2019

JOURNAL OF CENTRAL EUROPEAN GREEN INNOVATION

7 (1)

Eszterházy Károly Egyetem

HUNGARY

Editorial Office / Szerkesztőség
Líceum Kiadó
3300 Eger, Eszterházy tér 1.

Publisher / Kiadó
Líceum Kiadó
3300 Eger, Eszterházy tér 1.

Responsible Publisher / Felelős kiadó
Liptai Kálmán, rektor

HU ISSN 2064-3004
2019

ELŐSZÓ

Az Eszterházy Károly Egyetem kiemelt figyelmet fordít kutatási eredményeinek, valamint innovációinak a megismertetésére mind szélesebb körben konferenciák, workshopok, nyomtatott és elektronikus folyóiratok formájában egyaránt.

Ez utóbbi megvalósításához nyújt lehetőséget az intézmény számára a TÁMOP-4.2.3-12/1/1KONV-2012-0047 „Kutatási eredmények és innovációk disszeminációja az energetikai biomassza (zöldenergia) termelés, átalakítás, hasznosítás a vidékfejlesztés és a környezeti fenntarthatóság terén a Zöld Magyarországért" program, melynek keretében útnak indítjuk a „**Journal of Central European Green Innovation (JCEGI)**" című elektronikus folyóiratot.

Az intézményben folyó széles körű kutatások egyik kiemelt iránya a zöldenergia minél szélesebb körű hasznosítása, azokon a területeken, ahol erre adottak a lehetőségek, illetve az új innovációkra fogékony a környezet. A vidéki lakosság számára ez kiemelten fontos, hiszen ezeken a területeken egyre nagyobb problémát jelent a megnövekedett fosszilis energiaár, illetve a munkanélküliség, amelyek együttesen kezelhetőek ezen irány előtérbe helyezésével. Kutatásaink során számos területet vizsgáltunk már korábban is – biomassza, speciális fűtőberendezések, speciális fóliatakarások –, melyek azt igazolták vissza, hogy ezt mindenképpen folytatni – a lehetőségek kibővítésével – szükséges.

Az intézmény az Észak-magyarországi régió egyik meghatározó tudásbázisa, küldetésének vallja, hogy a régió fejlődése nem képzelhető el a tudás megosztása és együttműködés nélkül. A folyóirat alapításával teret kíván nyitni a régióban keletkező kutatási és innovációs eredmények publikálásával azok széles körű megismertetéséhez, a fentebb megfogalmazott célok teljesüléséhez.

A szerkesztők

INTRODUCTION

Eszterházy Károly University pays special attention to disseminate its research results and innovations increasingly as widely as possible in conferences and workshops as well as in print and electronic journals.

The implementation of the latter by the institution is aided by the TÁMOP-4.2.3-12/1/1KONV-2012-0047 program "dissemination of research results and innovations in the field of biomass energy (green energy) production, transformation and utilization in the field of rural development and environmental sustainability for a Green Hungary" in the framework of which the electronic version of the "**Journal of Central European Green Innovation**" will be launched.

One of the key directions of the wide range of research at the institution is the more widespread utilisation of green energy in areas where the possibilities are appropriate and where the environment is receptive to new innovations. It is particularly important for the rural population since in these areas both the increasing fossil fuel prices and unemployment present an intensifying problem which can be treated simultaneously by giving a priority to this direction. A number of areas – biomass, advanced heaters, the use of special plastic greenhouse covers – have already been examined during our research activities which have confirmed that these experiments must by all means be continued – with a wider range of available possibilities.

The institution is one of the knowledge base of Northern Hungary mission believes that the development of the region cannot be achieved without the knowledge sharing and collaboration. Foundation of the journal would open up the region resulting from the publication of results of research and innovation is broad awareness, the fulfillment of the objectives set out above.

The Editors

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TANULMÁNYOK – SCIENTIFIC PAPERS

JOURNAL OF CENTRAL EUROPEAN GREEN INNOVATION
HU ISSN 2064-3004
DOI: 10.33038/JCEGI.2018.6.4.13
Available online at http://greeneconomy.uni-eszterhazy.hu/

AZ URBANIZÁCIÓS FOLYAMATOK KÖRNYEZETI HATÁSAI KECSKEMÉT ÉS GYŐR VÁROSRÉGIÓJÁNAK PÉLDÁJÁN / ENVIRONMENTAL IMPACTS OF URBANIZATION PROCESSES ON THE EXAMPLES OF KECSKEMÉT AND GYŐR FUNCTIONAL URBAN AREAS

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Összefoglalás

Az elmúlt évtizedek városodási és városiasodási folyamataiban az elővárosok gyors fejlődése, valamint a városok szétterjedése – urban sprawl – voltak a meghatározó jelenségek (Tímár, 1999; Gardi, 2017; Szirmai, et al. 2011), melyek jelentős gazdasági, társadalmi és környezeti változásokat indukáltak az érintett térségekben (Kovács, 2014; Kahn, 2000). Kutatásunk alapvetően környezeti-ökológiai irányultságú, amin belül elsősorban a földhasználat/felszínborítás konverziójára és az ezzel szoros összefüggést mutató térségi demográfiai átrendeződésre helyeztük a hangsúlyt. Ennek oka, hogy a lakóterületek térfoglalása átalakítja a területhasználatot, visszaszorítja a természetes növénytakarót, adott esetben tájesztétikai problémákat is okoz (Antrop, 2004). Emellett a városok és az elővárosi területek növekedése maga után vonja a közúti forgalom intenzitásának fokozódását, amely magasabb károsanyag-kibocsátáshoz és fosszilis energia-felhasználáshoz vezet, így összességében negatívan befolyásolja a klímaváltozás elleni küzdelmet is. E rövid logikai okfejtés is mutatja a vizsgált folyamatok néhány környezeti szempontból negatív hatását, holott a városokból történő kiköltözés hátterében a zsúfolt és szennyezett levegőjű nagyvárostól való szabadulás, a természet közelsége iránti vágy, összességében a jobb életminőség iránti igény áll.

Az elmúlt két évtizedben az urbanizációs folyamatokat és következményeiket a közép-kelet-európai viszonylatban középvárosnak nevezhető magyar települések – pl. Kecskemét, Győr, Szeged – esetében is megfigyelhetjük. Jelen tanulmányban a napjainkban gyors ipari fejlődéssel jellemezhető Kecskemét és Győr példáján keresztül világítunk rá a folyamat néhány környezeti vonatkozására.

Kulcsszavak: funkcionális várostérség, környezeti hatások, szuburbanizáció, városi szétterjedés

JEL kód: Q51

Abstract

The rapid development of suburbs and the urban sprawl were decisive phenomenon in the urbanization process (Tímár, 1999; Gardi, 2017; Szirmai, et al. 2011), which has many economic, social and environmental impacts in the last decades (Kovács, 2014; Kahn, 2000). Our research focuses on the environmental-ecological aspects of the changes, mainly because it is relatively less explored but it has important lessons and consequences. While the main motivations to move out of cities are the closeness of nature and to have a better quality of life, ultimately it leads to negative environmental impacts because the growth of built-up areas, decrease in natural plant cover and the arise of landscape aesthetic problems (Antrop, 2004). Migrating out to suburbs causes intensive road traffic, which leads to bigger air pollution and greater fossil energy consumption; overall it has a negative impact on the fight against climate change.

In the past two decades, urbanization processes and their consequences have been identified in Central and Eastern Europe, such as in Hungarian cities; for example in case of Kecskemét, Győr, or Szeged. In our study, we highlight some of these environmental changes and outcomes through the examples of Kecskemét and Győr, which are characterized by rapid industrial development nowadays.

Keywords: functional urban areas, environmental impacts, suburbanization, urban sprawl

Bevezetés / Introduction

Urban sprawl is a common phenomenon both in developed and undeveloped countries in the last decades. There is a difference in the scale: while it is affecting many people for example in the USA, but in some countries the sprawl is in an initial state. For instance, in the post-socialist countries the process started with the market economy after the regime change. Now we can follow it in Estonia (Samarüütel et al., 2010), Romania (Carrière et al., 2018), Poland (Różańskaa – Zadworny, 2016), etc., and of course, in Hungary.

The rapid urban changes are challenge for spatial planning and urban development, which are often unable to control processes even in the developed countries, not to mention the least advanced ones, and so the environmental impacts are intensifying. The European, especially Eastern European researches have primarily focused on the suburban zones of the capital cities and other big cities, and paid little attention to the processes of the rural centres and areas (Bajmócy, 2012; Csapó – Balogh, 2012; Leetmaa – Tammaru, 2007; Hirt, 2007).

Over the past decade and a half, peri-urban development has enormously changed the traditional cultural landscape, land use, and settlement-functions of villages around regional centres and around many other cities in Central Europe (Székely – Michniak, 2009; Antrop, 2004). This process has intensified in the former socialist countries after the 2000's and it caused problems, which are similar to the ones Western countries had in the eighties and nineties, or USA had in the fifties-sixties.

Urban sprawl causes numerous environmental and landscape-ecological problems. Among environmental problems, international literature focuses especially on traffic-based pollution. Spreading cities are found to be suffering from increasing air pollution problem (Dulal et al., 2011). The connection between land use and transportation is driven by the distribution of activities (residential, employment, shopping areas, recreational areas, and leisure facilities) over an urban area (Wegener – Fürst, 1999). Rapid growth of cities has led to expansion in residential, employment and recreational activities.

Pollution from transportation manifests mainly as air pollution with increasing CO2 emissions along with many other gases. The statistical analysis shows that wherever sprawl occurs in the EU, it results in a strong increase of transport-related CO2 emissions. Bart (2010) found that correlation between transport CO2 emissions and the increase of artificial land area is much stronger than the correlation between CO2 emissions and GDP or population data. An increase in urban areas increases individual trip lengths, and most newly urbanised areas are fully car-dependent with no public transport. According to our previous empirical

research in the agglomeration of Győr one of the most important consequences of this process is that traffic needs growing faster than the population. The lifestyle of the suburban population (changing working time, scattered services etc.), the physical structures of the new built areas less and less allows choosing the public transport for their daily moving. The new settler families have significantly more cars than the traditional local families (Hardi – Nárai 2005). Therefore, these areas are responsible for the growth of road traffic, which increases transport realated emissions. That is why sprawl is not a climate friendly way of urban development, that cannot be eliminated by better transport policies – it needs better land use policies (Bart, 2010).

The 'compact city' concept is a kind of answer to these problems. It has been increasingly perceived as a model to reduce urban air pollution. Borrego et al. (2006) performed the air quality assessment of three idealized city structures which were created considering different land use patterns from the scenario of urban sprawl to the opposite scenario of a compact city with mixed land use. They found that compact city concept not only reduces air pollution but it has multiple benefits. A related idea is to reduce the need to travel (particularly by car), to encourage greater use of public transport (and walking and cycling), and to reduce travel distances (Banister, 2011). Besides this, Banister (2011) finds that the desire for low density car based lifestyles has become dominant. In this way, significant reductions of CO2 emissions in transport in the EU can only be achieved through behavioural change.

Many researchers (see below) are focusing on ecosystem fragmentation when examining the environmental problems of urban sprawl. Basically the history of human settlements is the story of the fragmentation of the landscape. This fragmentation is growing dramatically with urban sprawl. The process involves microclimate changes and rapid rearrangement of vegetation (Margules – Meyers, 1992). Over time, fragments will operate on the principles of island biogeography. It means decreasing number of species, growing number of individuals, impoverished vegetation and anthropogenic disturbance. Concepción and his colleagues (2016) found that the increases of ruderal plants and common generalist birds are highly related to the intensity of urban land use, whereas the spread of non-native plants was strongly related to urban dispersion.

Ecosystem fragmentation closely related to land cover changes. Many researchers agree that one of the most negative effect of urban sprawl is the land use change (Canedoli et al., 2018; Mohammady – Delavar, 2016; Dupras – Alam, 2015). These investigations of land use – land cover changes are based on GIS methods with the use of CORINE Land Cover data. In our paper we also use this method to evaluate the changes in the case of Győr and Kecskemét Functional Urban Areas.

Urban sprawl is one of the most common drivers for land use change generating a variety of impacts on natural and agro-systems. It leads to multiple impacts on land use change, including loss of sensitive natural areas and farmlands, which negatively impact the production of a wide range of ecosystem services (Dupras – Alam, 2015). In addition, land use effects on travel behaviour tend to be cumulative and mutually reinforcing (Hickman, 2007; Litman, 2007).

Johnson (2001) summarized environmental impacts of urban sprawl which have been identified in the literature. On the basis of this, the environmental impacts are the following:

- loss of environmentally fragile lands,
- reduced regional open space,
- greater air pollution,
- higher energy consumption,
- decreased aesthetic appeal of landscape,
- loss of farmland,
- reduced diversity of species,
- increased runoff of stormwater,
- increased risk of flooding,
- excessive removal of native vegetation,
- monotonous (and regionally inappropriate) residential visual environment,
- absence of mountain views,
- presence of ecologically wasteful golf courses,
- ecosystem fragmentation

From the above mentioned impacts in our paper we focus on loss of environmentally fragile lands, increasing traffic load (which has strong connection to greater air pollution) and loss of farmlands. Later on, in the future, we continue our work with investigate structural (e.g. excessive removal of native vegetation) and visual transformation of suburban settlements, together with studying the effects of lifestyle and environmental demand of the population on landscape. These results will show not only the (negative) environmental consequences but the aesthetic and social changes also.

The strength of the urban sprawl process in Hungary is not as strong as it is in the USA for example, but we can detect it in different cities. In our paper we analized land use changes around Győr and Kecskemét to evaluate transformations in the last decades. In addition, we investigated the changes in the population, which also refers to urban sprawl based on the migration balance of the surrounding settlements. We deal with the development of transport in the last ten years. The diffusion of urban expansion results in higher emissions of global warming gases,

especially CO_2, because urban sprawl eventuates in specifically higher energy use in transportation. It means, increasing traffic is one of the most serious consequences of this process.

Anyag és módszer / Material and methods

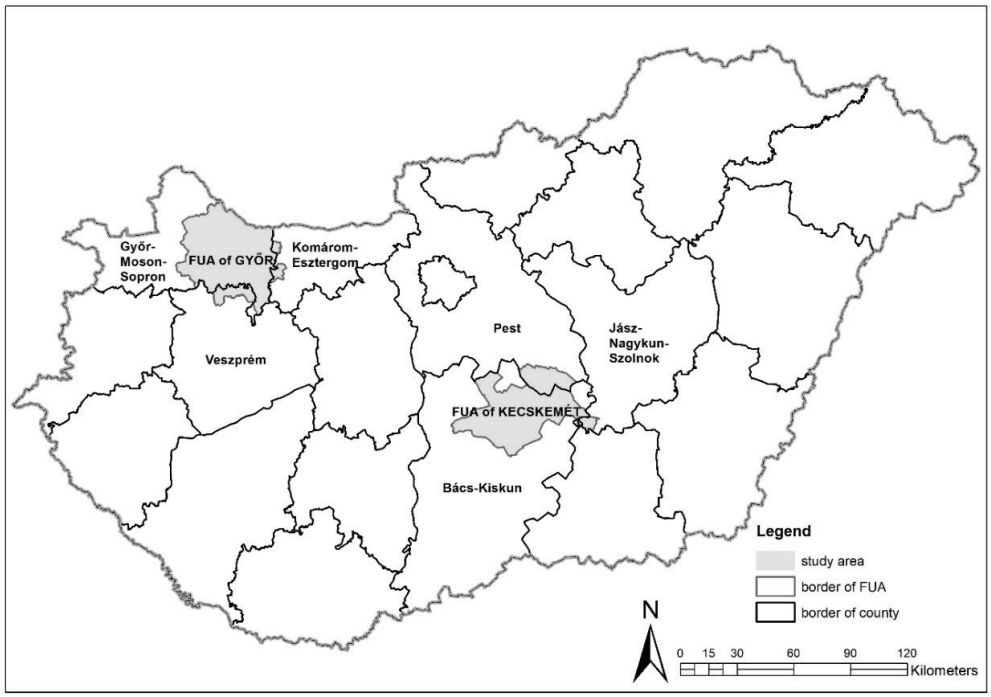
In our analysis we used the Corine Land Cover and Urban Atlas products of the Copernicus Land Monitoring Service (https://land.copernicus.eu). Corine is an acronym which means 'Coordination of information on the environment', and it is part of the European environmental monitoring system. The program started in 1985, and it provides a common methodological framework to collect and analyse environmental data. The Corine Land Cover (CLC) and Land Cover Change (CHA) datasets are available from 1990 to 2018 at five dates: 1990, 2000, 2006, 2012 and 2018. In this analysis we mainly used the CHA datasets, which have a 5 hectares minimum mapping unit, which defines the theoretical minimum area of land cover changes in the database. We also used the Urban Atlas database (UA), which has a different, urban thematic focus in land cover monitoring than the CLC. It has larger map scale, therefore higher resolution, but only available for two years: 2006 and 2012. The timeframe of our research is much longer so we used UA only to define the functional urban areas (FUA) of the analysed Hungarian cities Győr and Kecskemét. We chose this solution to ensure compatibility with UA, because when UA2018 will be released we plan to get involved it in our later analysis.

Győr is regional centre of Western Transdanubia NUTS2 region, and an automotive assembly centre (Audi and Rába) with significant university background. Kecskemét is the capital city of Bács-Kiskun County, a former agro-market town with new industrialization processes, which can be connected to the arrival of Mercedes Benz Manufacturing Hungary Ltd. in 2008. The most important data of the two FUA's are summarized in Table 1. Fig. 1. shows the base map of the two areas while Fig. 2. is the current land cover of Győr and Kecskemét FUA's.

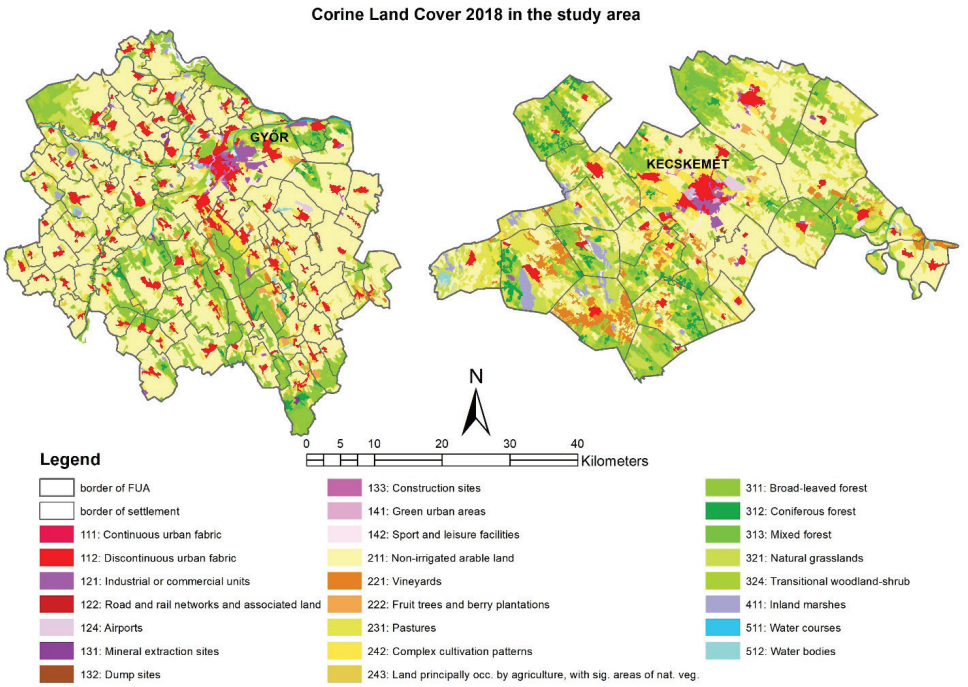
We also used demographic data in our analysis to compare them to land cover changes. The datasource of these indicators is the "National Spatial Development and Spatial Information System" (TeIR), which is managed by Lechner Knlowedge Centre. TeIR is a constantly expanding collection of databases from which we used the Hungarian Central Statistical Office census data from 1990, 2001 and 2011, and also used the yearly settlement data tables (T-STAR).

Indicators	**Kecskemét FUA**	**Győr FUA**
Total area (sqkm)	1819.49	2046.71
Population (person)	186782	251317
Population density (person/sqkm)	102.65	122.79
Number of settlements in FUA	24	93
Area of centre (sqkm)	322.57	174.62
Population of centre (person)	110638	130094
Population density of centre (person/sqkm)	342.98	745,01
Area without the centre (sqkm)	1496.92	1872.09
Population without the centre (person)	76144	121223
Population density without the centre (person/sqkm)	50.86	64.75

1. táblázat: A kiválasztott városrégiók alapadatai /
Table 1. Basic data of the selected FUA's
Forrás / source: TeIR, HCSO T-STAR, 2017



1. ábra: A kutatási terület / Figure 1. Overview map about the study area locations
Forrás: saját szerkesztés az Urban Atlas adatai alapján / Source: own construction on the bases of Urban Atlas database



2. ábra: Győr és Kecskemét Funkcionális Városrégiójának felszínborítási kategóriái 2018-ban / Figure 2. Land cover categories of Győr and Kecskemét FUA's in 2018
Forrás: saját szerkesztés CORINE CLC alapján / Source: own construction on the bases of CORINE CLC

Road traffic utilization data was also used to measure the traffic growth between the centres and suburbs. The data is available from the Hungarian Public Road Non-profit Co. (Magyar Közút Non-profit Zrt.).

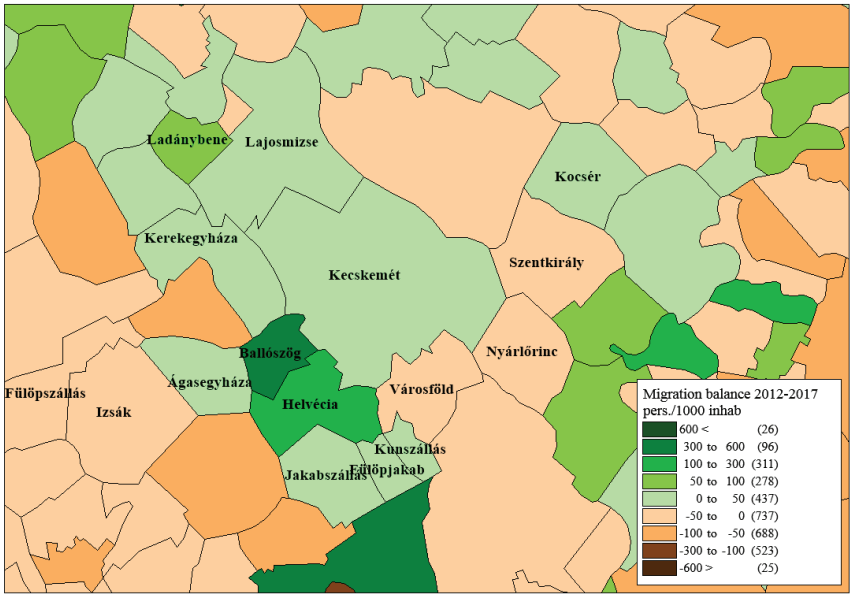
We used GIS and statistical methods in our analysis. We prepared the CLC and CHA databases in ArcGIS, which means we clip the datasets to the exact area of the two FUA's. After data export, we summarized and analysed the data in MS Excel. We also used MS Excel to statistically analyse migration and road traffic utilization data.

Eredmények / Results

The FUA of Kecskemét contains 24 settlements, while the FUA of Győr has 93 settlements. These are all administratively independent settlements, but the centre cities have some settlement parts (satellite settlements) within their administrative area too, which are basically considered to be suburbs of the central area (e.g. Kadafalva, Hetényegyháza, Katonatelep – in case of Kecskemét –, or Győrszentiván, Ménfőcsanak, Bácsa, Gyirmót – in case of Győr).

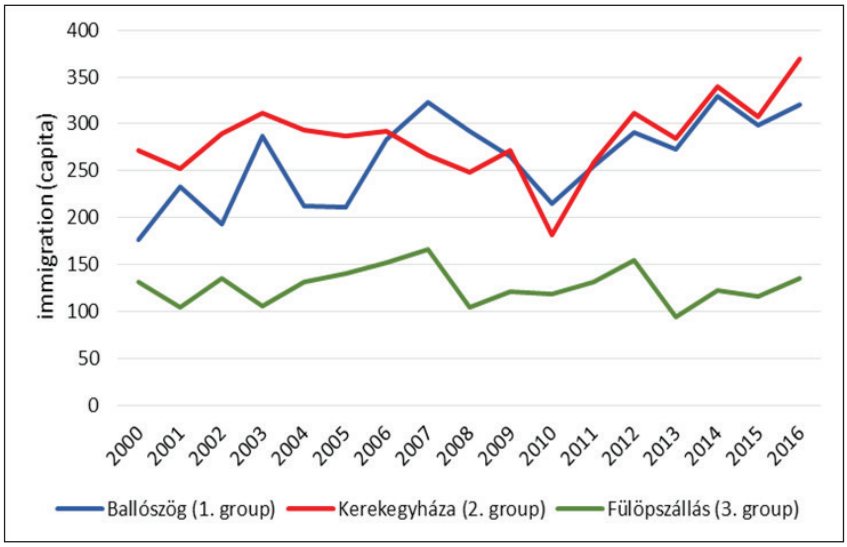
Three settlement groups can be identified in the selected Functional Urban Areas. The first one consists of settlements (some of them within the administrative boundary of the centre), which are very close or conurbate into the central city. They have rapidly growing populations because of the intensive outmigration from the centre and immigration from other areas. The second settlement group is a little bit farther from the centre, and also affected by immigration. The third group of settlements inside the FUA's has the smallest number of inhabitants and probably characterized by a decline of population.

In case of population changes, the population of the suburban zone around Kecskemét stagnated or slightly increased in the case of settlements closer to the city center, while it decreased in farther settlements between 2012 and 2017. The population of Kecskemét has increased until 2013, and since then a slight decrease has occurred. Stagnation or increase in the population primarily refers to immigration, because the demographic feature of the country is the natural population loss. Kecskemét is a classical example of suburbanisation, where the settlements closer to the centre have a relatively significant extra population on an annual basis, because of the outmigration from the centre. But there is a significant difference between Győr and Kecskemét. In case of Győr, the population growth of the villages and the urban periphery remained almost uninterrupted during the last economical crisis. Moreover, in the second half of the examined period, significant areas were built, which have been so far semi-natural or agricultural areas. This dynamic transformation was caused by migration from other parts of the country, and only partly by outflow from the city. Examples of the population changes can be seen on Fig. 3-6.



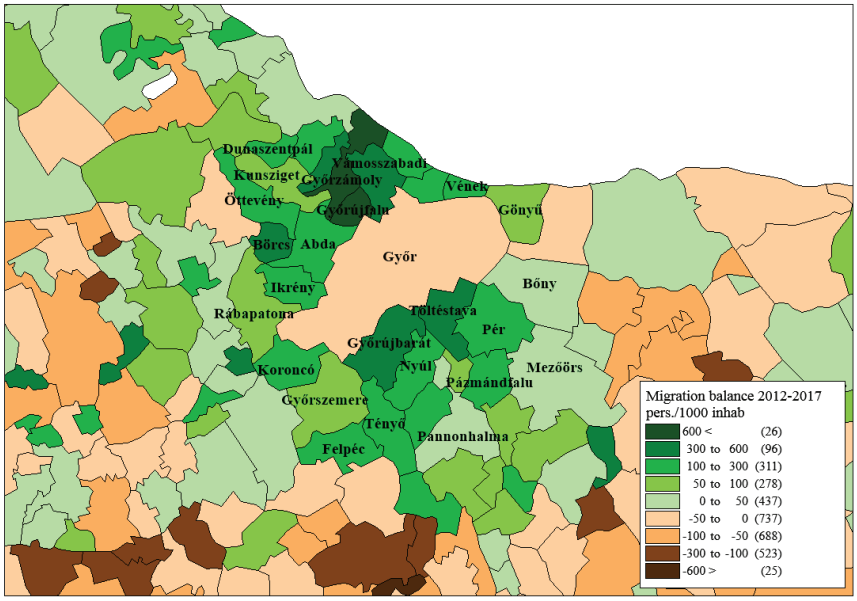
3. ábra: Kecskeméti környéki települések vándorlási egyenlege (2012-2017) / Figure 3. Migration balance of some settlements around Kecskemét (2012-2017)

Forrás: TEIR / Source: National Spatial Development and Spatial Information System



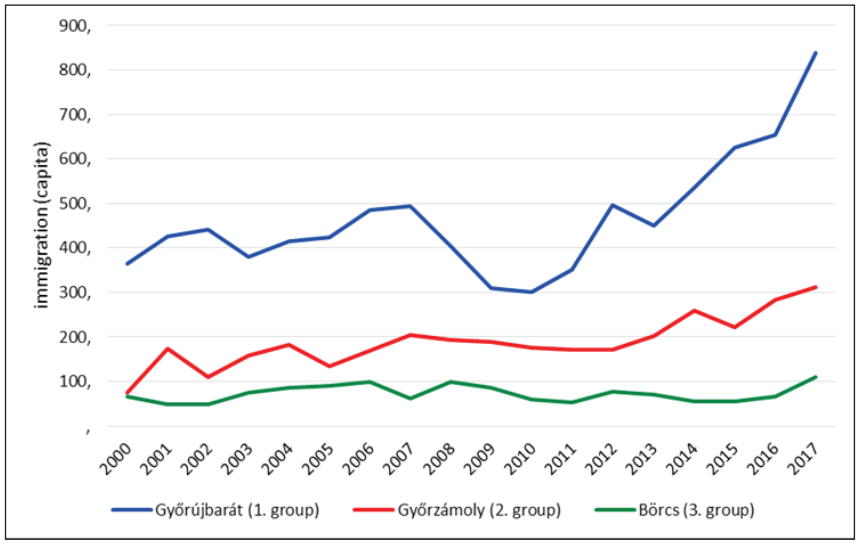
4. ábra: A három településcsoportot jellemző bevándorlási értékek Kecskemét környékén (2000-2016) / Figure 4. Immigration values typical of the three settlement groups around Kecskemét (2000-2016)

Forrás: TEIR / Source: National Spatial Development and Spatial Information System



5. ábra: Győr környéki települések vándorlási egyenlege (2012-2017) / Figure 5. Migration balance of some settlements around Győr (2012-2017)

Forrás: TEIR / Source: National Spatial Development and Spatial Information System



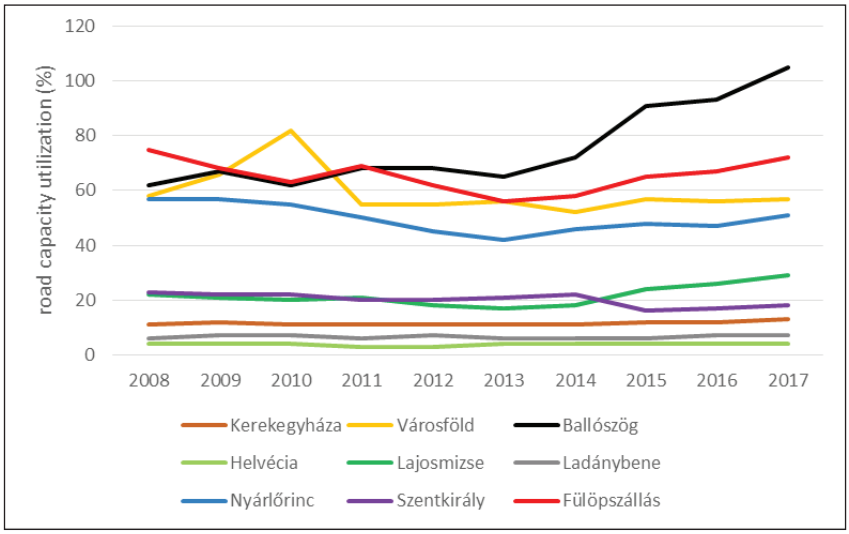
6. ábra: A három településcsoportot jellemző bevándorlási értékek Győr környékén (2000-2017) / Figure 6. Immigration values typical of the three settlement groups around Győr (2000-2017)

Forrás: TEIR / Source: National Spatial Development and Spatial Information System

In case of the migration balances, we can see relatively large differences between settlements. Especially around Kecskemét we can find settlements (e.g. Ágasegyháza) which has very high and low migration balance within one or two year. Apart from this, most of the settlements characterized by a positive net migration balance in average in the examined one and a half decades. In case of Győr, the migration balances are also changeable, but we can not find such negative values as around Kecskemét. Fig. 5. shows, more settlements have considerable migration surplus than in case of Kecskemét (e.g. Győrzámoly, Győrújfalu, Győrújbarát).

If we concentrate only to immigration values, we can see a clearer picture. We can separate the three settlements groups on the basis of the immigration, especially in case of Győr (Fig. 6.). In the first group there is remarkable immigration, particularly in the last 6-7 years. A rapid industrial growing is in the background of this process (see Mercedes-Benz Manufacturing Hungary Kft. in Kecskemét and its suppliers from 2012).

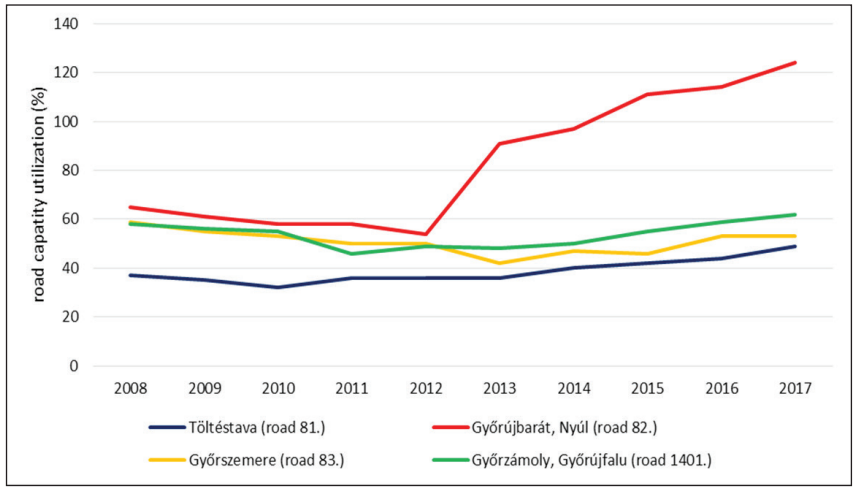
It is worth comparing demographic data with changes in road traffic. Its slight upward trend in Ballószög has been transformed into significant growth, in parallel with overcapacity in the driving route (Fig. 7.). Ballószög, which characterized by the largest immigration, and a positive migration balance every year, is also the settlement with the highest road traffic around Kecskemét – compared to the planned capacity of the road.



7. ábra: A Kecskemét környéki településekre vezető utak kihasználtsága (%) (2008-2017) / Figure 7. Road capacity utilization leading to settlements around Kecskemét (%) (2008-2017)

Forrás: Magyar Közút Nonprofit Zrt. / Source: Hungarian Public Roads Non-profit Co.

In Győr, there is also a significant increase in traffic on all introductory routes (Fig. 8.). Szigetköz direction is prominent as the most dynamic growth of the agglomeration took place along the Moson-Danube. At the same time, the vicious circle of transport can be seen: the agglomeration is growing faster along the new roads that have been built, and predictably will be more dynamic in the future.



8. ábra: A Győr környéki településekre vezető utak kihasználtsága (%) (2008-2017) / Figure 8. Road capacity utilization leading to settlements around Győr (%) (2008-2017)

Forrás: Magyar Közút Nonprofit Zrt. / Source: Hungarian Public Roads Non-profit Co.

In some cases we can see more than 100% road capacity utilization, which means, the traffic is higher than the original planned capacity. This is the situation on the road to Ballószög or Győrújbarát. In case of Győrújbarát (road Nr. 82.) we have to note that this traffic also includes traffic to shopping centers in Győr.

The land conversion data from Corine CLC shows similar changes in the two study areas. Between 1990 and 2018, the proportion of artificial surfaces in the city region of Győr has increased from 7,18% to 8,35%, in Kecskemét from 4,3% to 5,14% (Table 2. 3.).

	area (ha) 1990	area (%) 1990	area (ha) 2018	area (%) 2018
artificial	**14728,62**	**7,18**	**17044,31**	**8,35**
arable lands	129336,73	63	121488,41	59
vineyards	2775,77	1,3	957,49	0,46
fruit tree plantations	339,44	0,16	1081,82	0,5
pastures	10001,57	4,88	8970,98	4,37
other agricultural lands	7497,56	3,6	8964,65	4,3
forests	29155,31	14,2	34556,04	16,8
other nature-close areas	7627,96	3,7	8192,77	4
wetlands and water bodies	2989,61	1,46	2914,39	1,42

2. táblázat: Földhasználati kategóriák változása a Győri Városrégióban / Table 2. Land use changes in the Győr City Region

Forrás: saját szerkesztés CORINE CLC alapján / Source: own construction on the bases of CORINE CLC

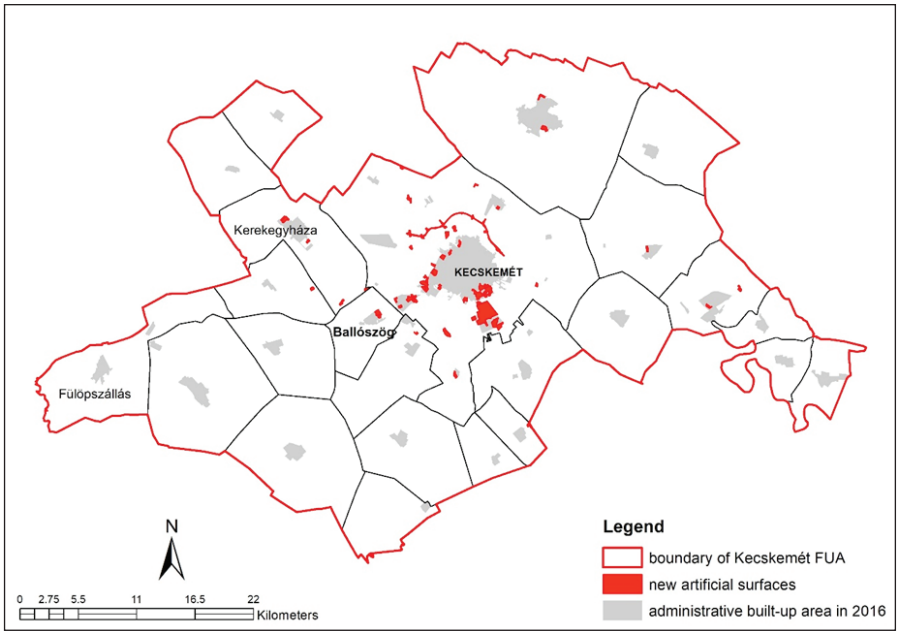
According to the CORINE database, artificial surfaces have increased at the expense of agricultural lands. Increase in artificial surfaces occurred at the expense of arable lands, vineyards and pastures. All together it means 11% decrease in Kecskemét and 8% decrease in Győr. At the same time some land use categories (mainly forests) increased because of afforestation.

	area (ha) 1990	area (%) 1990	area (ha) 2018	area (%) 2018
artificial	**7846,48**	**4,3**	**9340,37**	**5,14**
arable lands	76882,25	42,24	68426,26	37,6
vineyards	10053,18	5,5	6585,17	3,6
fruit tree plantations	4630,16	2,5	2537,31	1,4
pastures	18839,57	10,35	19856,14	10,9
other agricultural lands	17994,44	9,88	14461,37	7,9
forests	25505,15	14	35786,27	19,6
other nature-close areas	15637,42	8,6	20914,88	11,5
wetlands and water bodies	4766,95	2,6	3900,16	2,1

3. táblázat: Földhasználati kategóriák változása a Kecskeméti Városrégióban / Table 3. Land use changes in the Kecskemét City Region

Forrás: saját szerkesztés CORINE CLC alapján / Source: own construction on the bases of CORINE CLC

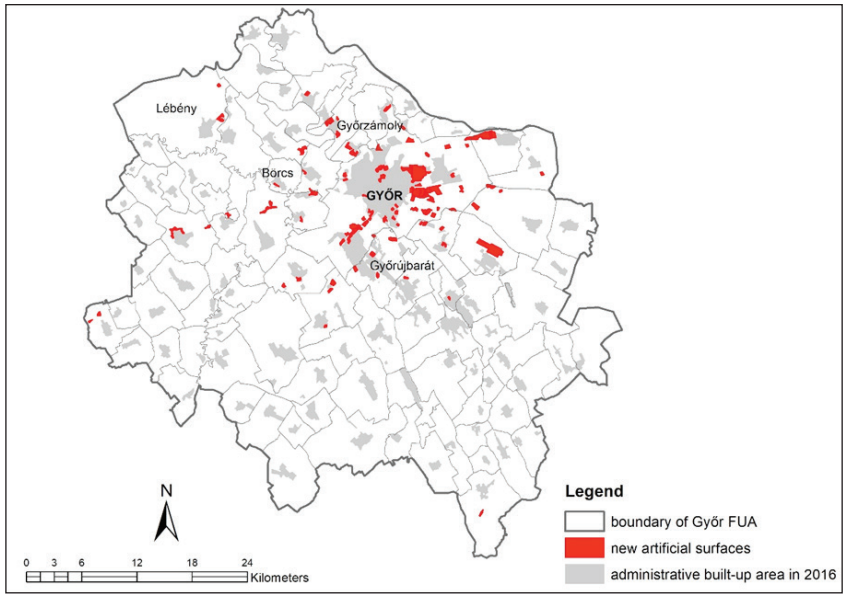
If we illustrate the changes of land use categories on maps, we can see the biggest changes close to the central cities. These changes mean not only new housing estates but infrastructural investments (new roads, industial fieds etc.) also (Fig. 9. 10.).



9. ábra: Mesterséges felszínek növekedése a Kecskeméti Városrégióban (1990-2018) / Figure 9. Increase of articicial surfaces in Kecskemét City Region (1990-2018)
Forrás: saját szerkesztés CORINE CLC alapján / Source: own construction on the bases of CORINE CLC

On Fig. 9. and 10. we can see the example settlements from the three groups. Ballószög (near Kecskemét) and Győrújbarát (near Győr) from the first group characterized by significant artificial surface growth, but in case of Győrzámoly (second group) the growth is also significant. In Börcs and especially in Fülöpszállás there was no growth in artificial surfaces. In case of Kecskemét the biggest change is the industrial area growth south of the city between 1990 and 2018 (Mercedes-Benz Manufacturing Hungary Kft. and its suppliers).

It should be noted that the annual growth rate of built-up areas in the Kecskemét City Region has decreased while in city of Kecskemét it has increased. In addition to the expansion of industrial areas, it suggests, that urban sprawl occurred primarily within the administrative boundaries of the city (in the area of attached settlements: Kadafalva, Hetényegyháza etc.). There is a similarity between Kecskemét and Győr. In case of Győr, growth is more dynamic within the city boundary – like in Kecskemét –, but the annual growth rate of built-up surfaces decreased in Győr after mid 2000's. This shows the delayed industrial development of Kecskemét and generally the south-eastern region of Hungary.



10. ábra: Mesterséges felszínek növekedése a Győri Városrégióban (1990-2018) / Figure 10. Increase of articicial surfaces in Győr City Region (1990-2018)
Forrás: saját szerkesztés CORINE CLC alapján / Source: own construction on the bases of CORINE CLC

Következtetések / Conclusions

According to the international literature, urban sprawl is a delayed process in Eastern and Central Europe, including Hungary. As a result, changes and environmental consequences are not as pronounced such as in Western Europe. However, we are witnessing striking changes, especially in some frequented settlements. The most conspicuous changes are ecosystem fragmentation, increasing traffic load (with greater air pollution) and loss of farmlands. Greater air pollution is a very harmful consequence of urban sprawl which can be managed not only by a better transport policy but by a better land use policy.

Tracking land use changes be considered one of the most important investigation in this topic. As we have seen, spectacular transformations are taking place around Győr and Kecskemét in the last decade and a half. The process is primarily driven by rapid industrial growth and the paralel demographic and transport changes have long-term consequences. Industrial growth and economic crises alternate, but the process itself is a long-lasting factor in the landscape, in the transportation and in the pollution of the environment.

The processes of urban sprawl and suburbanisation are major factors in the environmental changes of the selected cities and their FUA's in the last decades. We can conclude that the examined processes affect mainly the settlements near to the centre, or in many cases they are within the administrative boundaries of the cities. The consequences are wide-spread from the decline of green surfaces to the negative micro-climatic changes. The effects go beyond the environment and bring significant changes to both the economy and to the everyday life of local societies in various forms, such as more intensive and spatially expanding urban heat islands or increasing number of heat waves (Landsberg, 1981; Oke et al., 2017).

For the latter phenomenon microclimatic measurements are good example from Kecskemét. The data from the four measuring points operated by our institute show that daytime overheating and night cooling are similar to the city center in one of the city's most prominent expansion directions (Hoyk, 2018). Due to the dense built-in environment and increasing of the covered surfaces, the urban heat island extends towards the city boundary. This suggests that due to urban sprawl, overheating of surrounding settlements is intensifying, which means a negative microclimatic change in the future. These changes are increasingly challenging for the society; both for inhabitants and decision-makers. All these draw attention on the increasing importance of adaptation to the climate change. In order to mitigate the above mentioned negative trends, it would be desirable to handle more consciously the processes of urban sprawl and suburbanisation in the future.

Köszönetnyilvánítás / Acknowledgment

This research was support by the National Research, Development and Innovation Fund (NKFIA). Reference number: NKFI-6-K-128703

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JOURNAL OF CENTRAL EUROPEAN GREEN INNOVATION
HU ISSN 2064-3004
DOI: 10.33038/JCEGI.2018.6.4.13
Available online at http://greeneconomy.uni-eszterhazy.hu/

A TÁRSADALMI VÁLLALKOZÁSOK REGIONÁLIS KÜLÖNBSÉGEI MAGYARORSZÁGON
REGIONAL DIFFERENCES OF SOCIAL ENTERPRISES IN HUNGARY

BERECZK ÁDÁM – KÁDÁRNÉ HORVÁTH ÁGNES – PÉTER ZSOLT
SIPOSNÉ NÁNDORI ESZTER – SZEGEDI KRISZTINA

Összefoglalás

A gazdaság társadalmi beágyazottságának kérdése régóta vizsgálatok tárgyát képezi. A valós társadalmi szereppel bíró és társadalmi célokat maguk elé kitűző társadalmi vállalkozások egyre nagyobb száma a gazdaság társadalmi beágyazottságának ékes bizonyítéka.

A társadalmi vállalkozás fogalma napjainkban egyre ismertebbé és elterjedtebbé válik, mégis egyidejűleg több definíció és meghatározás létezik ezekre a szervezetekre a szakirodalomban. Ezek főbb pontjainak áttekintése után a magyarországi társadalmi vállalkozások regionális eltéréseit egy 2017-es primer kutatás adatai alapján elemezzük. Vizsgáljuk a társadalmi vállalkozások életkora, alapítási indítéka, pályázati forrásokra támaszkodásuk mértéke és a foglalkoztatotti létszám összetételének regionális jellegzetességeit. Kutatásunk eredményeképpen arra a következtetésre jutunk, hogy Közép-Magyarország, Közép-Dunántúl és Nyugat-Dunántúl fejlettnek tekinthető, míg Észak-Magyarország és Dél-Alföld teljesítménye országos átlag alatti. Vegyes képet mutat Észak-Alföld és Dél-Dunántúl.

Kulcsszavak: társadalmi vállalkozás, alapítás, foglalkoztatás, regionális különbségek

JEL kód: M13, R12

Abstract

The social embeddedness of the economy has long been a topic of many research works. The increasing number of social enterprises with real social role and social goals is an evidence of the social embeddedness of the economy.

The concept of social enterprise is now becoming more and more well-known and wide spread. In spite of this, several definitions exist at the same time in the literature. After reviewing their main aspects, we analyze the regional differences of Hungarian social enterprises based on a primary data collection carried out in 2017. We examine the regional characteristics of their age, of the reason of their foundation, of the extent to which they rely on tender funds and of the decomposition of their stuff. As a result, we conclude that Central Hungary and Central Transdanubia are considered developed, while the performance of Northern Hungary and Southern Great Plain falls below the national average. The performance of Northern Great Plain and Southern Transdanubia is not unambiguous.

Key words: social enterprise, foundation, employment, regional differences

Bevezetés / Introduction

A közgazdaságtan megközelítése szerint az egyén másoktól függetlenül, kizárólag önérdekét követve cselekszik, vagyis a gazdaság társadalmi beágyazottsága alacsony. Amennyiben azonban a gazdaság szereplői elsősorban egyéni profitmaximalizálók, nincs köztük megfelelő információáramlás és hiányoznak a gazdasági cselekvést orientáló normák és tradíciók, akkor a bizalom hiánya lehetetlenné teszi a hatalomnak és az erőforrásoknak másokra történő átruházását, megnehezítve és gyakran ellehetetlenítve ezzel a vállalatok létrehozását. (LENGYEL – SZÁNTÓ 2006). Ezt felismerve a szociológusok és a közgazdászok körében egyre inkább konszenzus alakul ki arról, hogy a vállalatok sikerének feltétele a bizalom megléte, ugyanakkor a nem-gazdasági követelések hiánya, amely biztosítja, hogy a vállalatok ne válhassanak racionális döntéshozó szervezetek helyett segélyszervezetté. A társadalmi vállalkozások megjelenése és folyamatos gyarapodása a gazdaság társadalmi beágyazottságának ékes bizonyítéka.

Cikkünkben a magyarországi társadalmi vállalkozások néhány főbb jellemzőjének regionális sajátosságait, illetve eltéréseit mutatjuk be, különös tekintettel a társadalmi vállalkozások életkorára, az alapításuk indítékaira, a pályázati források szerepére és a foglalkoztatotti létszám jellemzőire.

Anyag és módszer / Material and methods

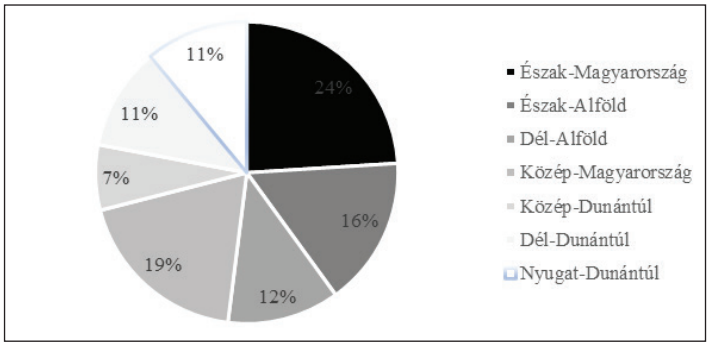
A társadalmi vállalkozás fogalma napjainkban egyre ismertebbé és elterjedtebbé válik, mégis többféleképpen definiálják és határozzák meg. Az angol nyelvű szakirodalom alapján a társadalmi vállalkozás értelmezhető személyként (social entrepreneur), tevékenységként/folyamatként (social entrepreneurship) és szervezetként (social entreprise) (KISS 2015). A társadalmi vállalkozás fogalmát másként értelmezi az „amerikai" és az „európai" iskola. Az „amerikai iskola" értelmezése szerint a vállalkozó egyén, a társadalmi innováció és a nyereségszerzés kapnak központi szerepet. Az „európai" iskola szerint ezzel szemben a hangsúly a kollektív dimenzión és a demokratikus működési jellemzőkön van (DEFOURNY - NYSSENS 2009, 21). Az EMES nemzetközi szervezet szerint a társadalmi vállalkozás olyan szervezet, amelyben (1) közérdekű, szociális vagy társadalmi cél jelenti az üzleti tevékenység alapját; (2) a realizált profit visszaforgatása valamilyen társadalmi cél érdekében történik; (3) amely demokratikus vagy részvételi alapelveken és a társadalmi igazságosság célkitűzését szem előtt tartva szervezeti felépítéssel vagy tulajdonrendszerrel rendelkezik (EURÓPAI BIZOTTSÁG 2011, 2, BERECZK et al, 2018).

Vizsgálatunk alapja az a „Társadalmi vállalkozások alapkutatás" című kutatási program a GINOP-5.1.2-15-2016- 00001 „PiacTárs – Kiemelt projekt a társa-

dalmi vállalkozások ösztönzésére a fenntartható és versenyképes szociális gazdaság érdekében" elnevezésű program keretében, melyre az OFA Országos Foglalkoztatási Közhasznú Nonprofit Korlátolt Felelősségű Társaság megbízásából 2017 első felében került sor. A kutatás eredményeit a G. FEKETE et al. (2017) zárótanulmányban foglaltuk össze. A kutatás keretein belül dokumentumelemzést, adatbázis elemzést, kérdőíves felmérést és fókuszcsoportos interjúkat végeztünk. A potenciális társadalmi vállalkozások alapsokaságának a Központi Statisztikai Hivatal adatai alapján 13014 szervezetet tekintettünk és ezek jellemzőit vizsgáltuk. A társadalmi vállalkozások regionális jellemzőit a kérdőíves felmérés adatai alapján elemeztük, amely 220 szervezet bevonásával készült. Ezen szervezetek regionális megoszlása a következőképpen alakult: Dél-Alföld (12%), Dél-Dunántúl (11%), Észak-Alföld (16%), Észak-Magyarország (24%), Közép-Dunántúl (7%), KözépMagyarország (19%) és Nyugat-Dunántúl (11%). A mintabeli arány a dél-Dunántúli régióban megegyezett az alapsokasági aránnyal, Észak-Alföld 5 százalékkal, Észak-Magyarország 4 százalékkal felülreprezentált a mintában, míg Közép-Dunántúl 2%-kal, Dél-Alföld 3%-kal, Közép-Magyarország pedig 8 %-kal alulreprezentált az alapsokasághoz képest.

Eredmények / Results

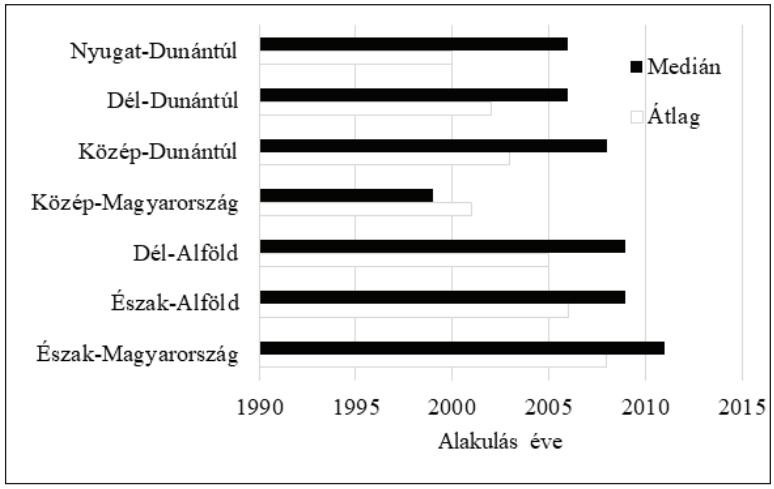
A megkérdezett társadalmi vállalkozások székhelyének közel egynegyede (23,7%) az Észak-Magyarországi régióban, míg közel 20%-a a Közép-Magyarországi régióban található. Mintegy minden hatodik társadalmi vállalkozás Észak-Alföldön található, míg a megkérdezett társadalmi vállalkozások székhelyének közel 10-10%-a található Dél-Alföldön, Dél-Dunántúlon, illetve Nyugat-Dunántúlon. A Közép-Dunántúli régióban mindössze a társadalmi vállalkozások 7,3%-a székel.



1. ábra: A vizsgált társadalmi vállalkozás székhelyének régiója / Figure 1. Region of the residence of the examined social enterprises

Forrás: G. Fekete et al., 2017, 92 / Source

A vizsgált társadalmi szervezetek átlagosan 2004-ben alakultak. Mivel a társadalmi vállalkozások átlagéletkorát néhány nagy múltú társadalmi vállalkozás évtizedekkel ezelőtti alakulási éve is befolyásolja (és jelentősen csökkentheti), a regionális elemzés esetén érdemes az átlag mellett a medián értékét is vizsgálni.



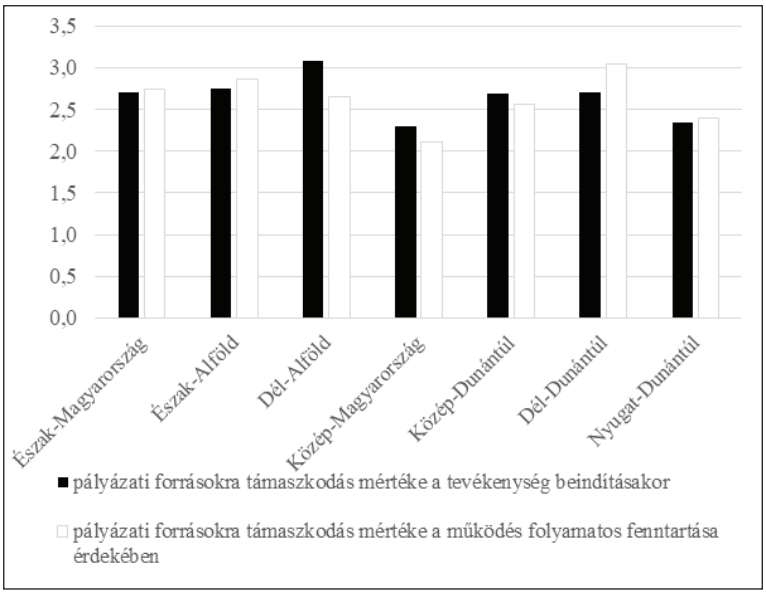
2. ábra: A vizsgált társadalmi vállalkozások alakulásának éve regionális bontásban / Figure 2. Regional distribution of the year of foundation of the examined social enterprises

Forrás: G. Fekete et al., 2017, 111 / Source

A legrégebbi társadalmi vállalkozások Közép-Magyarországon találhatók, ahol az alapítás évének átlaga 2001, a medián pedig 1999. A Dunántúlon működő társadalmi vállalkozások fiatalabbak, viszont a legfiatalabb társadalmi vállalkozások az alföldi régiókban és Észak-Magyarországon találhatóak. Észak-Magyarországon a vizsgált vállalkozások felét 2011 után, Észak- és Dél-Alföldön 2009 után alapították (2. ábra).

A társadalmi vállalkozások alapításának egyik indítéka lehet a rendelkezésre álló támogatási lehetőségek megragadása. Mivel ezek legkisebb arányban a Közép-Magyarországi régióban állnak rendelkezésre, feltételezésünk szerint ott jellemző legkevésbé az ilyen irányú vállalkozásalapítás. A kutatás eredménye megerősíti a feltételezésünket, hisz a támogatási lehetőségek megragadása a társadalmi vállalkozások alapításának indítékaként leginkább Észak-Alföldön és Észak-Magyarországon, legkevésbé pedig Közép-Magyarországon jellemző. Számos régióban (Észak-Magyarországon, Dél-Alföldön, Közép-Magyarországon, Közép-Dunántúlon, Dél-Dunántúlon és Nyugat-Dunántúlon) leginkább „valamely társadalmi / közösségi cél megvalósítása" érdekében hoznak létre társadalmi vállalkozásokat. Észak-Alföldön ez az indok a második lényegesebb a „fenntartható fejlődés elősegítése" után. A

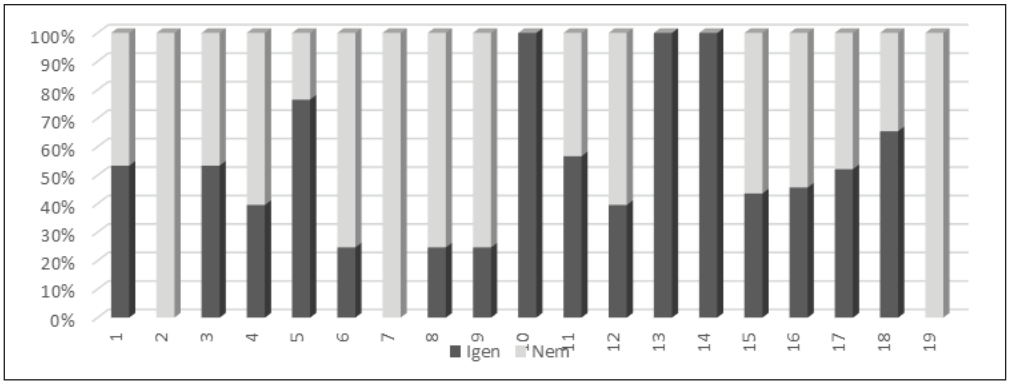
„transzparens működés", a „közjó támogatása" és a „társadalmi innováció" a többi régiót meghaladó mértékben generál vállalkozásalapítást Közép-Dunántúlon. Az „önfenntartás / önsegélyezés" gyakrabban szerepel motivációként társadalmi vállalkozás alapításakor az alföldi régiókban és Észak-Magyarországon, mint az ország nyugati régióiban. Nyugat-Dunántúlon a többi régióhoz képest kevésbé jellemző a „társadalmi problémák enyhítése", az „üzleti alapú tevékenység végzése", a „demokratikus döntéshozatal", a „szolidaritás biztosítása", az „együttműködés, az érintettek bevonása", a „transzparens működés" és a „társadalmi innováció", mint az alapítás indítékai.



3. ábra: Pályázati forrásokra támaszkodás mértéke regionális bontásban* / Figure 3. Extent to which examined social enterprises rely on tender funds, in regional distribution*

*** 1 egyáltalán nem, 2 inkább nem, 3 inkább igen, 4 teljes mértékben / *1 not at all, 2 too lenient, 3 moderately, 4 extremely**

Forrás: G. Fekete et al., 2017, 112 / Source



4. ábra Pályázati forrásokra támaszkodás mértéke a tevékenység beindításakor tevékenységi típusonként1 / Figure 4. Extent to which examined social enterprises rely on tender funds when starting the activity, by type of activity[1]

Forrás: saját szerkesztés

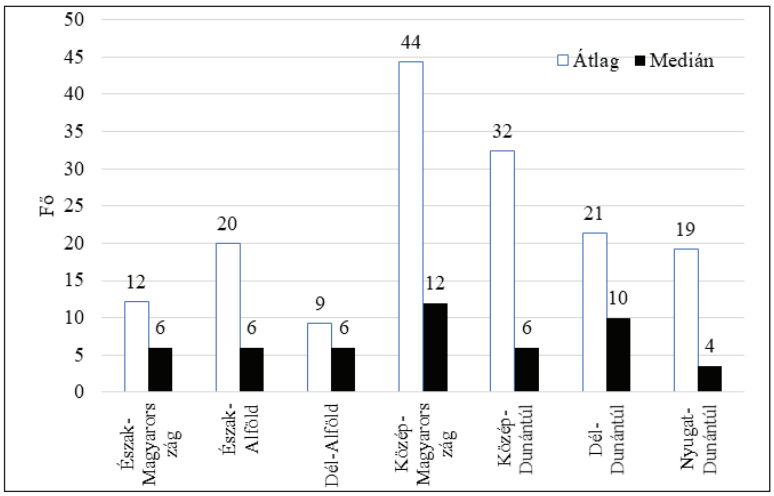
Bizonyos tevékenységi körök beindítása nagymértékben igényli a pályázati forrásokat. Ilyenek az adminisztratív és szolgáltatást támogató tevékenység, vagy a közigazgatás, védelem; kötelező társadalombiztosítás, ahol valamennyi vizsgált társadalmi vállalkozás csak pályázati támogatással tudta elkezdeni a tevékenységét. A vizsgált építőipari társadalmi vállalkozások 84%-a szintén csak pályázati támogatással tudta elindítani tevékenységét. A legkevésbé a szállítás, raktározás, a háztartás munkaadói tevékenysége; termék előállítása, szolgáltatás végzése saját fogyasztásra, a bányászat; kőfejtés, valamint a szálláshely-szolgáltatás, vendéglátás és az információ-kommunikáció területén szükségesek a pályázati források a tevékenység beindításához. A tevékenység fenntartása során hasonlóan alakult a pályázati források igénybevétele tevékenységtípusonként.

Pályázati forrásokra a társadalmi vállalkozások nemcsak a tevékenység beindításakor, hanem a működés fenntartása során is támaszkodhatnak. A tevékenység beindításakor leginkább Dél-Alföldön veszik igénybe ezt a fajta lehetőséget, míg a működés fenntartása során legnagyobb mértékben Dél-Dunántúlon jellemző a pályázati források felhasználása. A pályázati forrásokra támaszkodás mértéke mind

[1] 1 - Mezőgazdaság, erdőgazdálkodás, halászat, 2 - Bányászat, kőfejtés, 3 – Feldolgozóipar, 4 - Vízellátás; szennyvíz gyűjtése, kezelése, hulladékgazdálkodás, szennyeződésmentesítés, 5 – Építőipar, 6 - Kereskedelem, gépjárműjavítás, 7 - Szállítás, raktározás, 8 - Szálláshely-szolgáltatás, vendéglátás, 9 - Információ, kommunikáció, 10 - Pénzügyi, biztosítási tevékenység, 11 – Ingatlanügyletek, 12 - Szakmai, tudományos, műszaki tevékenység, 13 - Adminisztratív és szolgáltatást támogató tevékenység, 14 - Közigazgatás, védelem; kötelező társadalombiztosítás, 15 – Oktatás, 16 - Humán-egészségügyi, szociális ellátás, 17 - Művészet, szórakoztatás, 18 - Egyéb szolgáltatás, 19 - Háztartás munkaadói tevékenysége; termék előállítása, szolgáltatás végzése saját fogyasztásra

a tevékenység indításakor, mind a működés során Közép-Magyarországon a legalacsonyabb (3. ábra), ami szintén a régió fejlettségéből adódik.

A vizsgált társadalmi vállalkozások átlagos foglalkoztatotti létszáma Közép-Magyarországon a legmagasabb, ahol átlagosan minden társadalmi vállalkozásban 44 fő dolgozik. A medián értékéből azonban az derül ki, hogy a társadalmi vállalkozások felének kevesebb mint 12 foglalkoztatottja van, ami arra enged következtetni, hogy a magas átlagos érték néhány, kiemelkedően magas létszámot alkalmazó társadalmi vállalkozásnak köszönhető. Közép-Dunántúlon szintén néhány kimagaslóan sok alkalmazottal működő társadalmi vállalkozás található. Dél-Alföldön, Észak-Magyarországon és Észak-Alföldön kisebb az átlagos foglalkoztatotti létszám és a két középérték között sincs olyan nagy arányú eltérés (5. ábra), amiből arra következtethetünk, hogy ezekben a régiókban nincsenek nagyon nagy, (100-nál) több főt foglalkoztató társadalmi vállalkozások.



5. ábra: A vizsgált társadalmi vállalkozásoknál foglalkoztatottak átlagos létszáma regionális bontásban / Figure 5. Average number of employees at the examined social enterprises, in regional distribution

Forrás: G. Fekete et al., 2017, 115 alapján saját szerkesztés / Source: own compilation based on G. Fekete et al., 2017, 115

A női foglalkoztatottak minden régióban többségben vannak a férfiakhoz képest a vizsgált társadalmi vállalkozásokban, különösen a Dél-Alföldi (69%) és a Közép-Magyarországi (66%) régiókban. A nők magasabb aránya összefüggésben állhat a hagyományosan több női munkavállalót felvevő tercier szektorban működő társadalmi vállalkozások viszonylag nagy arányával.

A foglalkoztatottak korösszetételét vizsgálva megállapítható, hogy a fiatal (16-24 év közötti) és az 50-64 év közötti munkavállalók legnagyobb arányban Észak-Magyarországon jelennek meg a társadalmi vállalkozásokban. Fordított a helyzet Nyugat-Dunántúlon, ahol a 25-49 év közötti foglalkoztatottak magas (75%) aránya a fiatal (4%) és az 50-64 év közötti foglalkoztatottak (17%) alacsony arányával párosul. A hátrányos helyzetű foglalkoztatottak aránya Dél-Alföldön a legmagasabb (meghaladja az 50%-ot), míg a Közép-Dunántúli, Észak-Alföldi, Dél-Dunántúli és Észak-Magyarországi régiókban nem sokkal marad el attól. A Nyugat-Dunántúli régióban ez az arány a legalacsonyabb, csupán 40%.

A vizsgált társadalmi vállalkozások jelentős hányadának van olyan társadalmi hatása, hogy javítják a munkaerőpiaci részvételt és csökkentik a munkanélküliséget. Közép-Magyarországon csupán a vizsgált vállalkozások 40%-ának van munkaerőpiaci hatása, Közép- és Nyugat -Dunántúlon azonban ez a hatás 44-46%, míg az alföldi régiókban és Észak-Magyarországon 54-58% körül alakul.

Következtetések / Conclusion

A társadalmi vállalkozások működési ideje, foglalkoztatotti létszáma és alapítási indítéka alapján Közép-Magyarország, Közép-Dunántúl és Nyugat-Dunántúl fejlettnek tekinthető, míg Észak-Magyarország és Dél-Alföld teljesítménye országos átlag alatti. Vegyes képet mutat Észak-Alföld és Dél-Dunántúl. Különösen kiemelkedő Közép-Magyarország helyzete, ahol az országos átlagot jelentős mértékben meghaladó a társadalmi vállalkozások életkora és átlagos foglalkoztatotti létszáma. Bízunk abban, hogy kutatásunkkal és az eredmények publikálásával ösztönözni tudjuk a társadalmi vállalkozásokat piacképes termékek és szolgáltatások előállítására, valamint a marketing és piacra jutás ösztönzése révén a fenntartható üzleti modell alapján tartós foglalkoztatási lehetőségeket létrehozására az ország valamennyi régiójában.

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JOURNAL OF CENTRAL EUROPEAN GREEN INNOVATION
HU ISSN 2064-3004
DOI: 10.33038/JCEGI.2018.6.4.13
Available online at http://greeneconomy.uni-eszterhazy.hu/

A METHOD FOR MAKING CHILDREN WITH LD SUCCESSFUL

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Abstract

Although there are an increasing number of methods treating children with learning and behavioral problems, the provided results are in a lot of cases not self-evident. During my work and research it has gotten clear that all participants, children and parents included, need a feedback on achievements. As most of the times these children suffer a lack of attention during their studies a neurofeedback system was implemented in a movement-development course to provide a more scientific approach in developing their minds. Using this method the gathered data can be used to analyze the growth of participating children and doing so the course can be adjusted if needed. Developing the system also ensures that participants meet various challenges to train their focus while a playful atmosphere is maintained. The question is it worth doing it this way? In today's economical situation various factors must be considered on different levels to answer. On a basic level it must be considered what will a child gain if he/she goes through a developmental course. Will being successful outweigh the cost of training, is it worth for parents or on a higher level for society to invest more resources?

Keywords: learning disability, neurofeedback, success, children, stress, attention

JEL kód: I29

Introduction

In Hungary if a child is diagnosed with a learning disability parents have numerous options to choose from. In a lot of cases the child will undertake a movement development course where he/she will be doing various tasks that imitate infant movements. This method is used to rewire the participants brain and "repair" or improve cognitive functions (Blythe S.G,2002).

This method though not perfect can be and is used to alleviate the symptoms of learning disabilities (from now on referred as LD-learning disability). Work experience tells that circumstances have changed and the well used method is met with more and more resistance from younger generations of schoolchildren and skepticism from parents. The main cause for concern on the other hand is that children who have already participated in the course came back at a later time. What these children had in common that they had an increasing hard time concentrating on their schoolwork and they were all stressed out about school. As these children had already undergone the normal course a new method was needed to enhance their diminished abilities. Due to their age a new training menu was adapted which concentrates on appropriate conditional and coordinating tasks, but mainly on balance, concentration and movement control. To further strengthen the ability of these children to focus, a personally crafted neurofeedback system in DIY style was integrated in the method. This system serves various purposes. One is monitoring gathered data, which serves as a more scientific base in evaluating performance. As the used system can be adapted into more engaging "games" that challenges participants focus, children are more drawn into their self-improvement. This not only supports their growth it provides a less subjective viewpoint for everyone on their achievements. On the other hand it gives a certain sense of plus to parents as in they feel that their children do not participate in mundane movement development course. The purpose of this additional value though is not marketing but enhancement of growth. Participants of the hybrid and the normal course often leave a certain impression of a troubled mind state which could be defined as one form of stress. This stress is caused by their feeling that whatever they do or achieve is not enough and their hard work is in vain. Moving something with your mind can be very satisfying and relieves some of the feeling of effort in vain symptoms. This effect of the created system is backed by reports that claim that neurofeedback can be used to alleviate the symptoms of stress (Hammond, 2005). Through development children can be taught to have better focus, improved movement skills. Unfortunately, this is not enough if an external support system is not in place which gives children what they need in the right moment. Which system should include family, teachers, trainers and so on.

It should be evident now that to make these children successful addressing one element in the equation is not enough. In the future there are various challenges that will make life harder, be it a consequence or climate, demographic change or the changes in work conditions.

This paper attempts to paint a summary picture of an ongoing research what children can achieve using the developed method. The method is in a continuous developmental status so it has a few drawbacks which will be mentioned as well. As mentioned, the given plus to these children is only part of a bigger equation of their success. Based on work experience and previous available research a theoretical equation will be presented. These individual equations as a sum, depending on results could alter modern societal and economic problems. To raise awareness this bigger picture will be discussed as well.

Material and methods

To summarize previous research and discuss how the development of the neurofeedback is proceeding various sources will be used. Evaluating progress is based on gathered primary data while conclusions are drawn on secondary elements.

Material

The structure of used data is the following:
Secunder data:

- Various journal or research articles focusing on children with LD and their attention
- Stress related articles, studies
- Articles using neurofeedback systems improving attention
- Work experience

Primer data:

- Gathered data which represents the cognitive behavior of participants during sessions, for analysis raw EEG data and concentration value provided by the used dry EEG instrument are used.

Methods

During sessions children complete various tasks while a Muse headset monitors their brain. The android application of Muse headset can be programmed to provide data about the strength of the different brainwaves. Using these measured beta values, which can be associated with attention, (Linden et al,1996) participants can move through a mobile application for example a toy car. That is if they can mentally perform a mental task and maintain that for long enough for the algorithm to deem enough. When the car starts moving it gives a feedback that they are on the right track, thus participants can learn to control how to regulate the state of their brain. Analyzing over a longer period of time one can observe how the attention of participants have changed despite age or everyday influences. Using these data points and the occasional feedback from parents an equation about the probability of success for children with LD was created. These equations show based on conclusions from other studies and work experience what factors are important to set children on a successful path. This equation also represent the hypothetical additional value and its weight which the developed method provides.

To show how children with LD are more endangered to stress and how this is related to a lack of focus previous studies were used. Based on this thought train and using statistics which connect a cost to stress an economic cost of LD can presented. These costs include various sources, medical bills, missed opportunities and loss of quality of life. If we presume that making children more successful through development the cost of these courses are investment which aim to lessen their stress and related cost during their lifetime. Using this method a comparison can be made between investment and gain or in other way avoided cost.

If we progress based on previous assumptions made on individual level an estimation can be made by relying on secunder data on how society would benefit a certain number of children with LD would be successful.

Results

To show the effects of the neurofeedback two data sets will be presented. One was acquired during an intense training camp where the developed system was used everyday. The other data is measured during sessions from an another group of children who are currently weekly partaking in the new program.

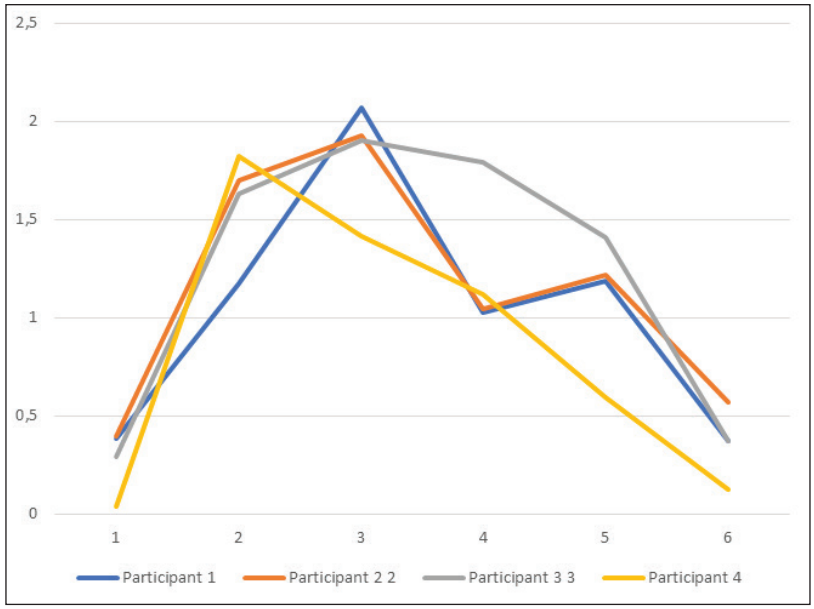

Chart 1: Average concentration score during training camp
Source: Own construction based on gathered data

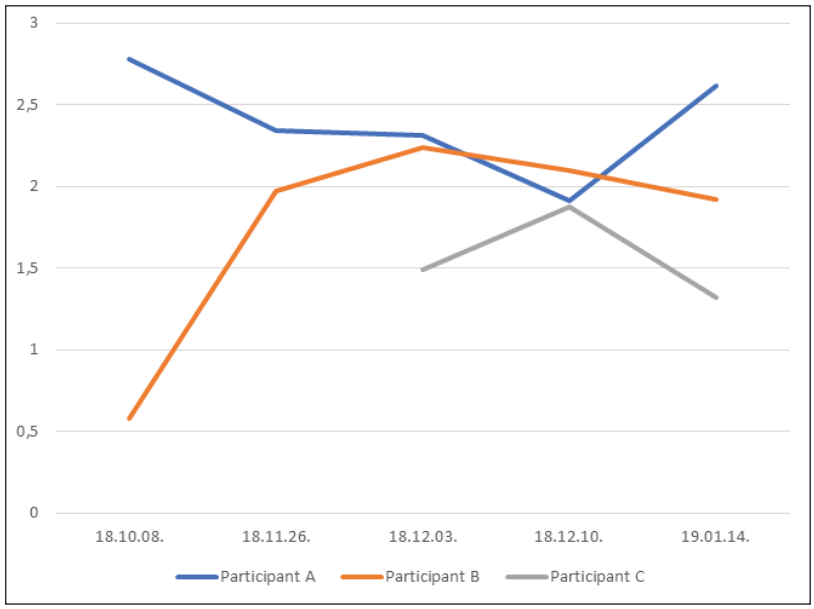

Chart 2: Another look on concentration scores
Source: Own construction based on gathered data

Chart 1 represents how growth can manifest itself as a result of the used hybrid method in a weekly course. It can be observed that all participants start strongly from day two, when they had to control a toy-car with their mind. After that participant four got very tired and could not maintain a performance. The exhausting effects of training got the other participants as well, but they had the mental strength to reduce the fall down. But how is that chart connected to growth? As an example, Participant B should be taken a look at on Chart 2. Participant B has only started using the system in that time frame. In my experience children with LD in general who have a problem focusing when they start using the system, they can only produce low measured concentration values. A typically encountered numerical average for beta value would be around 0.5 just as Participant B had in the start. In this case Participant B shows remarkable control and shortly gets the hang of the system on the easy settings. Current personal hypothesis is that the aforementioned low beta value is connected how children with LD have a different wiring in their brain and that must effect their ability to efficiently think or concentrate. Interestingly most of the participants of the training camp started as children who had already partaken in the traditional course, but later in school could not keep up the required attention level. Observation tells that these children were quite stressful about school and it is possible that some reverse change happened in the wiring of their brain which influenced their ability to focus. This reverse change was reflected in their movement skills as well. Balance, coordination was not on the level which they could attain during their earlier days of the course. While 75 percent the early participants started with a 0.5 beta value as a crystallization of their effort in the camp, they could maintain an average around 1. Their maximum value was in the range of 3-4. This is no mean feat as they produced these values after rigorous cardio and various coordination skill developing training. While some of the participants of the training camp showed recognizable improvement outside the sessions as well, on the other chart participant A is a clear sign that the system needs improvement. Participant A can generate from a data point of view very good concentration value but cannot make use of this increased brain power in other areas of life. This leads us to the other question what defines success and what factors are needed to make it useful in everyday struggles.

Equation of success:

The closest factors which correlate with work experience from the available studies are found in the work of Raskind et al (1999). In their long term study, which tries to pinpoint attributes that make children with LD successful they listed the following variables in table 1.

Variable	Correlation with succes
perseverance	0.88
proactivity	0.9
goal setting	0.75
self-awareness	0.69
emotional stability	0.55
lack of support system	-0.84
Emotional instability	-0.78
reactivity	-0.77
lack of goal setting	-0.7
lack of self-awareness	-0.58

Table 1: Success related attributes
Source: own edition, based on Raskind, 1999

While these resonate with personal experience based upon the last 4 years another approach should be taken. In this approach variables are classified into three big parts. One cluster could be defined as internal environment and closes external environment. Genetics, family teachings, situation, the child's psychology are all here. Second group of influencing factors could describe best as simply as school. The third batch consists of everything that can be defined as extra activities and are aimed on the improvement on the child. In this approach the variables of success or at least a probability for success could described as in table 2.

Genetics	Quality of school	Effects of extra activities on development
Family situation	Friends	Extra energy required to complete these activities
Psychology of the child	Positive or negative stress due to school life	Provided additional value
Performance of the child		Multiplier which influences additional value depending on the quality
$\sum$ =Success		

Table 2: Variables of success
Source: own edition

But why is success and attention such a key point? Based on various studies, conducted by Mark and colleagues (2008), Hoel et al (2001) on work related stress the following hypothetical process can be made.

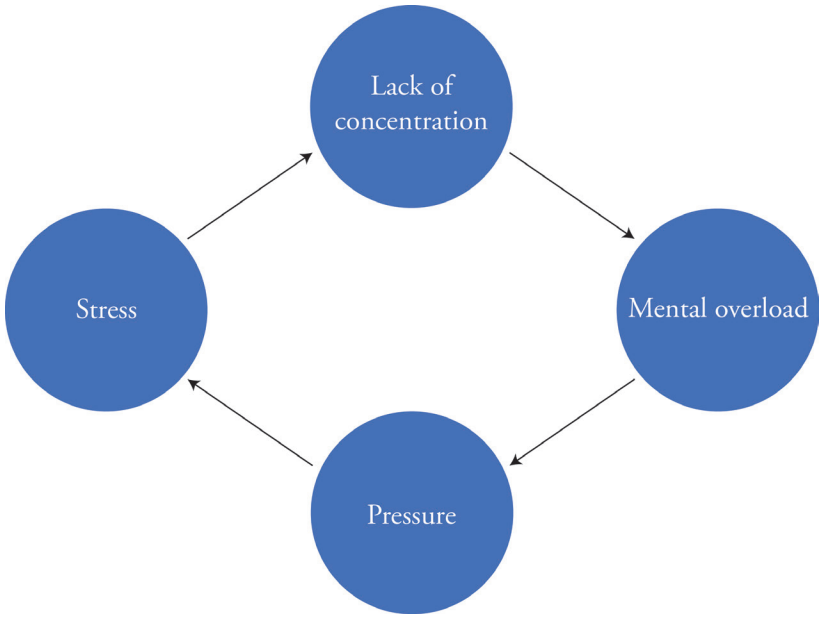

Figure 1: Devil's circle
Source Own editing based on Mark et al, 2008, and Hoel, 2001

Now previous studies using EEG agree that children with LD have a similar brain pattern. In frontal lobes they have excess theta waves while beta waves are less strongly present as in normal children. Due to this cognitive peculiarity children with LD have a hard time focusing their attention as their brain process is disturbed or overloaded with theta waves(Wang, 2013). This brain pattern was confirmed during early recordings and is showcased on Chart 3,where theta and beta waves of an early adapter is shown who had partaken in the traditional course.

But if this is case then children with LD are more endangered to stress as their brain work in such a way that mental overload is almost certain. At least one could say that if nothing is done to alleviate this pattern, if mental overload is given what follows is a stressed state. Now stress is a well discussed and researched topic. In this paper it is significant because we can link a cost to stress using various statistics thus an indirect cost to LD can be given. This would of course include variables like loss of productivity, health problems, loss in quality of life. The Roeher institute made a similar estimation which they calculated as cost of LD over an individual's lifetime. This cost amounted to 1.982 million dollar. If we calculate for example with ten percent of each generation who has LD one can draw the conclusion how badly this cost of life like symptom effects the success of generations. Including the different neural structure of people with LD, (Butterworth, 2013), its effects on concentration and other aspects of life it is evident these people face hardships in their life. To improve

their overall quality of life hard work is required on their part and parents to create the required environment where they can thrive and be a successful member of their community.

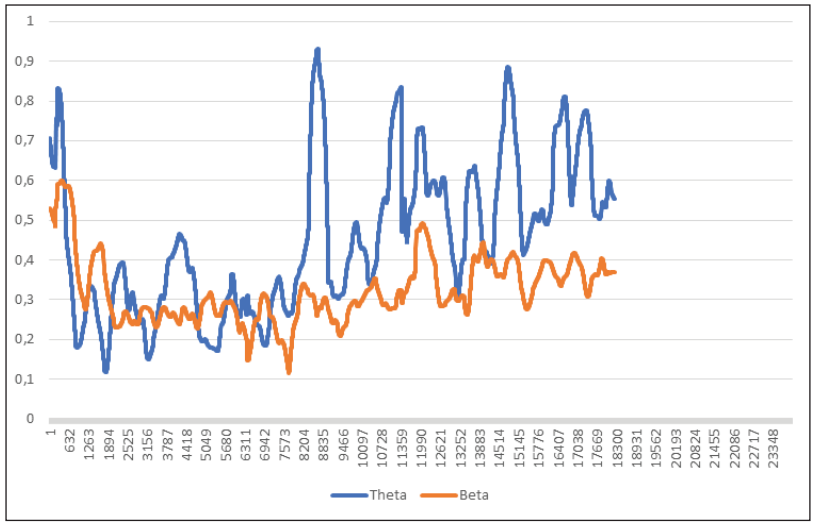

Chart 3: Beta/theta brainwave ratio
Source: own edition

Influence of society

Following the previous thought of train to make an estimation on society's cost three points must be considered.

1. The number of people or children with LD. Literature mainly agrees on 10 percent of current population (University College London, 2013) Available studies also state that in some cases these numbers are growing which are supported by workplace experience in a Hungarian foundation as well.
2. The cost of average stress per person. This can be deducted by starting with the following study on how much the EU has spent annually on stress. (Hassard et al, 2014) Using estimated population, the cost work related depression from the study's time cost can be calculated.
3. Average amount of investment for a child with LD to reduce symptoms through movement-development. Cost will be estimated based on gained work experience in mentioned foundation. This cost which would be around 100 euro is not the maximum amount, but should represent an average starting for extra activities. Depending on location and the child's problem cost can greatly vary.

Using these data for simple calculations and a 5 percent rate balancing time various estimations can be made of cost of stress and the development of a child. These estimations are represented in table 3.

Name	Estimated value (Eur)
Cost of LD/stress for a person per year	2975
Cost in a 15 years period	6185
Cost in a 40 years period	477 776
One year of movement development	4024
5 year of movement development	18 203

Table 3: Estimated costs of LD
Source: own edition

Up till this point these costs burden an individual who has LD or their parents when they pay for "extra curriculum" in hope to fix their children. These numbers should be treated as only as an artificial design, to show the loss of quality on life for these individuals. As mentioned before lack of focus, stress and LD cause can cause different indirect costs. This can be money spent on gas bringing a child when bringing him/her to movement development. Or a dyslexic person makes a mistake at work because his/her brain is overloaded and cannot properly process information anymore. These "costs" over a lifetime add up and not only affect certain specified individuals but their environment as well. This could be considered as a cost to society as their members have excess burden which they must pay. Question is what is the efficiency of different method that aim to treat people with LD. In other words when is it when the developmental course provides enough additional value to push the child over a certain threshold of success. On the other hand, it would worth to invest more into people with more LD so that they can be successful and what method should be chosen?

Efficiency is a key point because it matters that how much of the supposed cost of two million dollar can be reduced? For example, if with numerous development types during three years the child with LD improves overall 5 percent for their life the "investment" and "return" is not enough. If the parents during these years spend a fictional amount of 40 thousand dollars in return they would get with 5 percent efficiency 100 thousand dollars. It looks like worthwhile but we must consider that this cost represents life quality over a lifetime. In this approximation it is obviously

better to aim for efficiency in the higher numbers. This way maybe the child will be focused enough to save money, as opposed spending it on for example stress, to buy maybe a summer house.

One method can be individual movement development, but it's efficiency can be doubtful in a mot of times. Based on the effects and gathered data from the training camp intensive movement development and daily biofeedback sessions should be more efficient. To do so unfortunately one would need a specialized school with equipment and proper staff. Without going in much detail but accounting for neurofeedback equipment and a properly skilled staff for a reduced class with changed curriculum the price would be around 570 000 Euro. This would be a four year project for fifteen children with LD to bring them up to speed then integrate them back into the normal school process. Using this method as a plus option society's cost, investment is summarized in table 4.

LD incidence	Children who need movement development	Cost of three years movement development	Cost of proposed school
	Million	Million Euro	Million Euro
10 %	7.9	257	561

Table 4: Cost of LD from a broader view
Source: own edition

On the other hand, the possible gain in quality of life and for estimation purposes 40 percent of the related 1.97 million dollar would be **13*10^12 Euro**. As a comparison according to the World Bank's data in 2017 the GDP of the EU was around 16*10^12.

Conclusion

A traditional movement development is adapted to suit the needs of school aged children with LD who have trouble concentrating due to experienced stress. To monitor progress, to give a playful element and evaluate cognitive changes a neurofeedback system is integrated into the sessions. Early results of this hybrid method show promise as participant children's beta waves have gone through a significant growth which in some cases reaches four times the original starting values. During neurofeedback sessions children have to reach a beta threshold to move a toy car. The first batch of participants mostly showed better outside recognition in their skills and self-confidence. These included better behavior, diligence and improved ability to study. We could say that these children have gotten more successful or successful enough to

better adapt to their school life. Unfortunately, further testing shows the system has flaws and limitations. One flaw lies with hardware part of the system. The used dry sensor EEG devices can provide too much noise or invalid data. Partly due because of the behavior of the children partly because these systems were not designed for this audience. If there is not a strong enough support system around the child, and the cooperation of the child is just for show the additional value provided by the method is not enough to push over a certain threshold to achieve success. Different traits and factors of life must be provided for and by the child so that this threshold can translated into a criteria for success. To solve this on an individual level the system is currently under development to be more engaging and trustworthy. This also includes to make it more diversified in the hope to provide more of a challenge while strengthening various cognitive attributes that are required for success.

If the requisite psychological traits and ability to concentrate are not met than these children with LD are more endangered to various stress factors. As a result, they will have approximately a 2 million dollar cost over their lifetime which is spent on coping with their health, abilities. Given that at least around 10 percent of current younger generations have LD this poses a serious question to aging societies. As climate and demographic changes become more pressing it is more and more important that coming generations are prepared to meet the challenge. This can be done on an individual level which depending on the efficiency of the method can be a good investment for the child. This has the downside that parents can be overburdened by logistic and cost. Other pressing point is efficiency. As data shows gathered during sessions (Chart 2) a child's focus can greatly vary and in some cases cannot use what he/she learned. Using the neurofeedback system in a training camp showed that everyday usage greatly enhanced participants ability to rev up their brain and maintain that working state for more time. Thus in term of efficiency a daily session would the best. Work experiences tell that more and more children have some developmental issues. Unfortunately, not everyone can afford the different developmental courses needed on a personal level. As the occurrence of this problem grows a solution should be made on grater levels. For this to happen though greater investment should happen on state levels, changing and developing a developmental system with guaranteed efficiency to use in schools or a specialized school system. While the cost to do to this would be enormous in the range of trillions but in terms of quality of life or reduced economic cost spent stress related matters it would be a worthy investment.

Acknowledgement

Supported By the ÚNKP-18-2 New National Excellence Program of the Ministry of Human Capacities

Gratitude is due to my supporting parents, and my ever helpful consultant Professor K.Gy. Takácsné, without whose help this research could not happen.

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