – maximum value of the basic indicators.

The classification of settlements into 4 groups (according to the complex economic index) was done by double averaging: first, taking the overall average (N = 99), the authors divided the settlements into two groups (below average and above average), then, taking the average of those below the overall average and the average of those above the overall average, the authors further divided the settlements into 2-2 groups, thus forming 4 development groups:

- Number (1) of settlements Deprived settlements (below average);
- Number (2) of settlements Lagging settlements (below average);
- Number (3) of settlements Emerging settlements (above average);
- Number (4) of settlements Flagship settlements (above average).

**Results and discussion**

The first data of the analysis results are presented in Table 1, where the authors also present, one by one, the 2010 and 2020 values of the indicators used in the complex economic index, as well as the percentage change in the values of the indicators.

Table 1

**Values of the indicators included in the complex economic index and their changes for 2010 and 2020 averages of the Central Danube Region**

| Indicators included in the complex economic index | 2010 | 2020 | Growth from 2010 to 2020 (%) |
|---|---|---|---|
| Total permanent population, thousand people | 269.6 | 254.8 | -5.5 |
| Active age (15-64 yrs.) population as a percentage of total permanent population, % | 69.6 | 64.3 | -7.7 |
| Income tax payers as a percentage of the active age (15-64 yrs.) population, % | 62.2 | 77.0 | 23.8 |
| Unemployment rate, % | 9.4 | 4.9 | -47.9 |
| Jobseekers as a percentage of all unemployed, % | 10.0 | 8.9 | -10.8 |
| Annual taxable income per permanent resident, thousand HUF per person per year | 702.1 | 1402.1 | 99.7 |
| Annual taxable income per taxpayer, thousand HUF per person per year | 1622.4 | 2834.5 | 74.7 |
| Number of enterprises per 100 permanent inhabitants, number | 16.6 | 19.0 | 14.7 |

Note: 2010 regional data = 100%

The results of the analysis clearly show that the economic and social performance of the region investigated (over the period analysed) has undergone a marked change in indicators. The permanent population has decreased by 5.5% compared to 2010, a significant decrease that is more than double the

national average. In parallel, and, of course, closely linked to this, the working-age population also fell by 7.7%. At the same time, the dynamism of economic development is reflected in the increase in the number of taxpayers, which grew by outstanding 24%. The further increase in the economic potential of the region is shown by the fact that the unemployment rate has fallen by more than 47%, which is closely linked to the increase in the number of businesses. The number of active businesses in the region increased by almost 15% over the period (Table 2). The trend of economic expansion is also reflected in changes in the income situation. It can be seen that both the annual income per resident taxable person and the annual income per taxpayer taxable person have increased significantly (99.7% and 74.7% respectively) (Table 1).

The following figure (Figure 2) shows the results of the calculated complex economic index for 2010 for the settlements of the Central Danube Region. The analysis of the development groups clearly shows the impact of urban centres and the Danube River on economic concentration. The indicators that the authors have analysed show that Paks, as the most developed municipality in the region, is the most developed in the period under analysis, but there are also zones of gravity around the other central cities in the region, which are the main development areas in the area. Another prominent feature of the spatial structure under study is the region's only bridge over the Danube, which clearly generates a significant development centre by linking the two sides of the river.

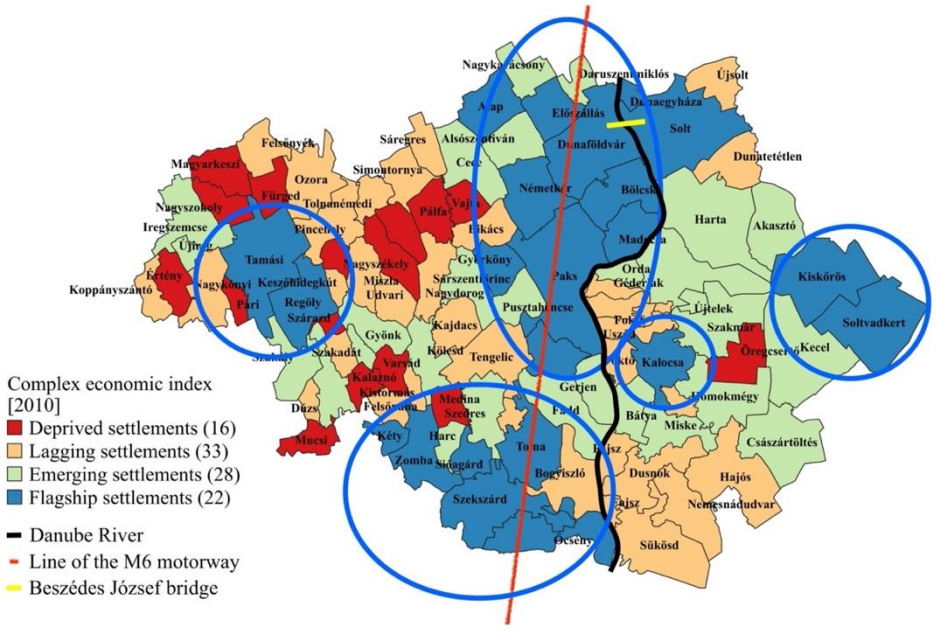


Fig. 2. **Development of the settlements in the Central Danube Region according to the complex economic index, 2010 (regional average)**

As shown in Figure 2, the settlement values of the complex economic index delineate five central urban economic centres, around which there are also closely related gravity zones. These gravity zones have different main economic trends (energy production, agriculture, food industry, tourism) and therefore the strategic planning of the municipalities is different. Out of the five economic centres, Paks and Szekszárd and the neighbouring settlements stand out, thanks to their position as centres of electricity production, the economic attractiveness of the M6 motorway and the strong tourism economy. It is clear that the development of the motorway network and the development of the transport infrastructure play a role in all segments of the development of these centres. According to the indicators used, the most deprived agglomerations in the region are located in the north-west and south-east of the analysed area. These settlements are considered to be mainly peripheral due to their distance from the motorway network and the regional centres. The mobility of the population is also significantly lower than the regional average and the economic structure is dominated by agriculture. Overall, there are 16 settlements in the deprived category (group 1), 33 in the lagging category (group 2), 28 in the emerging category (group 3) and 22 in the flagship category (group 4) (Figure 2).

As a continuation of the research, the authors analysed the spatial structural changes over the next 10 years (Figure 3). For the settlements in the Central Danube Region, several significant changes can be observed by 2020.

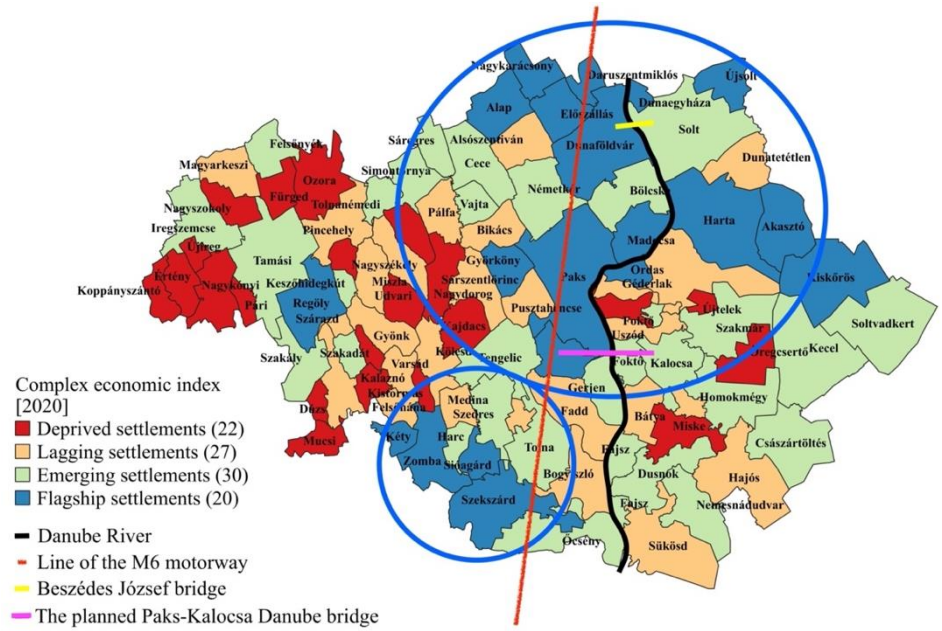


Fig. 3. **Development of the settlements in the Central Danube Region according to the complex economic index, 2020 (regional average)**

The analyses show that the number of economically defined centres in the Central Danube Region has decreased significantly. The number of the five central urban economic centres defined in 2010 has decreased to two centres due to economic growth and its concentration, while the number of the most endangered and underdeveloped settlements has stagnated or slightly increased. The reduction in the number of economic centres is mainly due to the expansion of infrastructure and the start of construction of the new Paks-Kalocsa Danube bridge. Compared to 2010, there have been no significant changes in the number of development groups, but only minor regroupings. The number of settlements in the deprived category (group 1) has increased from 16 to 22, while the number of settlements in the lagging category (group 2) has decreased from 33 to 27. In addition, the number of emerging (group 3) increased by 2 from 28 to 30, while the number of flagship (group 4) municipalities decreased from 22 to 20. Based on the analysis, the development of the economic sector related to electricity generation (Paks II) and the expansion of the related transport infrastructure (Paks-Kalocsa Danube bridge) play a prominent role in the change of the regional economy and its regional dynamism. The development of these sectors is expected to create a zone of gravity, in which the tourism economy and the development of the food industry can be expected to increase, as well as the expansion of services, as the priority investment is also expected to further enhance the economic performance of the region (Figure 3).

## Conclusions

1. In the analysis, the authors have shown that the population trends in the study area show a higher level of decline than the national average, which can be formulated as a trend. In addition to the decline, changes in the labour market and income situation have shown that income and entrepreneurship have also increased significantly compared to the national average, and that the unemployment rate in the region has halved in line with these trends.
2. The results show that the complex indicators of the area under study allow us to define the areas of the centre and the periphery. In the economic belt under study, it is possible to distinguish between groups of settlements that are deprived, lagging behind, developing and developed.
3. The studies have shown that the number of medium-sized economic centres in the region has decreased during the period under study and that a dominant regional centre (Paks) is emerging, which role as a centre has been significantly strengthened during the period under study. Both the income situation and the proportion of taxpayers, as well as low unemployment and the number of

businesses, suggest that Paks is the municipality most capable of influencing the development of the region under study, and that the continuous expansion of its gravity zone could be the basis for the long-term, complex development of the region under study.

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