SMART OPPORTUNITIES FOR RURAL COMMUNITIES IN 2021–2027

PAPER PROCEEDINGS

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FOR RESEARCHERS AND PRACTITIONERS

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CONTENTS

INTRODUCTION

This volume proudly presents the paper versions of a selection of the presentations held at the international conference of the 3rd Smart Communities Academy for Researchers and Practitioners. The event was entitled '*Smart opportunities for rural communities in 2021–2027*', and was co-organised by the Department of Regional Science of Eötvös Loránd University, the Technical University of Košice, Interindustria Knowledge Centre Foundation and the Hungarian Regional Science Association on the 15–16th April 2021, within the framework of the '*Smart Communities 2.0 – How to be smart in the countryside?*' project (SKHU/1902/4.1/027). Amidst the challenging times of the ongoing COVID-19 pandemic, we eventually opted for organising a *hybrid event*. As a result, the conference was simultaneously held in Legénd, a charming little village located in the picturesque countryside of Nógrád county, Northern Hungary, as well as in the online space, connecting various localities across Central and Eastern Europe and beyond. We firmly believe that this duality and entanglement of physical (geographical) space and virtual (online) space also aptly demonstrates how important '*smartness*' and digitalisation is (or should be) for rural communities.

Closely connected to the idea of smartness, *diversity* might be considered as another key notion – in the case of both the presentations and the subsequent paper submissions. Hence, under the main umbrella theme of smart rural communities, not only the topics were exceptionally diverse but also the list of contributors. Their disciplinary backgrounds include – but are not limited to – various sub-fields of geography, regional science, economics, sociology, urbanism, and GIS. Nonetheless, just as importantly, there were several contributions from outside of the academic realm as well, including the presentations of practitioners, planners and policy-makers working on different geographical scales, settlement leaders, and other stakeholders. Some of their contributions can be read in this volume, too. By bridging the (seeming) chasm between theory and praxis, this diversity indeed enabled a fruitful conversation between researchers and practitioners.

This edited volume consists of 20 papers. In the case of the proceedings of presentations, the total number of 43 slideshows were ordered in alignment with the conference programme (i.e. starting with those of the plenary session's contributors, followed by the presentations of the five parallel thematic sections, and then by some of the contributions of the two working groups' invited speakers). In contrast to that, in the case of these 20 papers, we were intentionally not aiming at establishing larger thematic units. Instead, in order to demonstrate the *diversity* mentioned above, the volume is simply structured along the alphabetical order of the papers' (first) authors.

As the first chapter, Mohammad ALHARIRI discusses the importance of ICT in the field of rural tourism. It is followed by the presentation of the Digital Village Programme and further smart opportunities for the 2021–2027 timeframe by Attila BALLA, one of the plenary speakers of the conference. José CAMPOS et al. focus on individual heat pumps as an opportunity for smart and sustainable heating for rural communities. Csaba CSONTOS et al. examine the validation possibilities of household heat demand in rural settlements using software-based heat atlases.

The paper of Tibor FARKAS and Dóra KOLTA revolves around the questions of smart villages and smart communities. Károly FEKETE outlines the possibilities and limitations of applying smart approaches in the case of the Lake Balaton Area. Anna GERA investigates the relationship between smart solutions and urban identity. It is followed by the contribution of András IGARI who analyses the effects of Covid-19 in the rural areas of Central Europe.

As another plenary speakers of the conference, Ákos JAKOBI draws a number of conclusions ranging from data driven cities to indicators of smartness in villages. Zsombor KÁPOLNAI provides an overview of online sales of local products in Hungary. Zoltán KOLTAI investigates 'successful settlements' in Northern Hungary. In their paper, Vilmos OSZTER and Álmos VIRÁG offer an introduction to demand responsive transport in rural areas, with experiences drawn from multiple EU cooperation.

Péter PARÓCZAI Sr. discusses the role of information and logistics in the context of spatial development. Ola QASSEER presents minibuses as unsystematic transportation modes that typically characterise rural mobility in the Syrian Governorate of Latakia. Mahla SHOJAE ANARI and Ákos JAKOBI provide an insight into the role of ICT in Iran's rural areas. Pál SZABÓ focuses the use of internet in the work of local governments.

Gábor SZALKAI offers an overview of various international smart transportation solutions for both urban and rural areas. Rita SZÉKELY's paper deals with smart solutions for ecotourism. Also based on demand responsive transport, János TÓTH and András LAKATOS offer tools to solve the problems of regional bus transportation. And finally, in the last chapter of the volume, Mónika URBÁN-MALOMSOKI et al. examine smart city and smart village 'good practices' in Hungary.

Based on the truly broad scope of topics featured in the conference programme, this volume is also recommended for those interested in the state-of-the-art on smart rural communities – both from and beyond the academic sphere. We do strongly hope that these genuine and wide-ranging ideas will be considered for and incorporated into future policy-making processes, territorial planning, and local development initiatives.

We wish all our readers plenty of smart discoveries while reading the volume.

the editors,

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THE IMPORTANCE OF ICT IN RURAL TOURISM

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ABSTRACT
Europe is one of the most important tourism destinations globally, utilising tourism as a development engine. Urban tourism is already extensive in most of the important European cities due to the unique cultural and historical factors in each one of them, but also on the other side, there is the rural tourism which is attracting attention recently due to its ability to achieve the balance sustainable tourism between urban and rural tourism. Both tourism types can be interacting with several economic and social factors. Therefore, it is really important to know which factors affect rural tourism than urban tourism to target rural tourism more efficiently. The information and communications technologies have played an important role in tourism industry, especially in travel and hospitality sectors. Companies, such as Airbnb, allowed many house owners in the rural areas to enter the hospitality industry, whether by listing their vacations houses or listing a room in their homes. This study will try to explore the relationship between ICT and rural tourism.

KEYWORDS
ICT; tourism; rural tourism

Introduction

Europe is considered one of the most important destinations in the world, holding 51% of the global tourist arrival in 2019 (World Tourism Organization 2020). Thus, the EU has emphasised tourism as an engine for these member countries (Lee, Brahmasrene 2013). Urban tourism is one of the forms of tourism. It can consist of cultural activities, historic, congress, sporting, gastronomic, nightlife, and shopping activities (Ashworth, Page 2011). And on the other side, rural tourism can consist of nature tourism, ecotourism, hunting, fishing, sightseeing, visiting historical places, festivals, and gastronomy (Eugenio Cejudo 2020). Both tourism types can affect and be affected by many factors such as unemployment, migration, GDP, population growth rates, and average ages. These factors can play as a push or pull factors. Therefore, it is vital to know the effect of each element on achieving the needed balance to develop the underdeveloped regions and attracting tourists and creating demand in new areas.

However, some cities are suffering from the enormous pressure of tourists causing more pressure on the public spaces and services. Most tourists seek hotel located within walking distance from the principal attractions; this growing demand for hotels in city

centres pushed more new hotels in the city centres causing more concentration and more pressure; this increasing demand for accommodation has developed with the development of the Internet and communication Technology (ICT) as a new way to meet the growing demand by peer-to-peer accommodation style, and many other examples.

The role of ICT in tourism

In modern societies, the annual holiday became an essential need for most households to release some of the life burdens; and it is the most expensive purchased service, and it takes a large part of the household yearly budget. This annual year holiday should be planned well; else it will be ruined for the whole year. Therefore, tourists need a lot of information that helping them to make the right choice with the slightest regret, or in economic terms, the least opportunity cost possible. The need for a lot of information also comes from the characteristics of the tourism services; as previously mentioned, tourism services are intangible, inseparable, and irreversible, which means tourists cannot test the service before buying it. Thus, information about the tourist's experiences with the service is essential information. That is why tourism is considered an information-intense industry. Information and Communication Technology (ICT) is all about information and its takes and gives information between the entities. Thus, the tourism sector is considered the first services sector in ICT. As the ICT has deeply affected the way of the businesses compete and work (Porter 2001), has also affected the tourism industry, the necessity of information in tourism industry has evolved with the development of ICT creating new digital market called e-tourism, allowing the customer to engage directly without intermediaries or connect dynamically with the service provider to customise their service (Jeong, Oh, Gregoire 2003), replacing the traditional distribution roles from travel agencies, tour operators, and inbound travel agents, to the internet-based replacements such as online booking and portals for touristic destinations with valuable information for the tourists, and these replacements can vary between business to business (B2B), business to customer (B2C), or customer to customer (C2C), pushing the enterprises to reshape their organisational structure and their partnerships to achieve more efficient win-win goals by optimising operating costs and generate more valuable services for their customers (European Commission 2004) by gaining a competitive advantage through either differentiating their products and services or by targeting the best price in the market. ICT enables tourists to reach accurate information in a short time and at less cost through conventional methods (O'Connor, Frew 2000). This is what e-tourism differs from traditional tourism, where e-tourism offers more considerable potential opportunities for the needed information to a more significant number of consumers and relatively low cost. Therefore, the development of ICT, called Web 2.0, i.e. the second-generation of Internet-based services that let people collaborate and share information online in perceived new ways such as social networking sites, blogs, wikis, video sharing sites, web applications, and communication tools. Ráthonyi (2011) has revealed a new term, Travel 2.0, which is based on Web 2.0 that allow travellers to interact

and exchange their experiences through the Internet instead of relying on mediators. One of the most crucial applications of Web 2.0 is social media, where people exchange photos, videos, and their experiences.

The role of social media in tourism

Social media has been created due to humans' nature; human is a social creature who likes to share his thoughts, experiences, and stories. Social media websites such as Facebook, Twitter, and YouTube, are created to show others how they feel when trying new experiences or how they spent their summer or winter vacations (Bethapudi 2013; Eurostat 2018). On the other hand, humans are curious creatures who know, discover, and try new experiences. These characteristics have created a fertile environment for, in one hand, prospect travellers to see the different backgrounds that are posted on the social media platforms by people could be their friends, family, or even millions of people who never have met them, to help them decide which destination is the most suitable, and on the other hand, suppliers to extend the reach for prospective tourists while they are sitting in their home without even meeting them (Bethapudi 2013).

Moreover, in the intensity of information inflows, tourists search for a more creative and reliable way to help them in decision-making. At the same time, they have less time to decide and a lot of options available. That is what assists the role of social media in tourism marketing, where people can find true, spontaneous, and real experiences (European Commission 2004).

On the other side, suppliers, which can be companies or even ordinary people, can easily create their distinct image, be targeted, and cheaper than the traditional ways (Eruera 2008). Still, social media has also raised the competition level between the suppliers by increasing the number of suppliers themselves due to the easiness of entering the market and growing the creativeness needed to catch the prospective tourists' awareness. Suppliers can also maintain a good and long relationship with their busy past customer and allow the suppliers to analyse the information existing in the social media platform to adjust their service based on the changing demand (Wang, Nicolau 2017).

Anyway, the social media's role can be a double-edge sword for tourism; it can be an aid and threat if something went wrong with several tourists; thus, suppliers need to stay transparent with their services by providing accurate and timely information without exaggerating or increase the value of their service to keep their competitive advantage (Sharma et al. 2017). The tourists' decisions are primarily based on emotional and irrational factors such as word of mouth, which are the comments and shares on medial social platforms (Chatzigeorgiou 2017). However, social media has also allowed suppliers to handle the spread of negative word of mouth by responding to the complaints, giving

an emotional touch to customers' value and suppliers' care to their opinions (Sharma et al. 2017).

Social media is considered a great marketing tool for companies; it allows them to conduct mass promotions in the increasing usage media lifestyle, cheaper, and more efficient, targeting a specific range of customers (Bethapudi 2013). On the other side, social media is a crucial tool to help tourists decide their new destinations, tourists nowadays do not trust advertisement that promotes for the attributes and specialities of the destination, but they are searching for something has a personal touch, communicative, and creative messages that include the downsides of each option (Sharma et al. 2017).

Two-sided platforms in tourism

Sharing economy has been accelerated by three market forces: economic, social, and technological. The densification of people has created a wide range of options from both sides, demand and supply; the growing awareness of environmental issue pushed the people to share more and consume less; in addition to that, people tend to communicate and interact with each other. While the rise of social media, smart phones, online payment systems, and the need to find trusted, reliable sources of information is the situation with the reviews and rating system (May, Königsson 2016). All these factors have been pushing the two-sided platform to be created and to meet the market demand.

One of the peer-to-peer accommodation styles is Airbnb, the most successful accommodation platform; it connects the people who have spare (hosts) with people looking for a place to stay (guests). Low costs are the main competitive advantage of Airbnb, but also the scattered apartments could offer varieties of options that can respond to the changing demand more flexibility (Guttentag 2015).

Pricing in hotels is one of the most critical decisions; there are different strategies for determining hotels prices, such as:

- Cost-based pricing: the costs of the hotels determine the price.
- Competition-driven pricing: the price is determined by competition, assuming that
- Competitors know the price and value of competing products.
- Customer-driven pricing: prices are determined by customer perceptions of the value of goods and services.
- Hedonic pricing.

Rating is also one of the main essential factors of pricing.

The role of ICT in rural tourism

It is hard to define what rural tourism is precise. That is because of the difficulty of defining what is rural in Europe (Nordregio 2013) and the variety of activities done in rural areas by the tourists. However, OECD has defined rural as the spatial concept, and it is not restricted to Particular use of land, degree of economic health, or economic sector (Eruera 2008). So far, we can say rural areas are far from urban areas and specialised in their natural environment. World Tourism Organization has defined rural tourism as an activity in which people travel and stay temporarily outside their place of residence in rural areas for a consecutive period of less than one year. More than 24 hours for pleasures, business, or others – using the exact usual tourism definition but only narrowing it to rural areas. Rural tourism can consist of agritourism, nature tourism, ecotourism, hunting, fishing, sightseeing, visiting historical places, festivals, and gastronomy (Eugenio Cejudo 2020).

Table 1. Rural tourism activities

Associated with	Leisure tourism	Accommodation	Attractions
Farm Tourism	Touring	B&B	Retail Outlets
Agritourism	Water related activities	Apartments	Vineyard / Wineries
Nature Tourism	Aerial activities on dry land	Rural hotels	Gardens
Ecotourism	Discovery–type activities	Guest houses	Heritage products
Leisure tourism	Cultural activities	Camping grounds	Cultural products
	Health-related activities	Second homes	
		Farm stays	
		Home stays	

Source: Eruera (2008)

Rural tourism started as a response to the urbanisation transformation in Europe in the 1960s when the residents of rural areas began to emigrate to the big cities, searching for higher incomes or better education. Because of the urban lifestyle, cities residents started to feel the need to go out from their towns and go back to the rural areas to enjoy their vacation from the stressful life in cities (Eugenio Cejudo 2020).

Because of the steady decrease in the labour in agriculture, governments realised that it is necessary to support the rural areas by programs trying to improve the quality of life in rural areas and enhance the ability to increase labour in more economically diverse business. Tourism was one of the main activities to enhance since tourism has been recognised as an important factor for rural areas' economic and social development. Still, these programs were affecting only the supply side of rural tourism without creating an actual increase in the demand side, and here comes the role of the necessity of information

in the tourism industry, which has evolved with the development of the Information and Communication Technologies (ICT), by creating a new digital marketplace with new opportunities and possibilities raising the level of competitiveness between companies working in the industry sector. Moreover, ICT has facilitated the locals' chance to reach the global market, giving the market a broader opportunity for services and goods to be provided to the tourists and creating a dynamic platform that enables the users to be more creative and attractive tourists.

Research methodology

The study determines the reaction of ICT indicators on tourism performance in Europe. Based on this concept, several studies have been carried out. Most of the reviewed literature includes empirical studies from several European countries or one of them. The study's primary aim is to analyse the role of ICT indicators on the demand side of tourism, which is nights spent here, from 2012 to 2019.

As the first step in this study, the annual data available on Eurostat has been analysed by multi regression analysis utilised on panel data with the variables of ICT indicators.

The methodology runs a multi regression analysis on nights spent as a dependable independent variable, ICT indicators in a multi regression analysis to determine the effect of each set of indicators on tourism. But since there is a strong correlation between the independent variables, a multicollinear problem appears in the regression analysis. Therefore, a stepwise regression has been run.

All data has been retrieved from Eurostat for each European country from 2012 until 2019 as follows:

Table 2. ICT indicators of the European Union

Descriptive Statistics	N	Mean	Std. Deviation
Nights spent at tourist accommodation establishments in the rural area	218	33160273	45757662
Individuals who used the Internet, frequency of use and activities once a week	222	77.15	12.11
Individuals who used the Internet, frequency of use and activities daily	222	68.29	13.972
Individuals who used the Internet, frequency of use and activities participation in social media	194	54.84	11.705
Individuals who used the Internet, frequency of use and activities Internet Banking	222	50.07	24.022
Individuals who used the Internet, frequency of use and activities selling goods or services	221	15.66	9.482
Individuals who used the Internet, frequency of use and activities last internet use in last 3 months	222	79.75	11.68
Individuals who used the Internet, frequency of use and activities the last 12 months	222	81.11	10.978
Individuals who used the Internet, frequency of use and activities never	222	16.77	10.331
Individuals who accessed the Internet away from home or work	218	57.07	19.171
Households with access to the Internet at home	222	81.23	10.571
Individuals who used the Internet for interaction with public authorities	222	51.65	19.926
Households with broadband access	221	78.99	10.475
Individuals who ordered goods or services over the Internet for private use last online purchase 3 months	222	37.55	17.725
Individuals who ordered goods or services over the Internet for private use last online purchase between 3 and 12 months	222	10.7	3.826
Individuals who ordered goods or services over the Internet for private use last online purchase in 12 months	222	48.27	19.681
Individuals who ordered goods or services over the Internet for private use last online purchase more than a year	222	6.82	2.652
Individuals who ordered goods or services over the Internet for private use more than a year ago or never	222	34	11.03
Individuals who ordered goods or services over the Internet for private use online purchase travel and holiday accommodation	222	25.35	17.267
Individuals who ordered goods or services over the Internet for private use online purchase from sellers from other EU countries	222	22.25	14.703

A correlation test was run, resulting in the following table showing the moderate correlation between the nights spent at tourist accommodation establishments in rural area variable and the rest of the variables:

Table 3. Correlation Matrix

Spearman's rho	LNS
Individuals who used the Internet, frequency of use and activities once a week	.224**
Individuals who used the Internet, frequency of use and activities daily	.242**
Individuals who used the Internet, frequency of use and activities selling goods or services	.190**
Individuals who used the Internet, frequency of use and activities last internet use in last 3 months	.240**
Individuals who used the Internet, frequency of use and activities the last 12 months	.223**
Individuals who used the Internet, frequency of use and activities never	-.214**
Individuals who accessed the Internet away from home or work	.264**
Households with access to the Internet at home	.245**
Individuals who used the Internet for interaction with public authorities	.263**
Households with broadband access	.217**
Individuals who ordered goods or services over the Internet for private use last online purchase 3 months	.260**
Individuals who ordered goods or services over the Internet for private use last online purchase in 12 months	.238**
Individuals who ordered goods or services over the Internet for private use last online purchase more than a year	-.294**
Individuals who ordered goods or services over the Internet for private use more than a year ago or never	-.241**
Individuals who ordered goods or services over the Internet for private use online purchase travel and holiday accommodation	.331**
Individuals who ordered goods or services over the Internet for private use online purchase from sellers from other EU countries	.265**

And after that to run regression analysis with the stepwise method to avoid the multicollinearity problem resulting in the following tables:

Table 4. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.323[a]	.104	.100	.92769	
2	.362[b]	.131	.122	.91600	1.761

The stepwise regression analysis will result as follows:

Table 5. Stepwise regression analysis

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-0.627	0.235		-2.673	0.008		
	$IOGS_{EU}$	0.392	0.079	0.323	4.940	0.000	1.000	1.000
2	(Constant)	0.391	0.464		0.841	0.401		
	$IOGS_{EU}$	0.324	0.083	0.266	3.901	0	0.893	1.120
	$IOGS_{>y}$	-0.445	0.176	0-.173	-2.529	0.012	0.893	1.120

From this table, we can formulate the following equation:

Equation 1: Guest Night spent at rural places

$$NS = 0.324\ IOGS_{EU} - 0.445\ IOGS_{>y} + 0.391$$

Where (NS) Nights spent by tourists at rural areas, ($IOGS_{EU}$) Individuals who ordered goods or services over the Internet for private use online purchase from sellers from other EU countries, ($IOGS_{>y}$) Individuals who ordered goods or services over the Internet for private use last online purchase more than a year.

And to compare the effect of ICT indicators on tourist's night spent in rural areas with the impact of ICT indicators on tourist nights spent in all areas, we will repeat the same process. Still, this time with tourist's night spent in all areas, we will compare the results.

We will start with the correlation matrix as per the following table:

Table 6. Correlation Matrix

Correlation matrix	
Nights spent at tourist accommodation establishments in all areas	1.000
Individuals who used the Internet, frequency of use and activities once a week	.138*
Individuals who used the Internet, frequency of use and activities daily	.218**
Individuals who used the Internet, frequency of use and activities participation in social media	.075
Individuals who used the Internet, frequency of use and activities Internet Banking	.033
Individuals who used the Internet, frequency of use and activities selling goods or services	.155*
Individuals who used the Internet, frequency of use and activities last internet use in last 3 months	.139*
Individuals who used the Internet, frequency of use and activities the last 12 months	.104
Individuals who used the Internet, frequency of use and activities never	-.068
Individuals who accessed the Internet away from home or work	.286**
Households with access to the Internet at home	.188**
Individuals who used the Internet for interaction with public authorities	.141*
Households with broadband access	.226**
Individuals who ordered goods or services over the Internet for private use last online purchase 3 months	.212**
Individuals who ordered goods or services over the Internet for private use last online purchase between 3 and 12 months	-.210**
Individuals who ordered goods or services over the Internet for private use last online purchase in 12 months	.149*
Individuals who ordered goods or services over the Internet for private use last online purchase more than a year	-.472**
Individuals who ordered goods or services over the Internet for private use more than a year ago or never	-.196**
Individuals who ordered goods or services over the Internet for private use online purchase travel and holiday accommodation	.313**
Individuals who ordered goods or services over the Internet for private use online purchase from sellers from other EU countries	.395**

And then, a stepwise regression analysis will be run to avoid the multicollinearity as the following table:

Table 7. Model Summary

t	R	R Square	Adjusted R Square	Std. Error of the Estimate	Sig. F Change	Durbin-Watson
1	.506a	.256	.253	.61973	.000	
2	.594b	.353	.347	.57929	.000	
3	.631c	.398	.389	.56027	.000	
4	.642d	.412	.401	.55504	.028	
5	.655e	.429	.415	.54831	.014	1.560

And the stepwise regression analysis is as follows:

Table 8. Stepwise regression

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
5	(Constant)	-.830	0.820		-1.012	0.313		
	$IOGS_{EU}$	0.427	0.075	0.482	5.686	0	0.388	2.578
	$IOGS_{1y}$	-0.623	0.128	-0.328	-4.858	0	0.612	1.635
	$IOGS_{0l}$	0.523	0.144	0.268	3.626	0	0.511	1.956
	IAI_{hw}	0.348	0.140	0.207	2.494	0.013	0.403	2.482
	$IOGS_{3m12}$	-0.329	0.133	-0.175	-2.467	0.014	0.555	1.801

Resulting in the following equation:

Equation 2: Night spent in all areas

$$NST = 0.427\ IOGSI_{EU} - 0.623\ IOGSI_{1Y} + 0.523\ IOGSI_{0} + 0.348\ IAI_{HW} - 0.326\ IOGSI_{3m12} - 0.830$$

Where $IOGS_{EU}$ Individuals who ordered goods or services over the Internet for private use online purchase from sellers from other EU countries, $IOGS_{1y}$ Individuals who ordered goods or services over the Internet for private use last online purchase in 12 months, $IOGS_{0l}$ Individuals who ordered goods or services over the Internet for private use more than a year ago or never, IAI_{hw} Individuals who accessed the Internet away from home or work, $IOGS_{3m12}$ individuals who ordered goods or services over the Internet for private use last online purchase between 3 and 12 months.

Findings and conclusion

As we can notice, the ICT indicators are more correlated with the tourist's night spent in rural areas than the tourist's night spent in all areas, which means that the ICT usage development is correlated more with attracting tourists to stay longer in rural than all areas.

The higher nights spent at tourist accommodation establishments in the rural area is associated with higher ICT indicators. Especially positive relationship with Individuals who ordered goods or services over the Internet for private use online purchase from sellers from other EU countries, travel and holiday accommodation. And a negative relationship with Individuals who ordered goods or services over the Internet for private use last online purchase more than a year.

Due to the huge diversity of rural areas in Europe, rural tourism is a complex activity, and it needs more data and more statistics focusing on further analysis. Depending on the available data, ICT is an essential factor for rural tourism, as mentioned before in the previous literature. Still, there is an excellent opportunity to foster rural tourism using the many ICT tools, such as developing the ICT skills of rural area residents.

References

Ashworth, G., Page, S. (2011): Urban tourism research: Recent progress and current paradoxes. *Tourism Management*, 1., 1–15.

Bethapudi, A. (2013): The role of ICT in tourism industry. *Journal of Applied Economics and Business*, 4., 67–79.

Chatzigeorgiou, C. (2017): Modelling the impact of social media influencers on behavioural intentions of millennials: The case of tourism in rural areas in Greece. *Journal of Tourism, Heritage & Services Marketing*, 2., 25–29.

Eruera, A. (2008): *Rural tourism development in the eastern Hokianga area*. Thesis, Auckland University of Technology, Auckland

Eugenio Cejudo, F. (2020): *Neoendogenous development in European rural areas: Results and lessons*. Springer, Cham

European Commission (2004): *The European e-Business Report: A portrait of e-business in ten sectors of the EU economy* (11th May 2010). URL: http://www.ebusiness-watch.org/key_reports/documents/EBR04.pdf

Eurostat (2018): *Power from statistics: Data, information and knowledge* (Guidance report). URL: https://ec.europa.eu/eurostat/documents/7870049/9126667/KS-FT-18-006-EN-N.pdf

Guttentag, D. (2015): Airbnb: Disruptive innovation and the rise of an informal tourism accommodation sector. *Current Issues in Tourism*, 12., 1192–1217.

Lee, J., Brahmasrene, T. (2013): Investigating the influence of tourism on economic growth and carbon emissions: Evidence from panel analysis of the European Union. *Tourism Management*, 38., 69–76.

May, S., Königsson, M. (2016): *Digital density and the sharing economy: A case study on the barriers and opportunities of digital sharing economy activities within Umeå*. Department of Informatics, Umeå University, Umeå

Nordregio (2013): *Small-scale tourism in rural areas: Trends and research in the Nordic countries*. URL: https://nordregio.org/publications/small-scale-tourism-in-rural-areas/

Sharma, P., Kumar, R., Rani, A. (2017): Social media in tourism: A double-edged sword. *International Journal of Trend in Scientific Research and Development*, 1., 1270–1275.

Wang, D., Nicolau, J. (2017): Price determinants of sharing economy based accommodation rental: A study of listings from 33 cities on Airbnb.com. *International Journal of Hospitality Management*, 62., 120–131.

World Tourism Organization (2020): UNWTO world tourism barometer and statistical annex (May 2020). *UNWTO World Tourism Barometer* (Vol. 18, Issue 2).

DIGITAL VILLAGE PROGRAMME AND FURTHER SMART OPPORTUNITIES IN THE 2021–2027 TIMEFRAME

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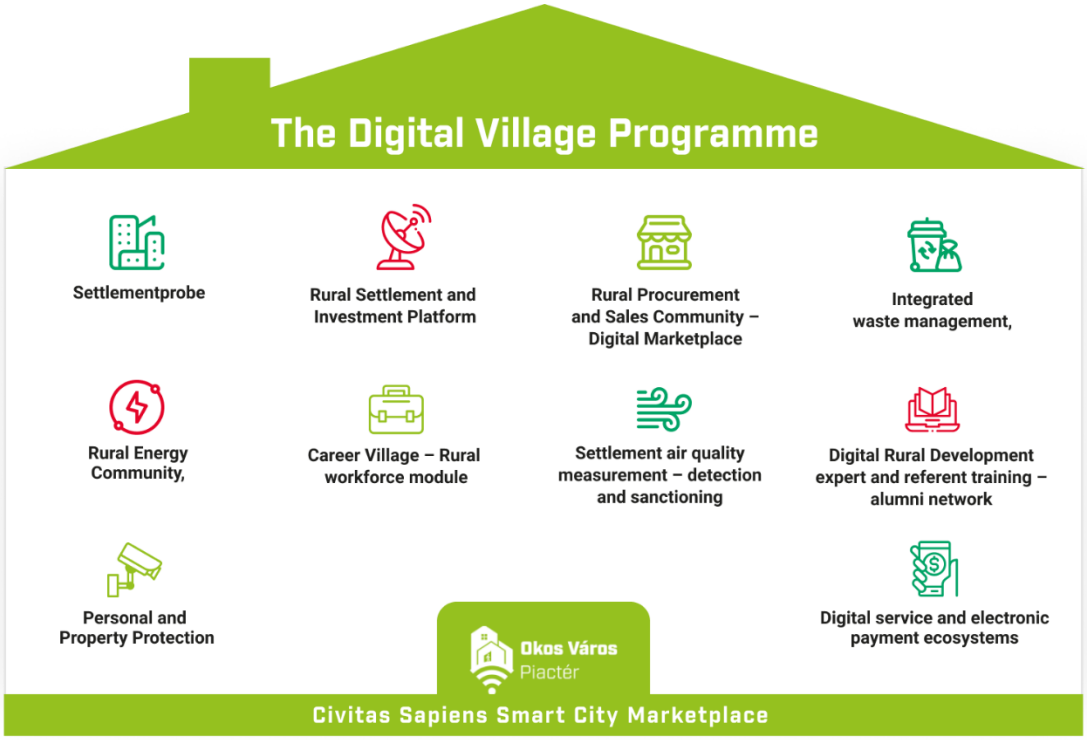
Cities and villages all around the world are facing different challenges, to which in many cases the use of smart practices can be the solution. The definition for smart cities in this age means the creation of cities that are sustainable, comfortable for the inhabitants and that are built to be in harmony with nature, which at the same time facilitate economic growth. Smart solutions that make life easier, more liveable, and safer for the inhabitants should be included in the everyday life of settlements. The Digital Success Programme wishes to aid the professional work of municipalities through the actions of the Civitas Sapiens Smart City Knowledge Centre for successful urban development, ensured access to and effective implementation of smart technologies.

For the healthy urban development of Hungary, it is outstandingly important to create a sustainable, high quality rural way of life, therefore the Hungarian Village Programme will continue in the following year. In addition, in cooperation with the Digital Success Programme it is necessary to launch the Digital Village Programme, which aims to increase the appeal and liveability of small settlements using digital and smart solutions. The goal of the "smart villages" initiative of the European Parliament and the European Commission is to revitalise European villages through the improvement of living conditions, mainly focusing on the younger generations by providing internet connection, quality education, developed healthcare services, good transportation, and substantive workplaces. Based on the Commission's decision, the "smart village" initiative was included in the Common Agricultural Policy (hereinafter: CAP) Strategy plan's compulsory acts, made for the 2021–2027 budgetary period on national level for the usage of rural developmental EU resources. In the CAP Strategy the plans that support local and regional "smart village" developments are included as compulsory indicators. The Digital Village Programme – in accordance with the ENRD (European Network for Rural Development) methodology and the expectations of the CAP Strategy – ensures the successful implementation of tasks and indicators in the CAP Strategy target system as the "smart village" initiative of Hungary.



The aim of the Digital Village Programme is to further increase the appeal of Hungarian villages and the standard of living of the inhabitants using smart and digital solutions, as well as to strengthen the traditional advantages of rural life, while simultaneously increasing the comfort of living in rural areas. The Digital Village Programme wants to make Hungarian micro-regions more appealing through the afore mentioned actions for those living in rural areas, and those who would like to settle in these regions. The elements of the Digital Village Programme include concrete products and services that can effectively combat the challenges faced in rural areas. Almost all elements of the Digital Villages Programme, created for developing opportunities of community participation, offer opportunities for multi-directional communication, for strengthening community relationships, contributing to the conscious decision-making of the population.

From the above-described actions of the Smart Village Programme, the Settlementprobe and the Digital Rural Development rapporteur training are immediately available services, furthermore the Smart City Marketplace is under development. We will discuss the Marketplace in depth in the following sections.

The Settlementprobe

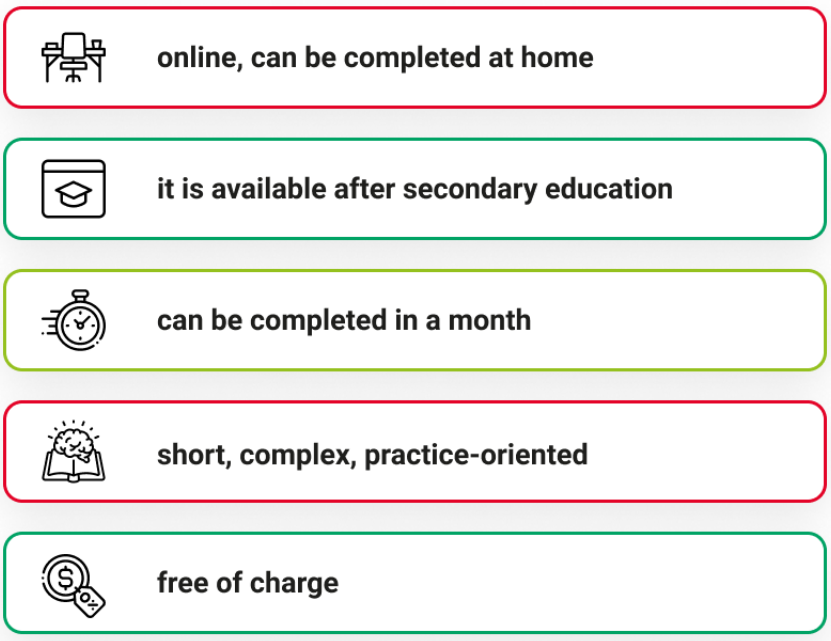
The application of innovative and digital solutions is also a part of the development of settlements, that are the direct living spaces of inhabitants – from cities to small villages. The operation of settlements, ensuring public services and the creation of far-reaching strategies all demand a complex, horizontal approach. The effects of digital innovation – immediate access to information and analysis opportunities, connecting to networks, IoT, data asset management etc. – create never before imaginable opportunities, such as dynamic service management, efficiency gains or data-based decision-making. The development of smart cities is based on the cooperation of governmental, municipal, economic, scientific, civil, and local stakeholders. The road to becoming a smart settlement requires a personalised programme in every case, and in line with technical development it comes with constant correction and monitoring. The aim of the Settlementprobe is to reflect upon the needs of the local community and voice proposals that can make the service management of the settlement or region more efficient, including environmentally and economically sustainable public transport, healthcare and social services, waste management, energy production or the management of services based on local resources and tradition. The result of a collaborative research is an action plan for municipal and governmental decision makers with technical content, reflecting on the concrete local needs, considering trends and problems awaiting solution. An important element of the Settlementprobe is the stakeholder analysis and the empirical study of preferences, the survey of user aspects, the study of the condition of digitalisation which was further put into focus with the effects of the pandemic and the creation of a problem-map considering environmental and economic sustainability. The study, which is the settlement level dimension of community planning is primarily based on citizen participation.

Digital Rural Development Rapporteur training, Alumni Network

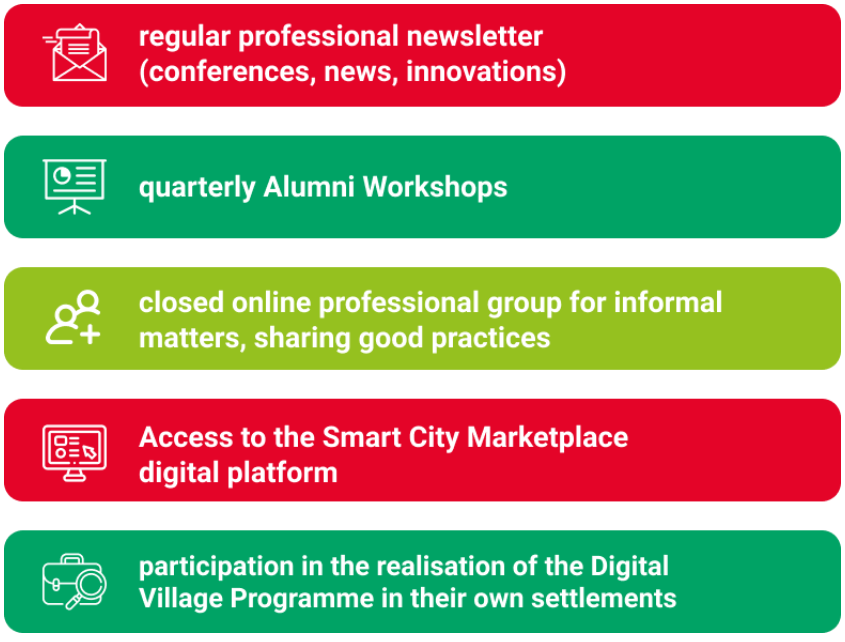
We must pay special attention to the preparation of human resources. The goal is the vocational training of local settlement leaders and developmental experts. The rural extension of the digital rural development expert postgraduate course and the systematic realisation of the digital rural development rapporteur webinar both contribute to the possibility that the participants will later implement innovative ICT solution in their own settlement adding to their development, digital infrastructure, innovative services and increase economic effectiveness. The digital rural development rapporteur course is carried out in cooperation with the University of Public Service and Edutus University. The long-term goal of the digital rural development rapporteur course is to have an expert in every settlement, who has previously completed the course, and can with their obtained knowledge support the “smart village” movement. The rapporteurs, who

successfully completed the course can act as decision makers or experts in managing smart city development. To ensure, that the obtained knowledge does not fade over time, and that the rapporteurs stay up to date with relevant information, we created the Alumni Network. The rapporteurs and experts who join the Alumni Network get a complex package of services for themselves and their settlements.

Digital rural development



Alumni service package



The Smart City Marketplace

The building of infrastructures and services aimed to bring forth smart city solutions are a combined effort of local governments and private companies that provide, develop and work to integrate products and services. To provide help and a safe environment for this cooperation, the Digital Success Programme, Civitas Sapiens Smart City Knowledge Centre created the government quality assured Smart City Marketplace, a platform where potential buyers, suppliers, and developers of smart city products, the local governments, government funded organisations, and their background institutions, can meet, converse, and build connections.

In our view, our existing services, and those that are still in development, are indeed a useful tool for villages to catch up in development, furthermore a great way to map and satisfy needs that are tailored to the locally unique prerequisites to a given area.

For more information, contact us using the information provided below.

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INDIVIDUAL HEAT PUMPS AS AN OPPORTUNITY FOR SMART AND SUSTAINABLE HEATING IN RURAL COMMUNITIES

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ABSTRACT
Heating-related air pollution is a problem faced by settlements in northern Hungary and other rural communities in Europe. High energy consumption and inadequate heating sources are in the centre of this complex issue. This paper investigates the effects of implementing individual heat pumps in combination with energy efficiency measures on providing clean and sufficient heating. This technology is the choice due to the possibility of creating flexibility in electricity consumption, particularly if a hot water storage tank is available. Field surveys were the data sources for a bottom-up model of the residential heating sector. Moreover, two scenarios project the energy demand in the year 2040. Results show that a combination of measures could result in primary energy savings in the order of 52-54%. The theoretical electricity demand flexibility is estimated at 0.8-1.2 kW_p per dwelling.

KEYWORDS
energy; heat pump; sustainable heating; smart heating; demand management

Introduction

Residential heating and air pollution are connected problems in the Bükkalja region in northern Hungary. Lignite and even domestic waste are examples of harmful resources that some residents of these communities need to appeal to keep their houses warm. This problem is referred to in the literature as energy poverty (Thomson, Snell, Bouzarovski 2017), and can be described as an issue of fuel affordability and high heating energy consumption of buildings.

There are some possibilities to improve local air quality and provide sufficient heating to residents in energy poverty with a focus on environmental sustainability. One possibility is to develop renewable-based district heating systems that can provide domestic heating by harvesting geothermal, solar or biomass resources (Möller et al. 2019). There are successful examples of such developments and significant potential in other areas (Soltero et al. 2018; Tian et al. 2019). Another alternative is to equip the houses with individual heat pump systems (Kaczmarczyk et al. 2020; Möller et al. 2019). HPs utilise electricity and ambient heat (from ground, water or outdoor air) to provide space heating and domestic hot water (DHW). It is essential to associate any of these alternatives with the improvement of the building envelope insulation to eliminate the need for inappropriate materials as heating sources. Moreover, from a social and environmental perspective, it is also crucial to stop burning materials that harm human health by polluting both indoor and outdoor air (Guerreiro et al. 2018).

The purpose of the paper is to quantify the effects of individual heat pumps and building efficiency improvements as an alternative to energy issues in these communities suggesting a type of action plan. This alternative is the choice because of the possibility to take the benefits one step further in the context of sustainable energy. Besides the lower electricity consumption of heat pumps, this technology could potentially offer flexibility in electricity demand, a valuable asset to systems based on weather-dependent sources, namely solar and wind (Hedegaard et al. 2012). Flexibility, in this context, means the possibility to move electricity demand from one given moment aiming to match the patterns of intermittent sources, among other purposes (IRENA 2018). This can be achieved by responding to electricity tariffs, for example. Moreover, the total flexibility can be enhanced if hot water storage tanks are available in each household (Arteconi et al. 2013). In this paper, the effects of introducing individual heat pumps systems (equipped with heat storage) and energy retrofit measures (i.e. building insulation) are quantified by two indicators; the savings in primary energy consumption (expressed in GWh/year) and the flexibility potential (expressed in kW).

The first part consists of the residential heat demand estimation through a bottom-up approach and the second part consists of projections of future heat demand in the case of energy retrofits that include individual heat pump systems.

Materials and methods

Extensive field surveys are the main source for estimating the residential heat demand in this study. A database was created from the surveys and complemented by official statistics. The following subsections describe the content of the surveys, the characteristics of the study area and the variables in the calculations.

Field surveys and heat demand estimation

The door-to-door field surveys were carried out between 2015–2019. The heat demand estimation is also based on previous studies of the area carried out by Csontos et al. (2020).

The surveys covered a minimum of 10% of houses in each visited settlement. The interviewers consulted the residents and completed a questionnaire. The results were extrapolated to those houses not visited and validated by interviews with representatives of local authorities. The results of the closest similar settlement are extrapolated to estimate the heat demand of settlements not visited yet in the study.

The field surveys consisted of (a) collecting energy billing data, meaning the type and quantity of utilised sources for residential heating and DHW, (b) building thermal insulation conditions, and (c) type of heating appliance (mainly boilers, stoves, or water heaters).

The average annual heat demand and DHW consumption of one house were calculated by multiplying fuel consumption by the average efficiency of heating devices (APPENDIX).

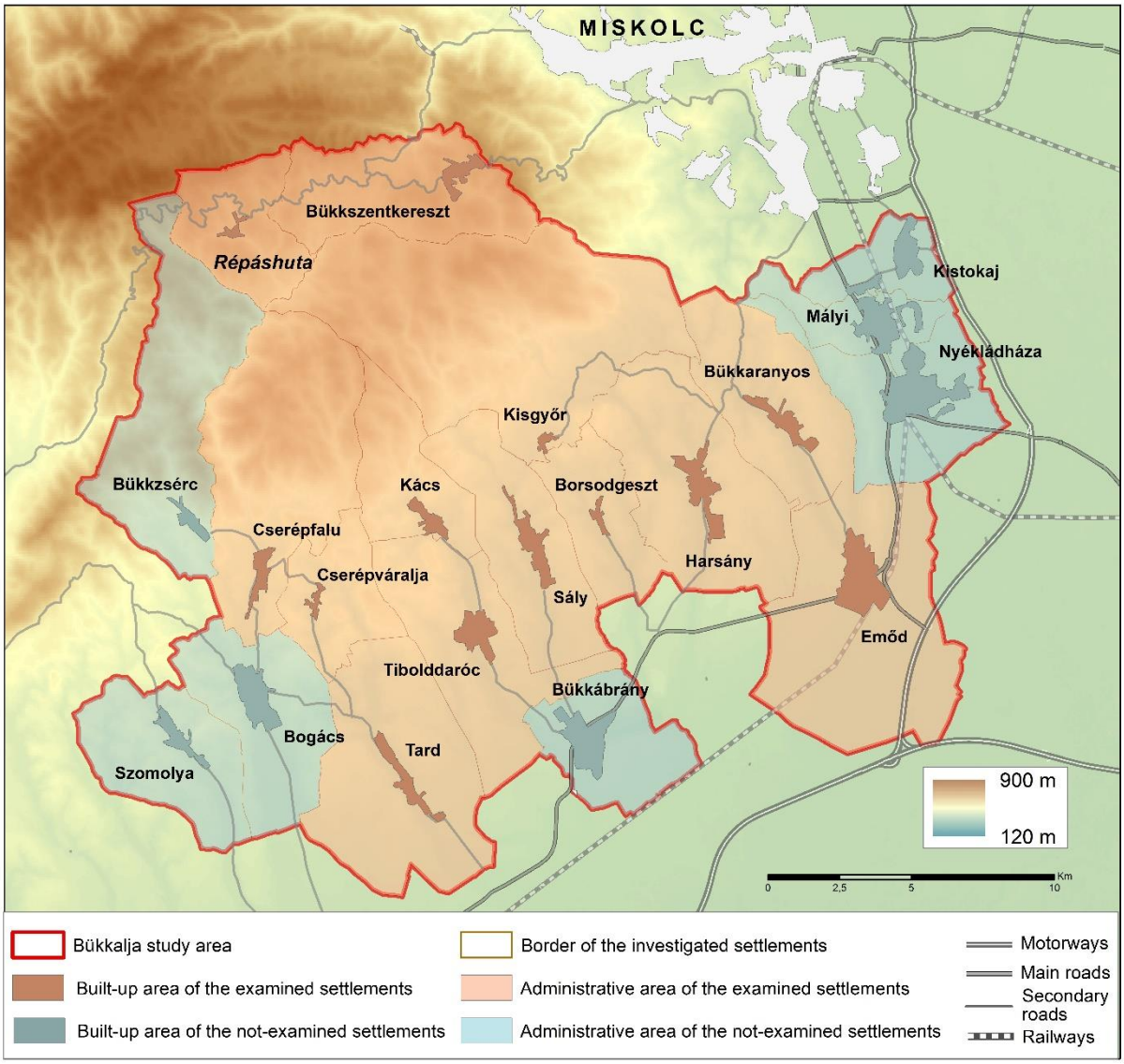
Study area

This paper focuses on 13 settlements with a total of approximately 5840 houses in the Bükkalja region, north-eastern part of Hungary (Figure 1). The focus on this particular region is based on its need for access to sustainable heating. Locally mined lignite is one of the sources for residential heating along with natural gas and firewood. Most of the houses rank low in energy efficiency standards. The GDP/capita of the region is below the national average, making this one of the most deprived in the country (KSH 2018).

Consequently, this region is affected by the energy poverty issue and many residents cannot afford sufficient energy services.

In a previous assessment, Csontos et al. (2020) identified difficulties for possible district heating developments in these particular 13 settlements in comparison to neighbouring settlements in the so-called Bükkalja study area (Figure 1). Therefore, this group of 13 settlements is investigated in detail regarding the effects of installing individual heat pumps.

Figure 1. The Bükkalja study area and the settlements examined in this paper



Energy consumption

The primary energy (PE) consumption can be estimated according to the physical energy content method. In this method, the primary energy form is represented as the first flow in the production process that has a practical use and does not consider the entire supply chain (Esser, Sensfuss 2016; Eurostat 2019).

The PE content of lignite, natural gas and firewood is calculated as the heat value generated during the combustion of these fuels. The PE consumption associated with electricity is calculated by dividing the electricity consumption by the efficiency of the generation process. Nuclear power accounts for approximately 48% of the total electricity generated in Hungary. For simplification, the conversion efficiency of electricity generation is adopted as 33%, which is a typical value for nuclear-based electricity generation (Esser, Sensfuss 2016). The efficiency of the relatively large capacity lignite-fuelled power station nearby is also similar.

The final consumption is the energy from the combustion of fuels (heating value) or the electricity available to the end-user. The values considered in the calculations are in the APPENDIX.

Flexibility potential

The flexibility potential is based on the calculations in Campos et al. (2020), which uses the capacity of the heat pump system and the seasonal coefficient of performance (SCOP). The heat pump's coefficient of performance (COP) is the "ratio of heat exchanged with the indoor environment and the mechanical work supplied to the machine" (Grassi 2017, 4). The SCOP, represents how efficient the heat pump is on an annual basis. The flexibility potential (L_{flex}) is estimated by dividing the capacity of the heat pump system (i_{hp}) by its SCOP (n_p):

$$L_{flex} = i_{hp} \times 1/n_p$$

This capacity represents the possibility to move demand from one hour to the next, or for shorter intervals. The result is a theoretical maximum because the heat pump would have to be operating at nominal capacity and this is not always the case. The thermal comfort during the load shifting periods is guaranteed by a 1 m^3 hot water storage tank (Arteconi et al. 2013). The electricity required to heat the water stored in the tank is the limit per continuous shifting cycle to avoid compromising the thermal comfort of residents. Based on a system's temperature conditions described by Renaldi et al. (2017), it is assumed that ~11.5 kWh_{th} is stored in the tank and 2.3-3.4 kWh_p is required to charge the storage.

Scenario development

The projected number of occupied households in 2040 considered historical data on the population in the last 20 years. The average decline in the area was 10%. The trend was extrapolated according to each settlement.

This demographic trend is part of two scenarios developed to quantify the effects of introducing individual heat pump systems and energy retrofit measures in the area. The end-year of the scenarios is 2040.

Scenario Business-as-usual (BAU) considers that the implementation of energy retrofit measures in the region remains at the current rate of 0.5% of the housing stock per year. Interviews with local authorities in the area provided this estimation. Most frequently, the retrofit measures implemented in the area consist of replacing windows and doors and occasionally wall insulation. We assume that these practices may lead to up to 50% reduction in heating energy consumption in most of the cases.

The alternative scenario named Deep Energy Efficiency (abbreviated to DEE) investigated the effects of increasing the retrofit rate and the extent of the retrofit measures. This scenario calculates the energy requirement in case the retrofit rate is 3.75% per year. This retrofit plan targets households using lignite first. The rate leads to retrofitting ¾ of housing stock by 2040. The retrofit measures comprise external wall insulation, roof insulation and the replacement of door and windows. These practices could result in heating energy savings in the order of 75% (Harvey 2013). In this scenario, individual air-to-water heat pumps (heating power of 4 kW) and low temperature heating replace the existing heating system (i.e. boilers). The SCOP value 3.4 was adopted in the calculations to represent equipment currently available in the market. The calculations were repeated with a SCOP value 5 to consider technologies that could be available in the near future. The heat pump is coupled with a hot water storage tank (1 m3) based on the design presented by Arteconi et al. (2013).

Demographic trends, heat energy consumption estimations and the scenarios were managed using the Low Emissions Analysis Platform (LEAP) (Heaps 2021). LEAP is a scenario-based model that allows users to input characteristics of the energy system in a bottom-up approach. The platform is widely used for analysis of energy demand and to produce environmental reports (Subramanyan et al. 2017).

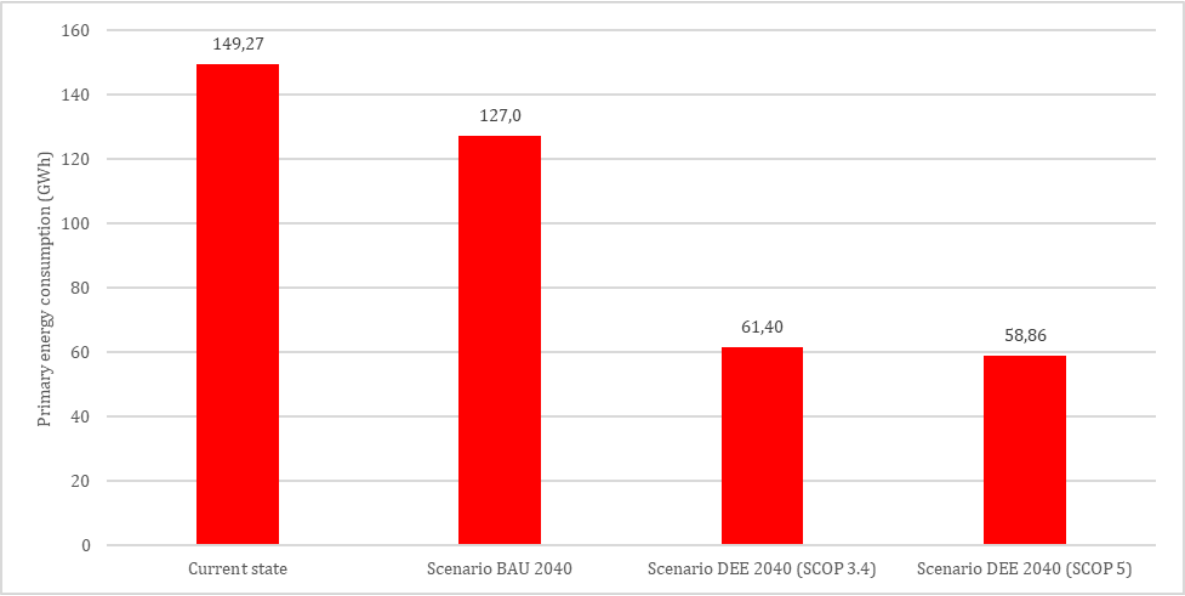
Results and discussion

The field surveys show that natural gas, firewood, and lignite are the sources for residential healing and electricity is common for providing DHW.

The total primary energy consumption for heating and DHW is estimated at approximately 149 GWh per year (Figure 2). In case the population movement trends and the current retrofit rate is maintained in the next two decades, the total primary energy consumption for 2040 is estimated at 127 GWh. This value could be further reduced by 52-54% with the measures described in scenario DEE. The savings could be in the order of 59-61% in comparison to the current situation.

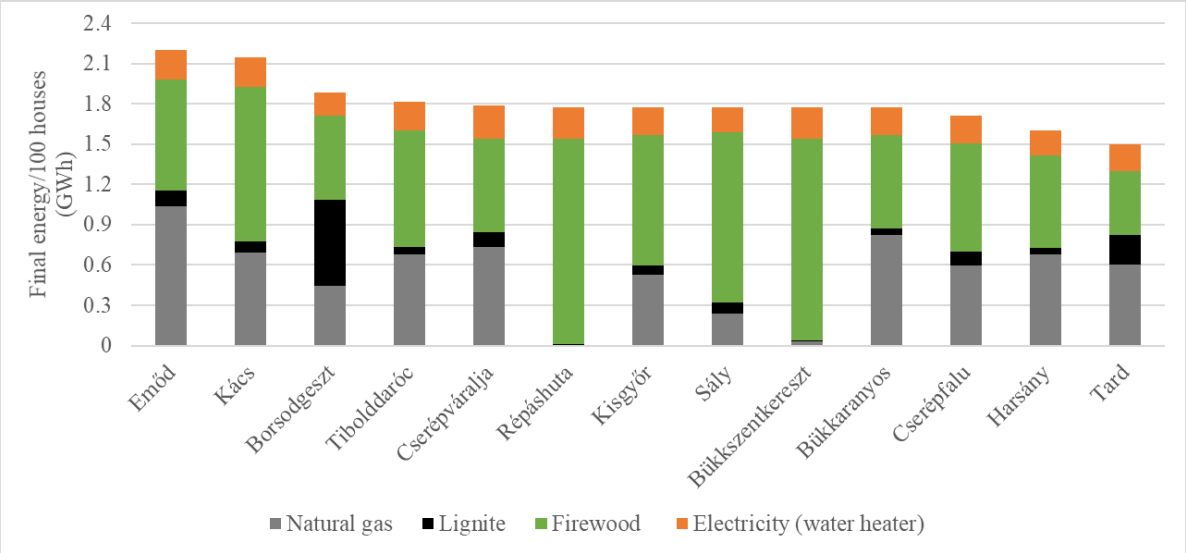
The decreasing population in the region is the main reason behind the difference between the current state and scenario BAU 2040. Scenario BAU and DEE differ due to building insulation which reduces the energy consumption for heating. Scenario DEE with SCOP 3.4 and scenario DEE with SCOP 5 differ because more electricity is required by systems with SCOP 3.4. Even though the amount of useful heat provided by the HP systems with SCOP 3.4 and SCOP 5 would be the same in this scenario, the primary energy increases with the increase in electricity consumption.

Figure 2. Primary energy consumption of the study area



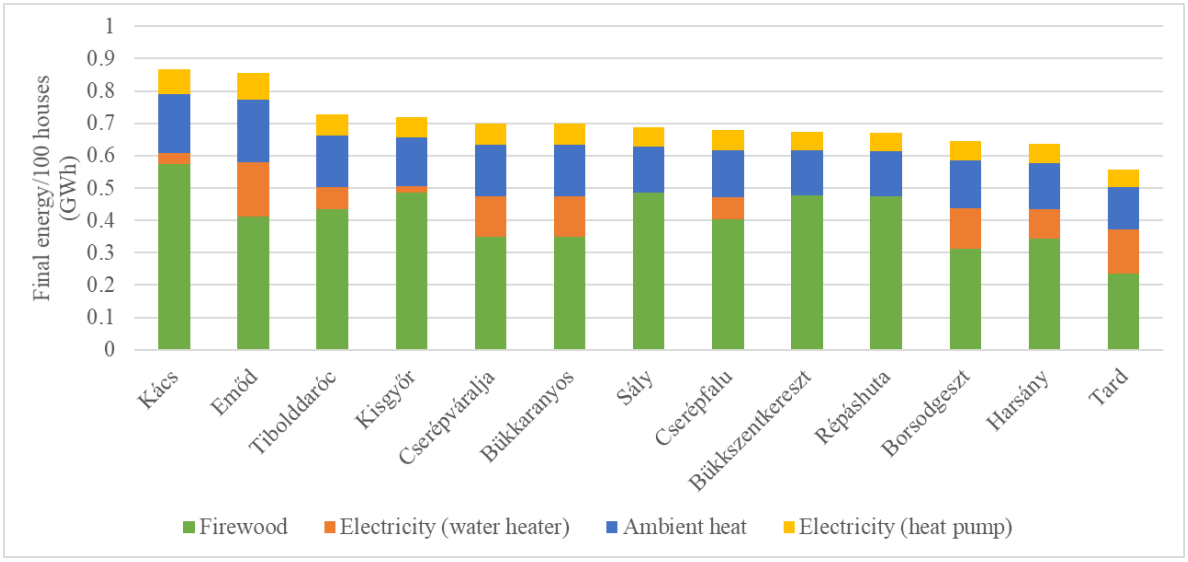
The final energy consumption and the heating energy mix varies in each settlement (Figure 3). The average heated floor area and final energy consumption per dwelling in the 13 settlements is 90 m^2 and 20.8 MWh/year, respectively.

Figure 3. Current state:
Final energy consumption in the settlements composing the study area



Similarly, adopting the retrofit measures described in Scenario DEE would result in both a change in the energy mix and in energy savings. The average final energy consumption of the area would be reduced due to the retrofitted dwellings (Figure 4).

Figure 4. Scenario DEE 2040 (SCOP 3.4):
Final energy consumption in the settlements composing the study area



It should be noted that the electricity consumption would increase in scenario DEE due to heat pump operation. Ambient heat would also be part of the energy mix. This is regarded as a practically “infinite” resource since thermal energy can be transferred from outdoor air to provide useful heat even at relatively low temperatures (i.e. –15 °C).

The estimated electricity consumption of the study area and of one representative dwelling is presented in Table 1. The aggregated flexibility refers to shifting the operation of all heat pumps from a given moment and is treated only as a theoretical potential. The main obstacle is that the demand patterns vary with the consumers' habits, and widespread ICT and smart technologies would be required for managing the flexible load.

Even though there are currently obstacles in accessing flexible loads, this asset could further contribute to reducing PE consumption by integrating weather-dependent electricity generation (Hedegaard et al. 2012).

Table 1. Electricity consumption and flexibility potential in the scenario "Deep Energy Efficiency"

		Seasonal coefficient of performance	
	Scale	3.4	5
Electricity consumption for heating (GWh/year)	Study area	3.9	2.7
Average electricity consumption for heating (kWh/year)	Household	849.2	577.4
Flexibility potential (kW)	Household	1.2	0.8
Aggregated flexibility (MW)	Study area	5.3	3.5

Conclusion and recommendations

Individual heat pump systems (air-to-water type with hot water storage) were investigated as one alternative to improve the current heating energy consumption and potentially the associated social and environmental issues. Based on the results, lignite could be phased out, and the building insulation measures would result in energy savings in the order of 52-54% (in comparison to scenario BAU 2040). Heating-related air pollution could potentially be mitigated since the heat pump system would use electricity, avoiding the need to burn lignite and inappropriate solid materials.

An added benefit of this alternative is the opportunity for demand flexibility. While the individual flexibility potential is relatively low, the aggregated potential is significant. The aggregated flexibility could play a role in the local energy system as well as in the national level if such heat pump systems become more widespread (Gils 2014).

It should be noted that energy poverty is a barrier for retrofit plans in this region and external support is necessary to bring these improvements to most households. Two main suggestions are highlighted: (a) the energy efficiency performance of most dwellings in the region must be improved to avoid the need for excessive amounts of fuel and (b) based on the results, individual heat pumps could provide cleaner heating in settlements that do not have favourable conditions for district heating networks.

References

Arteconi, A., Hewitt, N., Polonara, F. (2013): Domestic demand-side management (DSM): Role of heat pumps and thermal energy storage (TES) systems. *Applied Thermal Engineering*, 51., 155–165.

Campos, J., Csontos, Cs., Harmat, Á., Csüllög, G., Munkácsy, B. (2020): Heat consumption scenarios in the rural residential sector: The potential of heat pump-based demand-side management for sustainable heating. *Energy, Sustainability and Society*, 10., 40

Csontos, Cs., Soha, T., Harmat, Á., Campos, J., Csüllög, G., Munkácsy, B. (2020): Spatial analysis of renewable-based hybrid district heating possibilities in a Hungarian rural area. *International Journal of Sustainable Energy Planning and Management*, 28., 17–36.

Esser, A., Sensfuss, F., Amann, C. (2016): *Final report: Evaluation of primary energy factor calculation options for electricity*. 121.

Eurostat (2019): *Calculation methodologies for the share of renewables in energy consumption*.

Gils, H. (2014): Assessment of the theoretical demand response potential in Europe. *Energy*, 67., 1–18.

Guerreiro, C., González Ortiz, A., Leeuw, F. de, Viana, M., Colette, A. (2018): *Air quality in Europe: 2018 report*. European Environment Agency, Copenhagen

Grassi W. (2017): *Heat pumps: Fundamentals and applications*. Springer, Berlin

Hedegaard, K., Mathiesen, B., Lund, H., Heiselberg, P. (2012): Wind power integration using individual heat pumps: Analysis of different heat storage options. *Energy*, 47., 284–293.

Heaps, C. (2021): *LEAP: The Low Emissions Analysis Platform*. Stockholm Environment Institute, Stockholm

IRENA [International Renewable Energy Agency] (2018): *Power system flexibility for the energy transition, Part 1: Overview for policy makers*.

Kaczmarczyk, M., Sowiżdżał, A., Tomaszewska, B. (2020): Energetic and environmental aspects of individual heat generation for sustainable development at a local scale: A case study from Poland. *Energies*, 13., 454.

KSH (2018): *Statisztikai Tükör: Munkaerőpiaci folyamatok, 2018. I–III. negyedév*. URL: https://www.ksh.hu/docs/hun/xftp/idoszaki/mpf/mpf1809.pdf

Möller, B., Wiechers, E., Persson, U., Grundahl, L., Lund, R. Mathiesen, B. (2019): Heat Roadmap Europe: Towards EU-wide, local heat supply strategies. *Energy*, 177., 554–564.

Renaldi, R., Kiprakis, A., Friedrich, D. (2017): An optimisation framework for thermal energy storage integration in a residential heat pump heating system. *Applied Energy*, 186., 520–529.

Soltero, M., Chacartegui, R., Ortiz, C., Velázquez, R. (2018): Potential of biomass district heating systems in rural areas. *Energy*, 156., 132–143.

Subramanyam, V., Kumar, A., Talaei, A., Mondal, H. (2017): Energy efficiency improvement opportunities and associated greenhouse gas abatement costs for the residential sector. *Energy*, 118., 795–807.

Tian, Z., Zhang, S., Deng, J., Fan, J., Huang, J., Kong, W., Perers, B., Furbo, S. (2019). Large-scale solar district heating plants in Danish smart thermal grid: Developments and recent trends. *Energy Conversion and Management*, 189., 67–80.

Thomson, H., Snell, C., Bouzarovski, S. (2017): Health, well-being and energy poverty in Europe: A comparative study of 32 European countries. *International Journal of Environmental Research and Public Health*, 14., 584.

APPENDIX

Conversion and efficiency factors used in the heat demand estimation according to local conditions:

Fuel type	**Calorific values**	**Units**	**Appliance**	**Efficiency**
Firewood (moisture content 45%)	2.42	MWh/m^3	Wood burning stove	0.55
Natural gas	9.60	kWh/m^3	Boiler	0.75
Lignite	2.44	kWh/kg	Multi-fuel stove	0.45
Electricity	1.00	kWh	Water heater	0.85

VALIDATION OF HOUSEHOLD HEAT DEMAND IN RURAL SETTLEMENTS USING SOFTWARE-BASED HEAT ATLASES

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ABSTRACT
Our energy footprint is determined by the thermal energy demand of our buildings, which is the largest part of our GHG emissions. Rationalising the production and use of thermal energy is therefore key from a climate and urban environmental perspective. However, for rural areas, the thermal energy mix of households is difficult to determine, particularly when firewood or other solid fuels are dominant. Innovative online heat atlases (e.g. HotMaps, PETA) are useful tools for estimating household heat demand. In this paper, field surveys are the source for estimating the residential heat demand in the Bükkalja study area (Hungary) with the results being compared to the heat atlases. The results will contribute to accelerate rural thermal energy planning, to increase the energy efficiency of the building stock and to prepare the ground for the development of small-scale district heating systems based on local renewable energy sources.

KEYWORDS
residential heat demand; heat demand validation; heat atlases; rural heat planning

Introduction

Solving heating-related air pollution of the rural areas, district heating (DH) developments should be considered, but this technology is generally not accounted for in the case of villages and smaller settlements in Eastern Europe. Evaluating the residential heat demand and heat demand density are some of the first steps of planning DH developments. Software-based heat atlases are useful tools in the process because they cover a large territory and provide estimations for areas where no other studies are available. Therefore, heat atlases have been coming to light in order to map and analyse heat supply and demand (Möller, Nielsen 2014). The accuracy of these databases in Denmark was also investigated, confirming that such atlases can support energy planning (Grundahl, Nielsen 2019). One of the newest developments is Hotmaps (Energy Cities 2020), which is an open source heating and cooling mapping and planning toolbox. Hotmaps tool provides default data EU wide at national and local level. Thus, local authorities have an opportunity to identify, analyse, model and map resources and solutions to supply energy needs within their territory. Furthermore, the database could facilitate development of heating and cooling strategies on local, regional and national scale (Energy Cities 2020).

The hypothesis of the research is that residential heat demand estimations based on thorough field surveys can be just as useful or at least provide some new information in the case of rural settlements. Therefore, the following points were investigated: a) The current situation regarding residential heating energy mix and the level of fuel consumption; b) The average Residential Heat Demand (RHD) in the study area; c) The correlation between the outcome of this research work and the latest results of the PETA 4.3 (PETA 2019; Möller et al. 2018) and the Hotmaps project (Energy Cities 2020). Both atlases were used for comparison due to its detailed open database on heat demand which includes the study area.

Materials and methods

The first part of the analysis estimates the residential heat demand in the study area. This calculation and the whole methodology are based on Csontos et al. (2020) and Campos et al. (2020). This step considered a) statistical data on the population and natural gas consumption; b) heating pattern and thermal comfort expectations; c) “actual energy billing data” which means the type, quantity and quality of utilised fuels; and d) building insulation condition and stock of heating appliances. In-depth surveys in the study area collected data on b), c) and d). Official statistics (KSH n.d.) complemented the database created from the surveys. The results for each settlement are compared to the PETA database and the Hotmaps project.

Study area

The study area is composed of 15 villages and 3 small towns in the Bükkalja region, Hungary, situated on the southern side of Bükk Mountain. Specific natural and economic attributes make the subregion coherent from a geographical point of view. The population is around ~31,000 inhabitants in ~11,900 households (Ministry of Interior n.d.).

Socially, this is one of the most deprived regions in the country. The GDP/capita is 60–70% of the national average. Before the COVID-19 crisis the unemployment rate was 42% higher than the Hungarian average (3.6%) and the mean net income was in the lower quartile (KSH 2018). Illegal burning of waste and the usage of outdated heating devices are common in the region, which is highly influenced by energy poverty (Ürge-Vorsatz, Herrero 2012). Due to the geomorphological and climatic circumstances, atmospheric inversion is a frequent winter phenomenon in Bükkalja, which results in the harmful concentration of Particulate Matter (PM) (WWF 2017).

A long-term heat plan is inevitable in the study area and creating a detailed HD-analysis would contribute since this kind of dataset is not available in Hungary on the preferred scale. Basing this research solely on European level databases would not be sufficient because these databases usually consider the industrial and service sector in the total heat demand (HD) estimation. As most of the investigated settlements are economically situated in a peripheral zone, the industrial and service sectors have a negligible share of the heat market. Generally, no significant business units are operating in the area, the only exception is a brick factory in Mályi. Municipal and community buildings were also out of scope.

Heat demand estimation based on field surveys

The door-to-door surveys were the main source for the heat demand estimation. In the survey procedure, the interviewers visited every street of the surveyed settlements and completed a questionnaire for at least 10% of the occupied dwellings. The surveys were carried from 2015 to 2019. The official national database was the source for a first-step validation of the estimations. To eliminate the anomalies of the weather fluctuations, the main air temperature of the period 2013–2017 was considered.

The residential heat demand estimation considered the calorific value of the common fuels in the region and the efficiency of the heating appliances (Table 1). Therefore, the average annual HD of a single household is the product of fuel consumption and the efficiency of the conversion process. Most of the equipment identified in the surveyed households are old and/or low-efficiency gas boilers, firewood burning stoves and multi-

fuel stoves. The efficiency used in the calculations considered the observations made by Csoknyai et al. (2016) regarding the Hungarian residential stock.

The results of the heat demand estimation for each settlement, hereinafter referred to as BÜKK database, is compared to the PETA and HotMaps for validation. In case of significant differences, the possible reasons are discussed.

Table 1. Conversion and efficiency factors used in the BÜKK analysis

Fuel type	*Values*	*Units*	*Appliance*	*Efficiency*
Firewood	2.42	MWh/m^3	wood stove	0.55
Natural gas	9.60	kWh/m^3	boiler	0.75
Lignite	2.44	kWh/kg	multi-fuel stove	0.45
Electricity	1.00	kWh	electric boiler	0.85

Comparison and validation of field and software-based heat demand estimations

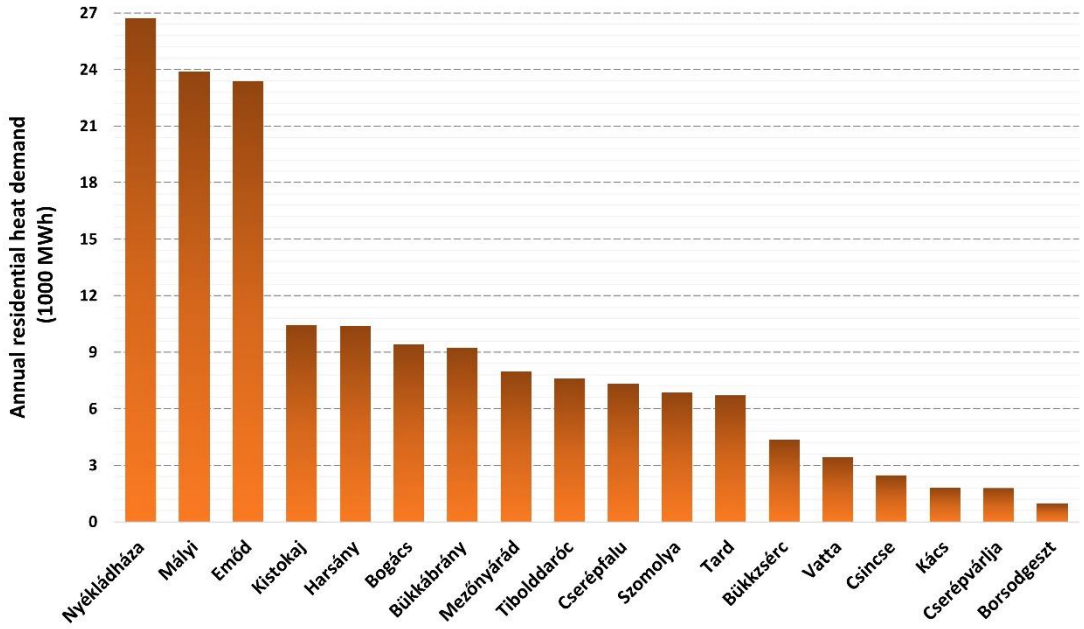
The household heat demand from the field survey was first compared with the PETA database. The PETA estimated heat demand only for the municipality as a whole (including residential, service, production and municipal sectors' heat demand). Thus, empirically, it was concluded that, in addition to residential, other sectors add approximately 25% to the heat demand of the municipalities in the study area. In practice, this means that the values in PETA's database should typically be 25% higher than the values in the BÜKK analysis. In comparison, results differing by +/- 15 pp. For results differing by +/- 25 pp, a slight anomaly was assumed. Only in a few cases, such as the smallest municipalities or communities with a high reliance on solid fuels, larger deviations were detected. This suggests that heat demand estimation based on the PETA software or the field survey-based analysis could be wrong. In such cases further studies are needed to address such problems.

In a second step, the residential heat demand from the field survey was compared with the Hotmaps database - in this case (due to the more sophisticated and accurate database of Hotmaps) it was possible to compare only residential consumption. The validation methodology was the same as described above.

Results

Residential heat demands in the study area

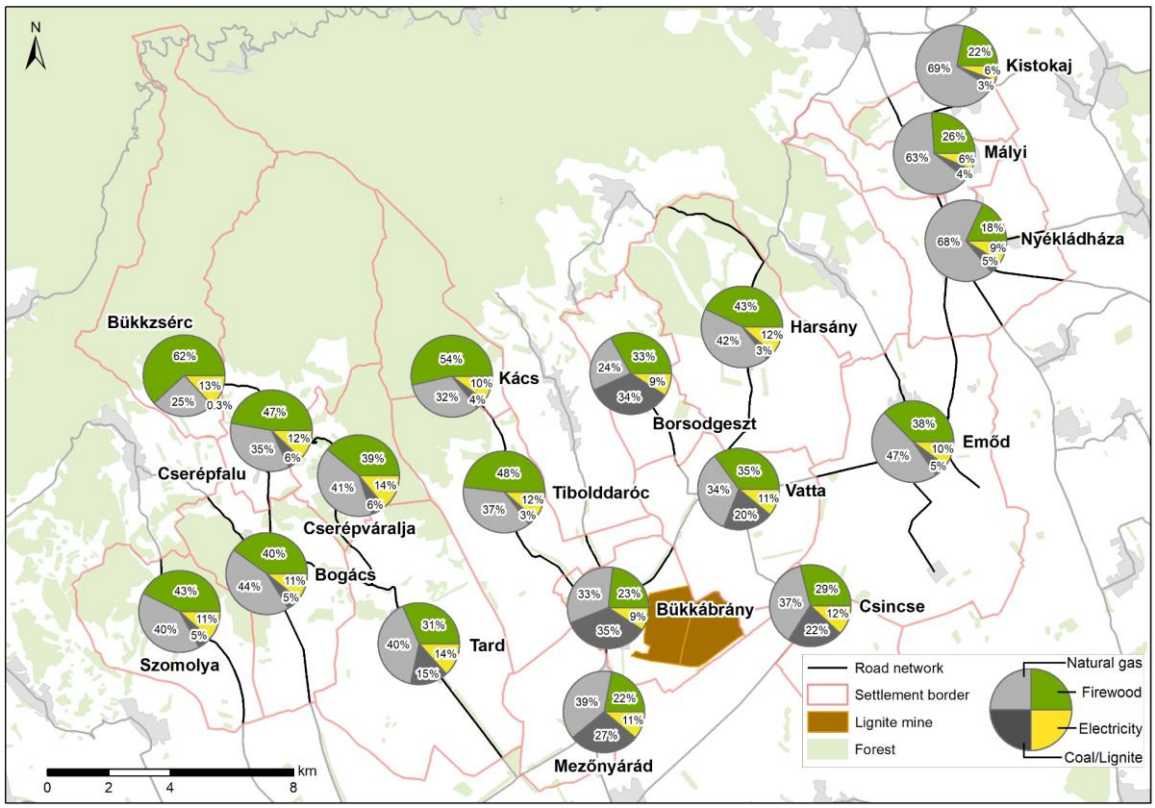
Figure 1. The residential heat demand of the settlements in the study area



According to the field survey, the total residential heat demand is mainly determined by the size of settlements. The values vary between 1,000 and 27,000 MWh/a (Figure 1). The heat demand of the three largest municipalities (small towns) is above 20,000 MWh/a. This means that the total heat demand of the municipalities is 20-25% higher than the average of the area due to the larger population and the more extensive service sector. The residential heat demand of most municipalities is between 5,000 – 10,000 MWh/a. The five smallest municipalities have a heat demand of 5,000 MWh/a. In their case, the household heat demand can account for more than 90% of the total heat demand of the municipalities, as the number of public buildings, service buildings and industrial establishments is negligible. It is important to note that residential heat demand can be influenced by many factors. Weather conditions, for example, can cause 15-20% or even more fluctuation between heating seasons.

Spatial pattern of heating energy mix

Figure 2. Settlements' heating energy mix within the study area



The heating energy mix consists of four sources: firewood, natural gas, electricity and (coal) lignite. For the study area as a whole, natural gas and firewood combustion are the most common, but the heating energy mix is strongly influenced by the natural and socio-economic environment of each municipality (Figure 2).

The dominance of natural gas is clearly visible in the case of municipalities close to the county capital Miskolc. The reason is the agglomeration effect and the higher purchasing power of the population. Therefore, in Kistokaj, Mályi and Nyékládháza, the share of solid fuel is 30% or less while the natural gas usage is over 60%.

In rural and peripheral settlements further away from Miskolc, the share of solid fuel is higher. In villages close to forests (e.g. Bükkzsérc, Kács) firewood consumption is clearly dominant. In these villages, natural gas consumption is low, but the share of solid fuels exceeds 60%, which is in stark contrast to the figures observed in agglomeration villages.

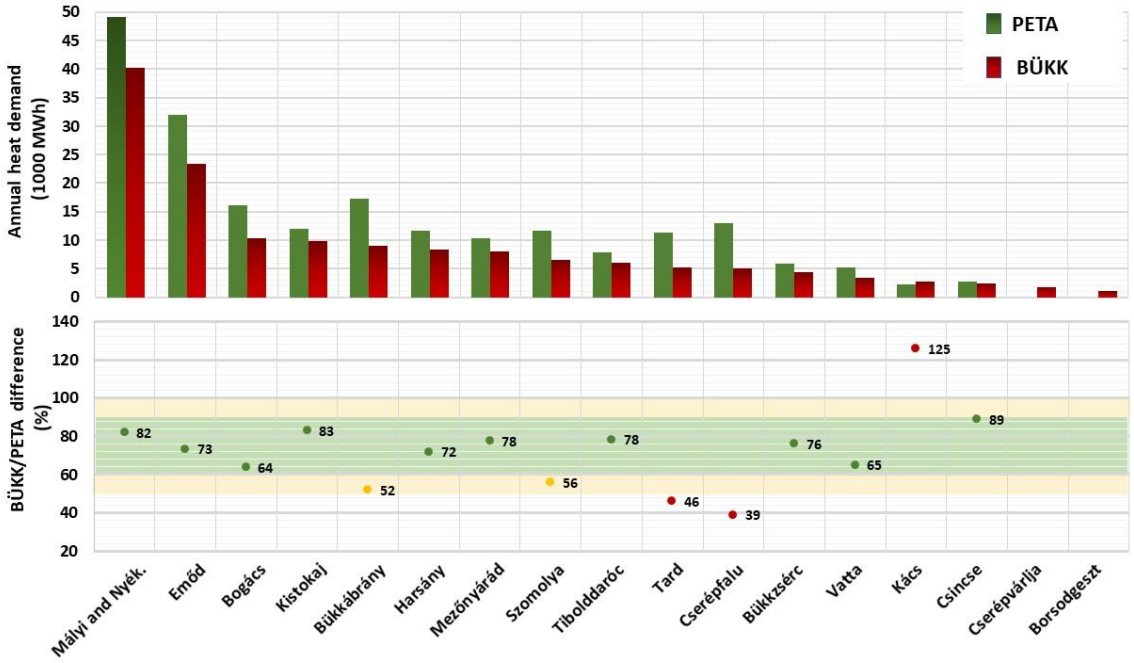
One of the largest open-cast lignite mines in the country is located in the southern part of the study area. Its economic impact is still significant in the heating energy mix of the

surrounding municipalities. Lignite consumption is between 20-35% in the settlements around the mine (Bükkábrány, Mezőnyárád, Csincse, Vatta and Borsodgeszt). The share of lignite in the energy mix of the settlements decreases as the distance from the mine increases (Figure 2).

It is important to note that the share of electricity is closely related to the share of solid fuel. In the study area, electricity is mainly used to produce domestic hot water. The use of electricity for direct heating is still not significant, even though heat pumps and other electric heating alternatives are becoming more widespread. Those households which use firewood or lignite for heating purposes typically use electric boilers to produce domestic hot water. However, natural gas heated homes often use joint systems that can provide room heating and domestic hot water. Therefore, electricity has a lower ratio in heating energy in suburban areas.

PETA – Bükk heat demand comparison

Figure 3. Heat demand comparison of total heat demand estimation of PETA4 database and residential heat demand estimations of BÜKK database



There is an apparent difference between the two value sets, as PETA shows approximately 20-25% higher heat demand consecutively for the settlements. However, this is quite reasonable since the BÜKK research targeted only the residential sector and the public and the industrial sectors were not considered during the investigation. The comparison reveals the following important differences:

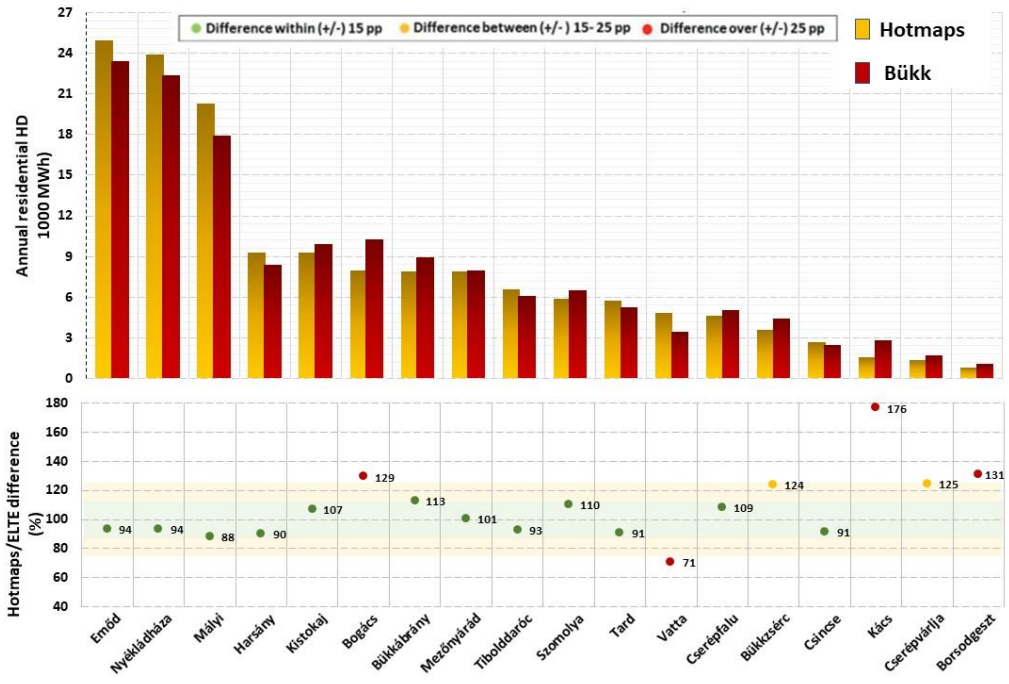
a) In the cases of the three smallest settlements with heat demand values below 2,000 MWh/year, due to methodological reasons PETA does not contain any information.

b) There is one settlement, Kács, where BÜKK results present higher values (Figure 3). This could be partially caused by the error rate (25%) of heat demand calculation from the BÜKK analysis. These differences are significant; therefore, the real total heat demand of these villages should be slightly higher than the values of PETA according to estimation of the present research work.

c) Another remarkable negative deviation was detected in the cases of four settlements (Bükkábrány, Szomolya, Cserépfalu and Tard). However, results regarding BÜKK show that the values of Bükkábrány and Szomolya are 15–25 percentage points (pp) lower. Furthermore, in the events of Cserépfalu and Tard, the differences are more than 25 pp (Figure 3). According to this result, it seems that PETA significantly overestimates the heat demands of these settlements. To confirm this statement, a corroborative calculation was made based on the available non-residential natural gas consumption statistical dataset. The result of the validation confirmed the presumption that the non-residential sector has only a moderate natural gas consumption in this area.

Hotmaps – BÜKK heat demand comparison

Figure 4. Heat demand validation of residential heat demand estimation of HotMaps database and residential heat demand estimations of BÜKK database



In general, the BÜKK database is a much better match to the HotMaps database, since both estimations focused on residential heat demand. Both analyses produced similar results for large municipalities, but for smaller municipalities there were higher discrepancies. similar (Figure 4).

During the comparison of BÜKK's and HotMaps' databases, the value of 100% was the reference. This value means that the field survey-based and the software-based heat demand estimations are in full agreement. 12 out of 18 municipalities' values were within 15 pp to 100%. In most cases, the HotMaps heat demand estimation is roughly equal to the BÜKK database.

In six cases, however, the validation showed a deviation of more than 15 pp. In four out of six of these municipalities, the anomaly exceeded 25 pp. These larger deviations could be partly explained by the fact that the heating energy mix of three municipalities (Kács, Borsodgeszt and Vatta) is dominated by solid fuels. In these cases, solid fuel ratios exceed 55% (Figure 2). In the case of Bogács, the reason behind the discrepancy could be that the village has a popular thermal spa, which has boosted tourism and made the number of non-permanent dwellings (weekend houses) also significantly high. This additional heat demand can cause such an anomaly.

Discussion

The results of the validations suggest that estimations based on field surveys can be a reliable starting point for long term thermal energy planning. This tool combined with heat atlases can greatly speed up the heat energy assessment of municipalities. Based on recent developments, HotMaps' database seems one of the most useful software for rural settlements, as the data series show a small mismatch compared to the field survey. However, it is important to stress that the open-source tools alone are not sufficient for a complete district heating assessment. In all cases, a detailed field survey and additional calculations are needed, which should consider the heating energy mix of the municipality and the energy efficiency of the households.

It should also be highlighted that the heating energy mix can be a key information for local decision-makers in developing energy and climate strategies for municipalities and in addressing local environmental problems such as winter air pollution. In rural areas, the determination of the share of solid fuel can fill the gap, as these data are difficult or impossible to obtain in official statistics.

Conclusion

This research work created a database for residential heat demand in 18 rural settlements using field surveys. The results (referred to as BÜKK results) were compared to the ones from the PETA and Hotmaps project that use software-based estimations. While the comparison to the PETA database revealed several differences, the results of the BÜKK and Hotmaps database were fairly similar. Overall, it can be stated that the BÜKK results are valid for most settlements. In those settlements where the difference is more significant, the database can still be useful for estimating the heating energy mix and the consumption of solid fuels, which are otherwise not present in official statistics.

Acknowledgement

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References

Campos, J., Csontos, Cs., Harmat, Á., Csüllög, G., Munkácsy, B. (2020): Heat consumption scenarios in the rural residential sector: The potential of heat pump-based demand-side management for sustainable heating. *Energy Sustainability and Society*, 10., 40

Csoknyai, T., Hrabovszky-Horváth, S., Georgiev, Z., Jovanovic-Popovic, M., Stankovic, B., Villatoro, O., Szendrő, G. (2016): Building stock characteristics and energy performance of residential buildings in Eastern-European countries. *Energy and Buildings*, 132., 39–52.

Csontos, Cs., Soha, T., Harmat, Á., Campos, J., Csüllög, G., Munkácsy, B. (2020): Spatial analysis of renewable-based hybrid district heating possibilities in a Hungarian rural area. *International Journal of Sustainable Energy Planning and Management*, 28., 17–36.

Energy Cities (2020): *The Hotmaps Toolbox supporting strategic heating & cooling planning at local level*. URL: https://www.hotmaps-project.eu/wp-content/uploads/2020/09/brochure-hotmaps-2020-web.pdf

Grundahl, L., Nielsen, S. (2019): Heat atlas accuracy compared to metered data. *International Journal of Sustainable Energy Planning and Management*, 23., 3–13.

KSH (n.d.): URL: https://statinfo.ksh.hu/Statinfo/index.jsp

KSH (2018): *Statisztikai Tükör: Munkaerőpiaci folyamatok, 2018. I–III. negyedév*. URL: https://www.ksh.hu/docs/hun/xftp/idoszaki/mpf/mpf1809.pdf

Ministry of Interior (Belügyminisztérium) (n.d.): *Statisztikák*. Belügyminisztérium Nyilvántartások Vezetéséért felelős Helyettes Államtitkárság, Budapest. URL: https://nyilvantarto.hu/hu/statisztikak

Möller, B., Nielsen, S. (2014): High resolution heat atlases for demand and supply mapping. *International Journal of Sustainable Energy Planning and Management*, 1., 41–58.

Möller, B., Wiechers, E., Persson, U., Grundahl, L., Connolly, D. (2018): Heat Roadmap Europe: Identifying local heat demand and supply areas with a European thermal atlas. *Energy*, 156., 132–143.

PETA (2019): *Pan-European Thermal Atlas* (v. 4.3). URL: https://heatroadmap.eu/peta4/

Ürge-Vorsatz, D., Herrero, S. (2012): Building synergies between climate change mitigation and energy poverty alleviation. *Energy Policy*, 49., 83–90.

WWF (2017): *Fűtés és energiahatékonyság: Körkép a helyi önkormányzatokról és a településekről*. WWF Magyarország, Budapest. URL: https://wwf.hu/public/uploads/toltsdle/1511533746_Futes_es_energiahatekonysag_WWFHU_jelentes.pdf

SMART VILLAGE – SMART COMMUNITY

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ABSTRACT
The obstacles to the development of smart villages are not only technical and infrastructural. In the following short paper, we will try to argue that when talking about the digitalisation of rural areas and agriculture, it is important to take into account the readiness and skills of rural people. Indeed, the use of digital culture and tools requires higher education, higher income and specific skills. Our research was conducted using literature and simple statistical analysis. We have found that currently rural areas and rural human resources are not yet sufficiently developed to effectively exploit the benefits of digitalisation.

KEYWORDS
smart villages; human resources; digitalisation; rural studies

Introduction

Today, digitalisation is an increasingly important term. The importance of digitalisation is growing day by day; in one way or another, technological equipment has a significant effect on all sectors of the economy, including agriculture. Digital agriculture is the use of digital technology to incorporate paddock to consumer agricultural production. These technologies can give farmers more informed decision-making and improved productiveness with resources and knowledge. Consumers would like to be more informed about the products they buy. They demand high quality and sustainably produced food and fibre and want to know more about where their products come from (Agriculture Victoria 2021).

The development of artificial intelligence goes beyond this; it means developing a digital capability that can go beyond that of humans. What is often overlooked here is that the development of digital capabilities and artificial intelligence should go hand in hand with the development of human capabilities. As Harari (2018, 71–72.) writes in his book, "[w]e are now breeding tame humans who produce huge amounts of data, (...) but these data cows are hardly fulfilling the human potential". This means that digital culture needs to

be grown up. But the potential to do so varies from country to country, from settlement to settlement.

In the following pages, we will explore the possibilities for introducing digital culture in rural areas. This short paper is based primarily on literature research and on basic statistical analysis. Our main findings relate to the extent to which the human resources of Hungary's rural communities are prepared to embrace digital culture.

Human factors influencing digitalisation

The 'Smart Village Project' responds to and seeks solutions to the challenges and problems of rural depopulation, rural brain drain, loss of rural jobs and a climate that is not conducive to services and business (Zavratnik et al. 2018). Smart development policies are well suited to developed or intermediate regions, which include both rural and urban areas, but do not work well for rural or more peripheral regions. Development policies for rural areas need to be adapted to their specific characteristics, the structure of their economies (agriculture, small businesses) and their diversity (remote regions, intermediate regions, rural areas close to urban areas). These findings are very important because they call into question the validity and applicability of the H2020 policy and of smart development and smart specialisation policies for the whole of the European territory (Torre et al. 2020).

In addition to the legal obligation, the use of digital technology, ITC, by farmers is only a trace element. Many tools have been introduced into farming, which include ITC developments, but these are used in isolation and without networking. In Hungary, IT tools are used on only 10 percent of the land under production. Studies show that there is still potential for improvement in Hungary in the areas of efficiency and productivity, but on the other hand, without training and IT development for agribusinesses, the persistence of these gaps will be a long-term competitive disadvantage for Hungarian SMEs (Berta 2018).

There is a clear digital divide in Hungary, which can also be seen in the distribution of internet subscriptions. In the counties of Szabolcs-Szatmár-Bereg and Borsod-Abaúj-Zemplén, one third of students have no or very limited access to online distance learning, which is true for almost one fifth of all primary school students (Szalai, Fabula 2021). There are also significant differences in internet access and use by educational attainment.

Table 1. Population aged 15 and over by highest completed level of education, 2011

	Budapest	Cities total	Villages and parishes	Country Total
Did not complete the first year of primary school	0,26	0,45	0,79	0,55
Primary school completed 1–7. years	1,64	3,22	7,02	4,36
Primary school completed 8 years	17,81	23,54	34,46	26,82
Secondary school without school leaving certificate, with vocational diploma	12,34	19,20	26,06	21,26
General baccalaureate	18,01	15,20	9,72	13,55
Vocational school baccalaureate	14,45	13,18	9,24	12,00
Baccalaureate-based vocational qualification at upper secondary level	3,98	4,11	3,53	3,93
Tertiary level qualification	0,71	0,62	0,46	0,57
College, bachelor's degree (BA/BSc)	15,19	11,81	6,11	10,10
University, Master's degree (MA/MSc)	15,14	8,44	2,58	6,68
Doctoral degree (PhD or DLA)	0,47	0,23	0,05	0,18
Total	100,00	100,00	100,00	100,00

Source: KSH Census (2011)

The spread of digital culture and smart solutions requires a high level of literacy, i.e. higher education. Table 1 shows that there are very large differences in educational attainment by type of settlement. For example, three times as many people in the villages did not complete the first grade of primary school compared to Budapest. For BSc education, a similar difference is observed, i.e. three times as many people in the capital have a BSc education than in the villages. At MSc level, the difference is six times higher, and for doctoral education it is almost 10 times higher.

If we look at the highest educational attainment, we find significant differences not only between types of settlement but also between counties. According to the 2011 Census, the counties of Nógrád, Tolna and Jász-Nagykun-Szolnok have the lowest proportion of people with a doctorate. Nógrád, Békés and Szabolcs-Szatmár-Bereg counties have the lowest proportion of people with a Master's degree. For the BSC degree, Nógrád, Borsod-Abaúj-Zemplén and Somogy counties close the gap. Nógrád county had the worst scores in all three cases in 2011 (KSH 2014).

Balázsi et al. (2016) found, based on a measure of students' competences, that the difference between settlement types is very pronounced in grades 6 and 8. In the grades examined, there is a difference of 122 and 128 points in mathematics and 150 and 145 points in reading comprehension between pupils from municipal and metropolitan schools. These differences are largely explained by the different the different economic and social characteristics of the different types of these municipalities.

In computer and internet use, the proportion of use within three months increases markedly as the educational attainment levels increase. This is almost the same for those with tertiary education (95% and 96%, respectively), while computer use (80%) was 6.2 percentage points lower than internet use among those with primary education. The difference between the two levels of education is significant, with the share of computer users at primary level 15 percentage points lower than at tertiary level, and the share of Internet users 10 percentage points lower (KSH 2017).

Table 2. Distribution of households with broadband by household net monthly income per capita (%)

Net monthly income	2013	2014	2015	2016	2017
Less than 100 thousand HUF	11,0	10,7	9,0	7,2	6,2
101–150 thousand HUF	20,1	19,6	17,6	14,7	13,9
151–200 thousand HUF	23,9	22,1	23,6	20,9	18,1
More than 200 thousand HUF	45,0	47,6	49,8	57,2	61,8
Total	100,0	100,0	100,0	100,0	100,0

Source: KSH (2017)

Table 2 shows that income inequality has a strong impact on internet access. The higher the net income per capita is, the higher is the proportion of households with broadband internet access. The correlation is perfectly understandable, but not the fact that inequality has increased rather than decreased over the years analysed.

Conclusion

The benefits of digitalisation can help rural people in many ways. It is not only the benefits for farmers, but also for the recipients who can be more confident about the origin of their food and its impact on the environment through digital technology. Digitalisation also poses risks if human resources cannot keep pace with its development.

Smart village projects can help solve a wide range of rural problems. These can include rural depopulation, rural brain drain or rural job losses (Zavratnik et al. 2018). However, the literature (Torre et al. 2020) suggests that the most disadvantaged rural areas are not able to reap these benefits. In Hungary, even farmers' adoption of digitalisation is low.

In terms of digitalisation, we observe further differences in regional disparities. Regions or counties that are generally more disadvantaged are also more disadvantaged in terms of internet access. A similar situation can be observed in terms of human resources. In rural areas and in the capital, the proportion of people with higher education is several times higher than in the capital compared to rural areas. If we look at student competences, we also find a significant difference between the competences of rural and urban students. Access to the internet is also influenced by per capita household income, which is also correlated with educational attainment.

Summary

In our study, we looked at the human resource development of smart villages in relation to the research on smart villages. Through literature and data analysis, we explored the potential for the introduction of digital culture in rural communities. We looked at the possible correlation between internet penetration, educational attainment and income. We found that rural communities, especially disadvantaged rural communities, can face serious barriers to the implementation of smart village projects. In conclusion, it is not enough to provide technical conditions for digitalisation, rural communities must also be prepared and strengthened. We can quote Bertalan Kemény: "We do not need a capacity for population preservation, but a capacity-preserving population."

References

Agriculture Victoria (2021): *What is digital agriculture?* [Online] URL: https://agriculture.vic.gov.au/farm-management/digital-agriculture/what-is-digital-agriculture

Balázsi, I. et al. (2016): *Országos kompetenciamérés, Országos jelentés* [*National Competence Measurement, National Report*]. Oktatási Hivatal, Budapest

Berta, O. (2018): A digitalizáció szerepe és jelentősége a modern mezőgazdasági vállalkozásoknál egy kutatás tükrében [The role and importance of digitalisation for modern agricultural enterprises in the light of a research]. *Jelenkori Társadalmi és Gazdasági Folyamatok*, 1–2., 55–66.

Harari, Y. (2018): *21 lecke a 21. századra* [*21 lessons for the 21st Century*]. Anonimus, Budapest

KSH (Hungarian Central Statistical Office) (2014): *A népesség iskolázottsága* [*Educational attainment of the population*]. Központi Statisztikai Hivatal, Budapest. URL: http://www.ksh.hu/docs/hun/xftp/idoszaki/nepsz2011/nepsz_14_2011.pdf

KSH (Hungarian Central Statistical Office) (2017): *Távközlés, televízió- és internetszolgáltatás – IKT-eszközök és használatuk a háztartásokban, a vállalkozásoknál és a közigazgatásban* [*Telecommunication, television and internet services – ICT tools and their use in households, businesses and public administration*]. Központi Statisztikai Hivatal, Budapest. URL: http://www.ksh.hu/docs/hun/xftp/idoszaki/ikt/ikt17.pdf

Szalai, Á., Fabula, Sz. (2021): Az okos vidékfejlesztés lehetőségei és korlátai Magyarországon [Possibilities and limitations of smart rural development in Hungary]. *Modern Geográfia*, 1., 59–79.

Torre, A., Corsi, S., Steiner, M., Wallet, F., Westlund, H. (eds.) (2020): *Smart development for rural areas*. Routledge, London

Zavratnik, V., Kos A. and Stojmenova Duh, E. (2018): Smart Villages: Comprehensive Review of Initiatives and Practices, In: Sustainability, MDPI, Open Access Journal, vol. 10(7), pages 1-14, July.

POSSIBILITIES AND LIMITATIONS OF APPLYING SMART APPROACHES IN LAKE BALATON AREA

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ABSTRACT
Sensitive and vulnerable ecological and socio-economical system of Lake Balaton Resort Area supposes efficient and resilient regional development and management issues and network. Principles and methods of smart city or smart region approaches typically such methodologies which are fit well to handling the special problems and challenges of Lake Balaton Resort Area. Several sectors can be identified where strengthening of smart approaches can be relevant, such as water management, public transport services, tourism destination management, regional governance etc. However, until this day, applying the smart approaches located at a very low level in the region. Role of smart approaches limited to separate small-scale projects in project implementation of 2014–2020 programming period. Territorial development documents of Lake Balaton Resort Area for the current – nearing its end – programming period 2014–2020 do not contain any special measures related to smart approaches, however the significance of the method seems to be strengthening for the upcoming period 2021–2027. Actors of the region recognised some usable aspects of smart approaches, but the regional apply of smart devices may require consolidated regional management system under a basically centralised territorial policy regime.

KEYWORDS
smart region; smart city; resort area; territorial development; territorial planning; territorial policy

Introduction

Lake Balaton region is a popular territorial subject of scientific investigation. Since the last decades of the 19th century numerous studies have been made from various science areas and sectors like hydrography, ecology, ethnography, sociology, tourism, geography and also regional sciences. The area has been playing the role of a highlighted territorial unit for natural and social sciences up to this day. Natural and social-economical specifications of the area and the interaction of these dimensions particularly fits the region for territorial analysis, territorial development studies, regional studies. Nowadays numerous papers and also legal documents treat the opportunities of regional development near Lake Balaton, however, potentials of using smart approaches in the regional development and management had not been discussed circumstantially. The intention of the study below is to open out the scientific and territorial policy discourse about the potentials and necessities of smart approaches in regional development and

management of Lake Balaton Resort Area. Beyond that the study examines the role of already applied smart devices and approaches in territorial planning and in practical development through the example of Lake Balaton Resort Area. In favour of the aims mentioned above the paper quests basically the main issues below:

- Whether is it necessary to dispute about applying smart approaches in Lake Balaton Resort Area?
- What are those sectoral and territorial topics and tasks in which relevancy and necessity of using smart devices emerges near Lake Balaton?
- How the smart approaches prevailed in the course of implementation of 2014–2020 territorial development programme?
- How the territorial development plans accepted for the 2021–2027 EU programming period handle the smart approaches? What kind of aims, priorities and measures can be identified related to smart devices?
- What are the potential ways of extending the application of smart approaches in development measures related to a functionally organic region?

Because of the main aim and function of the study, methodological range basically covers the overview of thematically relevant bibliography and territorial development documents of the region following the brief introduction of Lake Balaton Resort Area. Besides that, in favour of revealing the practical role of smart approaches short smart-focused analysis of the governmental database of EU co-financed operational programmes occurs.

Specifics of the Lake Balaton region – Why Lake Balaton region needs smart approaches?

Lake Balaton Resort Area can be identified as a special unit of recent Hungarian territorial structure. The area was legally established by the Act XXI of 1996 (act of territorial development) as a highlighted area crossing borders of NUTS 2 and NUTS 3 units. However, the roots of bottom-up regionalism near Lake Balaton go back to the last decade of 19th, and the first decade of 20th century (Kabai 2016). Current territory of LBRA is 3,886 km^2 (without the lake itself), the permanent population is 271,282 (2019), which means that the average population density is 69.8 person/km^2 that creates overall an area with rural particularities. LBRA comprises 180 municipalities belonging to three different NUTS-3 counties (Somogy, Veszprém and Zala). This level embodies the base unit of territorial institutional organisation in Hungary on upper-mid level. According to the recent content of the act of territorial development the county constitutes the regional basis of development, and county councils disponing substantive authorisation in territorial planning and distribution of territorial resources and supports.

As a result of belonging three separate counties institutional network of Lake Balaton Resort Area is fragmented, although some sectors and issues specifically demands unified institutional management. For instance, water catchment area of Lake Balaton is handled by 3 directorates of hydrography, and also 3 authorities of nature protection operate beside one territorially integrated National Park. In order to establish the integrated management of special issues of Lake Balaton, in 1996 the government founded Lake Balaton Development Council. Recent constitution of the Council involves the three concerned NUTS-3 counties (each of them delegates 2 members as local actors), and the governmental sphere such as the ministries those in charge of implementation of EU co-financed OPs, and in charge of the planning of territorial development (7 member). In spite of the fact that Council can be identified as a regional actor, it has been recently characterised by the prevalence of governmental actors. On one hand the sectoral institutional fragmentation appears as a structural challenge in the area, however the centralising transformation process of a body that serves decentralisation initially requires effective management tools (e.g. databases, networks) such as smart approaches.

Lake Balaton Resort Area is the second most important touristic destination (following Budapest), and the most popular summer resort in Hungary. In 2019 – before the Covid-19 pandemic – 1,9 million guests visited the accommodations of the region, generating closely 6 million guest nights. The region characterised by a strong touristic seasonality, the water itself is considered to be the main attraction. 45% of guest nights was realised in July and August in 2019. Attractivity of the region also manifests in about 80 thousand holiday homes on the shoreline of the lake. Due to these circumstances, the number of simultaneously existing local residents of the lake shore settlements can double. The considerable seasonal fluctuation of population results the inconstant recourse of services from the very basic level to the expansive public service systems too. This fluctuation necessitates the operation of flexible services and supply systems. Maintaining flexible service systems can be more efficient if the potentials and advantages of smart approaches are utilised.

Parallel with the strongly prioritised tourism development governmental policy in Hungary, endowment and supporting of Lake Balaton Resort Area became emphasised on governmental level. Whereas EU co-financed supporting of the region during the whole programming period 2007-2013 remained on a lower level than the country and county averages per capita, thus far in the 2014–2020 period the level of awarded EU subsidies per capita reached the 180% of the country average value. Large scale of supporting – augmented with endogenous resources such as valuable natural environment – strengthened the expansion of capital around the lake. Affected by this, the topic of the risk of overtourism and overdevelopment appears more common in the latest policy materials, since some precedents of the past (algae blooming in the 1980s, waves of intoxication of water life in the early 1990s) flashed onto the vulnerability of the ecological system of the Lake Balaton (Szegletes, Nemcsók 1992; Istvánovics 2000). For instance, long-term development conception of Lake Balaton Development Council lays

down the necessity of moderate, ecological-friendly development approaches. The existing contradiction in the subject of development principles of Lake Balaton between the institutional actors and policymakers also necessitates the practical usage of smart devices, such as data-based decision supporting systems.

Review of Hungarian "smart literature"

In order to get closer the recent concept of smart approaches related to regions and regional development the short exploration of thematic bibliography is needed. Regional sciences in Hungary focused mainly on cities in the last decade. The issue of smart regions is mostly unexamined. In regional explicitly regional dimension Niklasz and Varga-Ötvös (2018) published a paper about the role of geoinformatics support in regional economic development, besides Dicső and Varga (2019) published a policy-featured document about potentials of smart villages and regions from the aspect of a mayor from a rural municipality.

Review of bibliography belonging to smart city indicates that initially the conceptual framework and theoretical foundations of smart approaches constituted the subject of related works (Lados et al. 2011; Dobos et al. 2015; Baji 2017; Egedy 2017; Kolossa 2018). The most recent studies already emphasise the practical application and benefits of the smart methods (e.g. Kalocsai 2019; Nagy et al. 2021). Since processing of the smart issues primarily related to cities widespread, it is appropriate to investigate the theoretical fundaments of smart city from the aspect of adaptability to regions. Adaptation of smart city principles to Lake Balaton Region also might be relevant because of the verification of National Development and Territorial Development Concept, that identifies settlements around Lake Balaton as a special agglomerating urban region (NDTC 2014).

Lados et al. (2011) elaborated circumstantially the definition of smart cities for Hungarian cities based on IBM Corporation's method. The study specifies that the smart city concept covers a place that widely applies the available technological tools in order to assist a more diverse sustainable urban space and ecosystem. According to the demonstrated method a city can be titled "smart" if investments for human capital and traditional or ICT infrastructures drive sustainable economic growth and increases the living standards beside the smart handling of natural-ecological resources. This approach is accentuated because in the special regional construction of LBRA, conditions of natural ecological resources strongly determine the socio-economical sustainability and growth also. Interaction and sensitive relation of natural and socio-economic environment provides the relevancy of deeper analysis and potential regionally systematic application of smart approaches.

The other comprehensive, basically territorial policy material is "Smart City Tudásplatform" (knowledge-platform) which was prepared by a governmental actor,

Lechner Knowledge Centre (Dobos et al. 2015). The study demonstrates the subsystems of smart city and the Hungarian classification of them (smart mobility, smart environment, smart people, smart living, smart governance, smart economy). From the aspect of Lake Balaton Resort Area the issue of smart mobility, smart environment and smart governance are crucial. Declared development plans of LBRA for 2021–2027 point out the unfavourable effects of institutionally fragmented public transport system, such as uncoordinated public transport services, ununified tickets and timetables. Hiatus of regional public transport partnership and an integrative body retain the regional competitiveness primarily in tourism. By contrast the knowledge platform suggests fulfilling the spatial connects, ICT integration and partnership in different forms of public transport. On the other hand, the policy material declares that a functioning smart city assumes a city management determined by awareness, shared competencies and public governance. Transforming the conclusions into regional level the main crucial issue is how these conditions of smart functioning can be fulfilled while Lake Balaton Resort Area exists in a strongly centralised development policy system, intersection of three NUTS-3 counties without any administrative mandates.

Most of the Hungarian studies related to smart cities connect the smart issues to creativity and the creative city concept (Lados et al. 2011; Miszlivetz, Márkus 2013; Dobos et al. 2015; Egedy 2017). In connection to Lake Balaton this segment might be accentuated because of the creative priorities and measures of regional development plans. Since the programming period 2007-2013, development concepts and strategies for Lake Balaton Resort Area equally contained planned measures in favour of strengthening the creative industry sectors in the region. Nevertheless, the current situation analysis and planning section for 2021–2027 programming period justified that substantive progress did not happened. The fact that Veszprém jointly with Lake Balaton Region obtained the title of European Capital of Culture 2023 could intensify the role of creative sectors on the economical horizon of the area.

The role of smart approaches in Lake Balaton Resort Area

Besides reviewing the recent Hungarian literature and scientific discourse, it is expedient to analyse the role of smart initiatives and approaches in the regional development policy and practice in LBRA. In one hand the brief content analysis of the regional development documents will be presented, beyond a short database analysis of EU co-financed development projects. The monitored database is the governmental database of operational programmes supported by ERDF and ESF (FAIR).

As it was mentioned above, Lake Balaton Resort Area is a scene of a concentrated discharge of development policy resources during the whole 2014–2020 programming period. The legal basis of the supporting was constituted by a governmental decision (1861/2016), which was declared on the fundament of a concept, strategy, an operational

programme adopted by a Lake Balaton Development Council. These regional documents essentially do not contain any explicit measures connecting to smart city or smart region approaches. These policy materials formulate the demand of development of IT and creative enterprise sphere, and also the infrastructural aspect of IT investments. But the systemic proposal of strengthening smart approaches is missed (BFT 2014).

Related to the EU co-financed OPs 1500 project implementation took place with more than 1,1 billion EUR paid subsidies. Related to the content of development documents for 2014–2020, the role of smart projects is almost negligible. Supporting of smart city initiatives were basically possible from Territorial and Settlement Development OP, as this OP integrated a large scale of urban development measures. Although the OP itself contains explicitly smart approaches to a small extent, green city actions, and sustainable urban transport measures opened the possibility for implementation of smart city elements. Fitting to the principal related content of the OP, "green city" projects were implemented in 8 cities of LBRA. Reviewing the content of the projects, it becomes visible, that the emphasis is on renewal of green spaces and landscaping. Smart elements only occur connected to public lighting, and unique soft elements like community development of green spaces (in the case of Marcali). According to the FAIR database merely reclused and slight projects typically realised by means of TSDOP's urban transport subsidies (e.g. smart pedestrian crossings). Systemic municipal even more regional interventions did not happen.

In the sphere of enterprises mainly connected to RDI several thematic smart projects are observable, but most of these projects seems individual and specialised (e.g. smart fashion) substantive or special regional impact cannot be identified. Only one SME development project contains "smart city" term. The aim of the project is to construct the essential technologies for Siófok, for some further smart city developments in the future. To the tenders of Environment and Energy Efficiency OP not more than two mainly educative small-scale projects were submitted in the topic of smart energy utilisation. This fact strengthens the individual local character smart projects in the region, in spite of issues of environment and energy efficiency give the opportunities for developing smart project based on cooperation and IT technology using.

During the programming period the connection to ASP system of local governments were widely supported in Hungary in the framework of Public Administration and Civil Service OP. 33% of LBRA municipalities implemented the project in order to efficient operation of local governments. However, ASP is an inherently centrally driven device, what primarily assist the efficient communication between the municipality and governmental bodies. By means of the projects the local administration might be smarter, but the benefits for local communities and smart local governance are morefold indirect.

It is an important question that what role the region intends to take on smart approaches during the next EU programming period? During 2020 and 2021 Lake Balaton

Development Council declared the long-term development concept, and midterm (2021–2027) strategy and OP of the Lake Balaton Resort Area. According to the regulations laid down in the Act of Territorial Development, the Council is obliged to submit the documents to the government for declaration. Accordance of government can ensure the basis of a new (centrally financed) development programme. Recent documents declare the development necessity of web-based public services. Beyond the settlement level, using of smart approaches is justified to upscale to a resort area integrated level (e.g. in public transport services, tourism marketing and coordination, water management and quality monitoring). The 9th priority of the strategy and the OP also confirms the strengthening role of smart approaches. The aim of the priority axis is to facilitate the cooperative, consensual management and development of Lake Balaton Resort Area in favour of regional resiliency and sustainability, improving competitiveness, and the conflict-free social and ecological functioning. Putting institutional and social partnership to the forefront indicates the recognition and demand of smarter governance. It is a question of the future, how this approach can prevail in development practice in the recent centralised policy environment.

Conclusions

The original aim of this brief study was to open the scientific-professional thinking and discourse about the potential relationship between development of Lake Balaton and smart approaches of current spatial policies. Through the review of concerned literature several connecting point has been identified where applying of smart devices can be relevant in Lake Balaton Resort Area. Some crucial issues in the region can be parallel with frequent smart city issues such as flexible coordination of services (public transport, other public services), institutional and civil cooperation in a fragmented territorial system, water management, tourism marketing, coordination of cultural events.

According to the consequences of “smart city literature” challenges of climate change, ecology and social-economical dimension in the future can be handled more effectively by the help of smart technologies and cooperation. Specifics and challenges of Lake Balaton Resort Area strongly expresses the demand of smart projects, however not only on settlement level but on an upscaled regional level. Nevertheless, theoretical fundaments of smart city methodologies basically adaptable to the region presumably its institutionalisation and significant regional identity. Despite these circumstances, project owners, developers and beneficiaries did not recognise widely the possibilities of smart projects near Lake Balaton. Those EU co-financed projects which are trackable from governmental databases only shows some individual smart thematic projects in the circle of SME sector. It seems most of the regional actors did not recognise the possibilities of smart approaches in territorial or settlement development and management. Therefore, acceptance and integration the tools and methods of smart approaches is crucial in local society, governance, sectoral policies and territorial, regional policies also. In addition, as

using of smart devices barely spread also reclused around Lake Balaton, upscaling smart issues to a regional measure necessitates institutional responsibility which also could be organised by sectoral (e.g. public transport, tourism) or integrated territorial logic (Lake Balaton Development Council).

The fact that actual 2021–2027 development concept and strategy of Lake Balaton Development Council includes the demand of smart issues as a new element constructs the fundament of the way. Multi-dimensional vulnerability and conflict-debited local society demand the utilisation of cooperation and available technologies with good efficiency. But how can projects function which are based on regional institutional cooperation, applies smart technologies, and involves local actors in the current centralised territorial governmental system is an important issue for the future.

References

1996. évi XXI. számú törvény a területfejlesztésről és területrendezésről

Balaton Fejlesztési Tanács (2014): A Balaton Kiemelt Térség fejlesztési programja. I. kötet – Koncepció (2014–2030), Stratégiai Program (2014–2020), Operatív Program (2014–2020).

Balatoni Integrációs és Fejlesztési Ügynökség Közhasznú Nonprofit Kft. (2021): A Balaton Kiemelt Térség Fejlesztési Programja; Hosszútávú Fejlesztési Koncepció (2014–2030) – 2020-ban felülvizsgált változat, Stratégiai Program (2021–2027), Operatív Program (2021–2027).

Baji, P. (2017): Okos városok és alrendszereik: Kihívások a jövő városkutatói számára? *Tér és Társadalom*, 1., 89–105.

Dobos, K., Kulcsár, S., Nagy, P., Sik, A., Szemerey, S., Menyhárt, É. (2015): *Smart City Tudásplatform: Metodikai javaslat*. URL: http://lechnerkozpont.hu/doc/okos-varos/smart-city-tudasplatform-metodikai-javaslat.pdf

Dombi, G., Oláh, M., Fekete, K. (2019): A pályázati aktivitás és a forrásabszorpció specifikumai a Balaton Kiemelt Üdülőkörzet községeiben. *Comitatus Önkormányzati Szemle*, nyár-ősz, 23–29.

Dombi, G., Oláh, M., Fekete, K. (2019): A balatoni vízszintemelés társadalmi-gazdasági következményei. *Comitatus Önkormányzati Szemle*, nyár-ősz, 131–141.

Egedy, T. (2017): Városfejlesztési paradigmák az új évezredben: A kreatív város és az okos város. *Földrajzi Közlemények*, 3., 254–262.

Fekete, K. (2018): Mozgások az (erő)térben: A fejlesztési források kihelyezésének jelenlegi gyakorlata a Balatonnál. *Comitatus Önkormányzati Szemle*, különszám, 16–23.

Horváthné Barsi, B., Lados, M. (2011): *„Smart cities" tanulmány*. URL: http://www.rkk.hu/rkk/news/2011/smart_cities_tanulmany_IBM_RKK.pdf

Istvánovics, V. (2000): A Keszthelyi-medence trofitása a foszforterhelés függvényében. *Hidrológiai Közlöny*, 5–6., 309–311.

Kabai, G. (2016): *Regionalizmus és területi politika a Balaton térségében*. Doktori értkezés, PTE BTK Interdiszciplináris Doktori Iskola, Pécs

Kalocsai, K. (2019): Smart city és a blockchain: Buzzword vagy paradigmaváltás? *Tér és Társadalom*, 1., 98–105.

Kolossa, J. (2018): Az okos város: Új esély a tudatos településfejlesztés meghonosítására. *Metszet: Építészet, újdonságok, szerkezetek, részletek*, 4., 52–55.

Marton, I. (2013): A Balaton régió fejlődése: A regionális gondolkodás és a turizmus fejlődésének összefüggései a Balaton térségében. *Acta Scientiarum Socialium*, 39., 161–179.

Miszlivetz, F., Márkus, E. (2013): A Kraft-index – kreatív városok – fenntartható vidék. *Vezetéstudomány – Budapest Management Review*, 9., 2–21.

Nagy, Z., Szendi, D., Szép, T. (2021): Linking smart city concepts to urban resilience. *Theory, methodology, practice*, 1., 31–40.

National Development and Territorial Development Concept 2014–2030

Schleicher, V. (2019): *Kultúrfürdő: Kulturális kölcsönhatások a Balaton térségében 1821–1960 között*. L'Harmattan, Budapest

Szegletes, T., Nemcsók, J. (1992): Ökológiai tényezők szerepe az angolnapusztulásban. *Halászat*, 1., 19–21.

THE RELATIONSHIP BETWEEN SMART SOLUTIONS AND URBAN IDENTITY

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ABSTRACT
Smart solutions for developing an urban identity. Many cities are struggling with the problems caused by emigration, and one way to address these is to strengthen the municipal identity of local society. The extent to which local society is able to identify with a settlement, its values, its liveability and the positive experiences it offers, is a major determinant of its attachment to it. Smart solutions make the settlement more liveable, more familiar and at the same time more homely, which can have a positive impact on the identity of the settlement. In my paper, I will show smart solutions that can strengthen the identity of the local community.

KEYWORDS
smart solutions; urban identity; urban development; good practice

The challenges of cities in the 21st century

European cities these days are facing numerous challenges including social, economic and environmental ones. From the social aspect we can see that demographic changes can mean different problems from one city to another. Some cities have to cope with the phenomenon of an ageing population as young, educated people emigrate and start families elsewhere. In other cities income inequalities are increasing with the clear consequence that those with low social status are moving even lower down the social hierarchy. The consequences of this process are also visible in the urban space with residents in some neighbourhoods experiencing the negative effects of inequalities such as poor-quality housing, low quality educational infrastructure, unemployment, and the lack of certain basic services (e.g. health care, transport, information, and communication technologies).

If we take a look at the economy, we can see that we have already passed the period of economic recovery, and that currently we are experiencing stagnation and a possible decline. Certain sectors are facing a shortage of quality labour force while in others a significant proportion of the population is being forced out of the labour market or into low-skilled and low-paid service sector jobs.

The climate crisis, global warming, shrinking green spaces due to expanding cities, soil erosion, all put enormous pressure on the urban ecosystem which can have an impact on both economic and social problems.

Urban identity as an answer to challenges

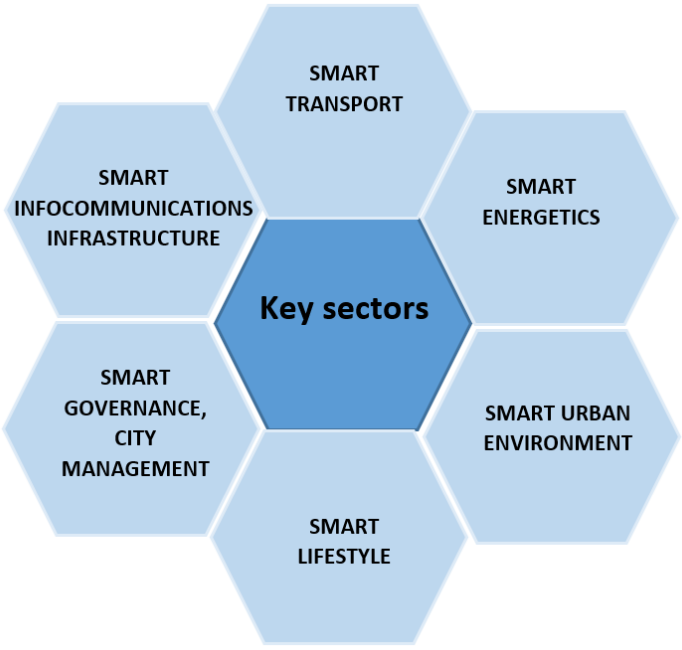
Urban development must respond to these challenges. In many cases a city that develops an environment that provides a good quality of life for the local community and is attractive to potential newcomers will be able to meet these challenges better. In this case it is not enough for cities to focus on solving the problems of the economic sectors, but they also need to identify the needs of the local society and create an image in the minds of locals with which they can identify with. Identifying with a place can create a sense of bonding which can encourage people to stay there and increase local activity and participation in the life of the city (Urbánné Treutz 2019). The development and strengthening of urban identity can therefore be considered as a kind of solution. The conceptual definition in the literature however is not clear, it is difficult to grasp the essence of the concept. In conceptualising territorial identity, researchers have encountered with several theoretical and methodological difficulties. In most cases the conceptual definitions are used synonymously or the concepts of territorial, regional and settlement identity are mixed up in the terminology and are characterised by fundamentally different conditions and properties (Oláh 2012). According to Zoltán Bugovics (2007), the definition of identity as a general concept is problematic but its interpretability and analyzability can be increased significantly if it is broken down into sub-areas. In the Hungarian literature, István Piskóti's (2012) dual approach is the most widespread describing identity on one hand side as an image or knowledge in people's minds through which a city can be identified (from a psychological perspective the identity of the area can be treated as a personality), and on the other hand side describing it as the ability to identify with the settlement as a local resident, i.e. the degree of attachment to the settlement.

Zoltán Cséfalvay (1990) in his book "Maps in our minds" wrote about the so-called reconstruction theory which describes people's subjective relationship with the spatial environment. He depicts the theory as a four-step process in which the individual develops a more and more direct relationship with space. The first stage is perception, the reception of environmental information. In the second one the information is converted into an internal orientation system. Then in the third step subjective content gets assigned to the environmental information giving it individual meaning. This process is called symbolisation. The fourth stage, identification, is when the subjective meaning of the perceived spatial elements is also processed emotionally.

Smart City

The question, which is of interest not only to researchers, but also to practitioners, is how to strengthen settlement identity in the 21st century with the help of new tools. If we take reconstruction theory as basis for the development of settlement identity, or accept the theory as a way for society to get to know the urban space, then we can help to strengthen the identification with the settlement which can make the local society aware of the opportunities offered by the settlement, help to convert the local society into a community, make the life of the local people more comfortable as well as the settlement more liveable etc. This could be the case for some of the so-called smart solutions, which are implemented within the framework of the smart city concept.

The definition of smart city has not been clearly defined in the literature however, there is a rich literature on the subject, focusing on the same set of problems. It seeks answers to the challenges that cities are constantly facing. In practice, the smart city concepts seek solutions to the challenges of the present, using the tools currently available with particular ICTs. Their aim is to find a comprehensive, integrated approach to solve the complex problems of the more and more compound cities with a mechanism to address complex processes that are built on each other. Such an integrated system can link all the actors in the city's operations and be present in all the areas needed.



Smart City has six key areas with a number of sub-areas. The key areas cannot be managed independently. Their interconnections, overlaps, common implementation elements and the use of solutions in multiple areas are at the heart of the Smart City concept.

Smart City related solutions aim to improve the efficiency and effectiveness of a city's operations and the quality of life and to raise the standard of living of its inhabitants by respecting and managing natural resources. In fact, smart solutions in achieving their objectives contribute to strengthening the municipal identity of the local society (BME 2016).

However, there are a number of issues for smart urban development that need to be thoroughly examined for some investments.

One of these is the topic of centralisation by which we mean the outsourcing of certain activities appearing in the management of smart cities such as data management and its development or any other technological system related activities. These external contractors can get access to data that earlier have been unimaginable however the very same applies to the local municipalities or even states who can get to know more about their citizens than ever before. In addition, the so-called personal data collection and management systems and cloud-based systems are also emerging with which the citizens also constantly provide data about themselves which without sufficient knowledge can escalate to total vulnerability. Therefore, in the implementation of successful smart city programmes it is utmost important that in addition to the development of cities the education and development of the local society is also continuous (Rab, Szemerey 2018).

Another similar issue is the cooperation since political passivity and the desire for instant and personalised services is typical for the modern consumer societies which also affects the participation in the urban life. Nowadays mobile and digital technology-based services are built to reorganise our environment (e.g. transportation, shopping, entertainment etc.) according to the real time preferences of the consumers. Map applications offer restaurants by location, send notifications about friends nearby or recommend routes based on interest and safety settings. This phenomenon is reshaping urban space, pushing it towards a more closed direction and creating an expectation towards the constructed environment and the community services that are hardly or not at all meetable.

A key priority for smart city projects is to facilitate the creation of communities and their successful joint or parallel coexistence and, above all, to encourage the progress of individuals from consumers to responsible citizens. In order to create the motivation for further participation and for the settlement to become a recognised and valued backdrop both services and developments need immediate and consistent feedback (Rab, Szemerey 2018).

As described above local societies have an important role in smart city developments. This should be taken into account in smart development strategies however in practice this can take different forms. There are significant differences between those strategies that prioritise services, technologies and data in cities and assign further decisions to them,

and those that start from improving the quality of life of its citizens, their knowledge, and capabilities, and later assign the appropriate tools to them (Rab, Szemerey 2018). In case of the technology-driven urban strategies personal sovereignty, privacy, or the aspects of the community can get somewhat overshadowed while it can compensate with the measurable data and the promise of efficiency based on applied technologies and the personalised urban environment.

On the contrary, strategies based on smart residents prefer autonomous choices and the retention power of communities, assuming that expanding opportunities and responsibilities will lead to stronger, more successful cities in the long run. Here the role of data, services and technologies is not meant to support the central decision making of the city governance, but to strengthen the flow of information towards civil stakeholders, and in parallel to share decision-making and support initiatives. Continuous optimisation is a recommended feature of both approaches. Optimal solutions can be found by combining the two strategies, always taking into consideration the local, municipal-level conditions, resources and needs (Rab, Szemerey 2018).

Examples of smart urban development focusing on urban identity

The aim in Debrecen's strategy is to improve urban wellbeing and quality of life through smart solutions. The smart city developments started in the city in 2015 and involved the local society from the very beginning. The city has identified seven focus areas for smart solutions:

- Digital literacy: all residents of Debrecen should have the right to acquire digital literacy
- City services: to make city services convenient, accessible and efficient for all
- Energy: To reduce the expenses of Debrecen with the help of smart solutions: Debrecen residents should behave, plan and optimise their energy and water consumption
- Public safety: smart solutions and processes to tangibly improve the safety of the city and the sense of security of its residents
- Transport: Significantly improve the permeability of the main urban roads. Urban development plans should support transport management with smart tools
- Sport: Smart solutions to encourage people to move more and lead healthier lifestyles. Smart solutions to contribute to more enjoyable professional and amateur sports activities.
- Health services: the work of heath care workers should be better coordinated, a more efficient information flow should be ensured between them

Debrecen's strategy is a good example of strengthening the identity of the municipality with smart solutions because the primary goal is to improve the digital literacy of the local

society, with the aim of improving the competitiveness of the population, businesses and public services. They would prepare the local society for new smart investments through a series of social programmes and forums, making it easier for them to digest and use. It is important that all social groups can be part of urban society and that smart solutions do not become exclusionary for certain groups. This requires a sufficient amount and quality of information to be disseminated to local people.

In the 13th district of Budapest, a district app, the Budapest13 Smart City App has been created to maintain direct contact between the district administration and the local community and to provide quick access to information. In addition to the application helping with administration and serving as a source of information, it also features a partner card service. The aim of this service is to enable residents of the district to use primarily district services for which the partner card holder can receive a discount. According to Mayor József Tóth, "[w]e believe that the card, in addition to the services provided, will strengthen togetherness, local patriotism and our love for the district". So, in this case we can see that the aim of strengthening the identity of the municipality and the identification with the district through smart solutions is also an objective.

Another example can be the city quiz organised by the Future of Europe Association at the International Children and Youth Meeting in Kecskemét. Local schoolchildren used their smart phones to scan QR codes to learn about the history of emblematic local buildings, statues, and famous people from the city. Knowing the place, the history and the common past play an important role in the identity of a municipality, and by getting to know it, the younger generation can be encouraged to like their hometown more. All this can now be achieved with the help of smart tools.

Smart solutions can also contribute to our level of comfort in the city by making our everyday lives easier, such as solutions that make transport easier. Smart parking systems are based on a network of sensors installed in parking spaces, which indicate in real time when spaces are full, saving time spent on searching for parking spaces. This makes the district's services more attractive to its residents and creates a more trusting relationship between residents and the district. The aim of the community bicycle system is to encourage more users to use bicycles in their daily lives, thus reducing air pollution, congestion, and noise in the city. It also aims to provide another alternative to urban transport.

Summary

The link of local society to the municipality has many benefits for the municipality, so it is advisable to look for the impact of any development on the relationship of local society with the municipality. Smart solutions are modern tools to respond to the challenges that municipalities face these days, and their impact on municipal identity should also be

considered. However, in theory they increase the comfort, security, and quality of life of local people, in some cases they can exclude certain groups in society. Groups who are not familiar with the functioning of smart devices or do not use them at all cannot be adequately involved in the developments. Municipalities need to provide with trainings and knowledge sharing to enable everyone to use them. Once this has been achieved, smart developments will become a positive direction for all age groups. It is important to note that not all smart developments are spectacular investments. Nevertheless, they can strengthen the settlement identity by making life in the municipality easier.

References

Baji, P. (2017): Okos városok és alrendszereik: Kihívások a jövő városkutatói számára? *Tér és Társadalom*, 1., 89–105.

Bugovics, Z. (2007): *Társadalom, identitás és területfejlesztés*. L'Harmattan, Budapest

Cséfalvay, Z. (1990): *Térképek a fejünkben*. Akadémiai Kiadó, Budapest

Rab, J., Szemerey, S. (2018): *Az okos város fejlesztési modell módszertani alapjai*. Lechner Nonprofit Kft., Budapest

Oláh, M. (2012): A területi identitás szerepe az igazgatási terek tervezésében. *Területi Statisztika*, 4., 307–334.

Piskóti, I., Nagy, Sz., Molnár, L., Marien, A. (2012): Identification between individuals and places of residence. In: Fam, K., Józsa, L., Yang, L. (eds.): *Retracing the Silkroad: MAG Scholar Global Business Marketing and Tourism Conference 2012*. Conference proceedings, Széchenyi István Egyetem, Győr, 1–16.

Urbánné Treutz, Á. (2019): Hellyel való azonosulás kapcsán felmerülő modellek. In: Bálint, Cs. et al. (eds.): *Rurális térségek a 21. században tudományos konferencia*. Tanulmánykötet, Doktoranduszok Országos Szövetsége, Budapest, 251–258.

Internet sources

- http://eit.bme.hu/sites/default/files/booklets/smart-city-megoldasok-hat-kulcsteruletrol/SmartCity_hat_kulcsterulet_B5belivek.pdf
- http://smartcity.debrecen.hu/hu
- http://smartcity.debrecen.hu/hu/strategia/
- https://www.budapest13.hu/wp-content/uploads/2019/03/smart_city_koncepcio.pdf
- http://partnerkartya.budapest13.hu

COVID-19 IN RURAL AREAS OF CENTRAL EUROPE

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ABSTRACT
The novel Coronavirus (Covid-19) pandemic severely affected whole Central Europe, but significant territorial disparities are observable within the region related to this. Specifically, this paper shows how rural areas were affected by the epidemic based on literature and statistical sources to. The paper presents that, while the epidemic is as widespread in rural as in urban areas (although the disease appeared firstly in urban regions, the inequality in this case between urban and rural areas equalised very quickly), rural regions have slightly higher (excess) mortality rates, so they are more affected by Covid-19, in generally. It means that the mortality rate of Covid-19 seems higher in rural than in urban regions. One possible reason for this may be the urban-rural difference in resilience, which is as much related to the age structure and health status of the population as to the accessibility of the health care system.

KEYWORDS
Covid-19; vulnerability; spatial diffusion models; urban-rural inequalities; excess mortality

Introduction

The Covid-19 epidemic spread around the world in 2020, and until this day hundreds of thousands of people are falling ill and thousands are dying every day from the Coronavirus. Central Europe is considered one of the most affected regions in the world, with a confirmed case count approaching 7,9 million (2nd May 2021), while 187 thousand deaths have been reported as related to Covid-19, but the real impact of the epidemic could be even serious. One of the main indicators of the real health impact of the epidemic may be the indicator of the excess mortality; showing how this indicator differs from confirmed mortality is an important aim of this paper.

The paper examines the epidemiological data in Central Europe, mainly in terms of urban-rural distribution. The research questions of the paper are the following: *Are the Central European rural areas more vulnerable than urban and intermediate regions in the aspect of Covid-19? How has the Covid-19 spread so far over Central Europe? What was the spatial pattern of it? How the rural areas are affected by the Covid-19 in Central Europe?*

Firstly, it presents the differences in vulnerability and resilience to epidemics between urban and rural areas. Secondly, it shows the spatial characteristics of the diffusion of the

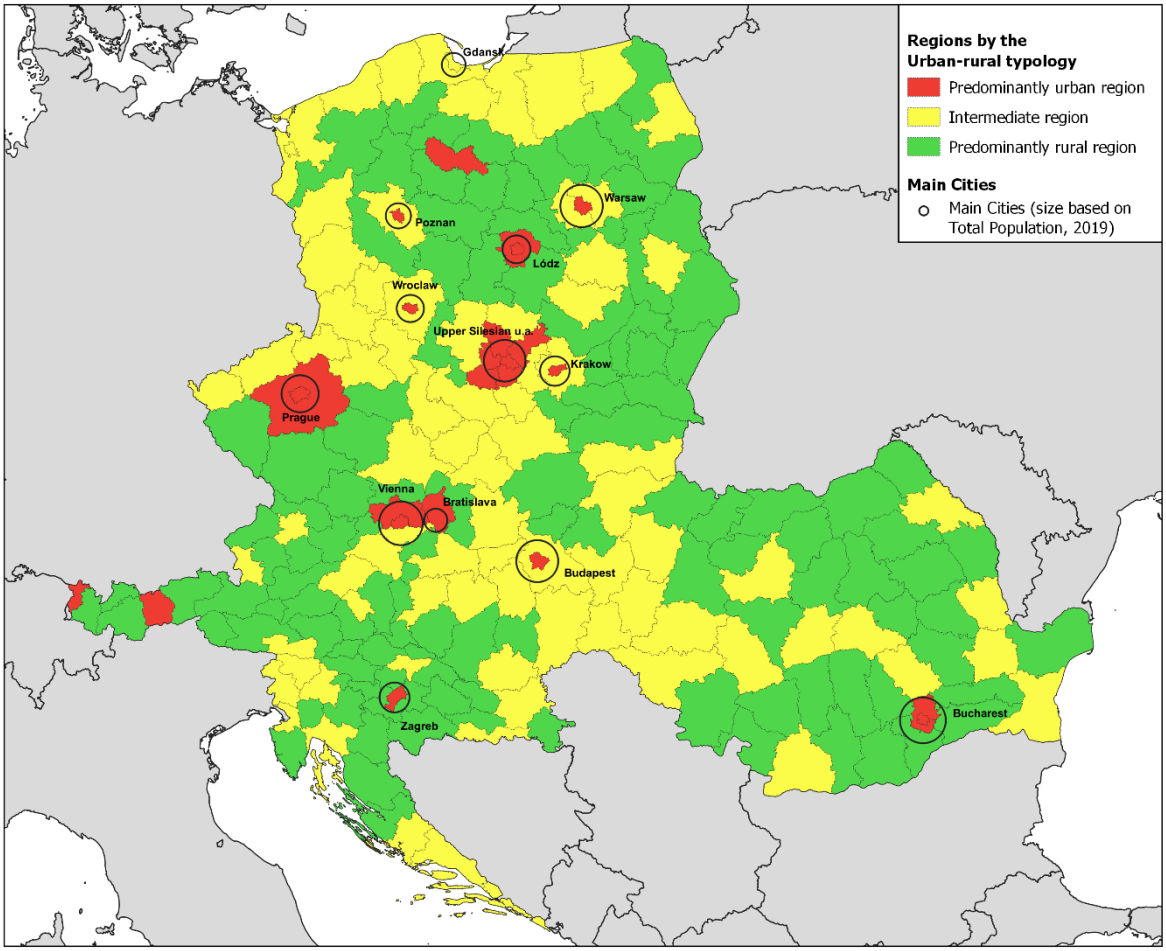
epidemic and the spatial inequalities of incidence of disease, while thirdly, it highlights urban-rural inequalities in the impact of the epidemic. Finally, the paper ends with a conclusion, directions for further research and the possible spatial actions.

Methodology

The focus of the paper is on rural areas in Central European countries and their epidemiological data. This chapter presents the spatial and temporal framework of the paper, as well as the indicators and used methods.

The spatial frame of this research is the countries of *Central Europe*: in this case they are Austria, Croatia, Czech Republic, Hungary, Poland, Romania, Slovakia, and Slovenia. The NUTS 3 level regions of these countries were the basis for the analysis: both social and epidemiological data were downloaded to this territorial level - if they were available. Although the author had previously planned to include Serbia, this country was excluded due to lack of regional epidemiological data.
An important question for this research is what counts as rural and what counts as urban region. Many experts have tried to define the *urban-rural distinction* in different ways, which has led to a number of explanations (Bengs, Schmidt-Tomé 2005; Kis 2011; Kovács, Farkas, Perger 2015; Szabó 2010; Valanszki 2015 etc.). This diversity is due to the fact that the interpretation of the concept also depends on the perspective: geographical, economic, social, cultural. The classification could be based on many types of indicators: population density, settlement structure, economic and labour market characteristics, land use, location etc. Each of these different interpretations yields different results, so that the different definitions result in regions of quite different size and characteristics (Kis 2011). However, with all this diversity, a clear demarcation is needed for this research, due to this a simplified typology of the Eurostat was used. This is the so-called urban-rural typology, which divides NUTS 3 regions into three groups on the basis of population density data from 1x1 km GRID cells: predominantly urban, intermediate and predominantly rural (Eurostat 2019). As the Map 1 shows, Central Europe is dominated by predominantly rural and intermediate regions, while there are only two dozen urban regions: the regions of capitals and some larger cities and their agglomerations.

Map 1. Predominantly urban, Intermediate, Predominantly rural regions and Main Cities in Central Europe



Source: own edition

To describe the *epidemiological situation*, the following data was downloaded on a weekly basis (data download date: every Monday, the most recent data available for Sunday): *Total Number of Confirmed Cases* (confirmed by test); *Total Number of Reported Covid-19 Deaths*. The indicator of the *Weekly New Confirmed Cases* could be calculated from the downloaded confirmed cases data. The source of data was official government Coronavirus-related websites (except in the case of Romanian Reported Covid-19 Deaths in NUTS 3 level). The downloaded data were summarised and analysed at NUTS 3 level, although for deaths – in several cases – the data was available only in national or other territorial level (e.g. Hungary and Slovakia); see in Table 1.

Table 1. Sources of the territorial level Covid-19 related data in the countries of Central Europe

Country	*Governmental websites of territorial data*	*Available territorial level of the different indicators*	
		Confirmed Cases	*Reported Covid-19 Deaths*
Hungary	https://koronavirus.gov.hu/	NUTS 3	Budapest - Countryside
Austria	https://covid19-dashboard.ages.at/?l=en	LAU	LAU
Slovakia	https://covid-19.nczisk.sk/sk	LAU	NUTS 0
Romania	https://stirioficiale.ro/informatii	NUTS 3	NUTS 0 (NUTS 3 from informal source)
Croatia	https://www.koronavirus.hr/	NUTS 3	NUTS 3
Slovenia	https://www.nijz.si/sl/dnevno-spremljanje-okuzb-s-sars-cov-2-covid-19	LAU	NUTS 3
Czech Rep.	https://onemocneni-aktualne.mzcr.cz/covid-19	LAU	LAU
Poland	https://www.gov.pl/web/koronawirus/wykaz-zarazen-koronawirusem-sars-cov-2	LAU	LAU

There are *many challenges in using epidemiological data*. Firstly, testing capacity is playing an important role in the Number of Confirmed Cases (and it also influences the Number of Covid-19 Deaths). In each Central European country, there have been weeks when more than 20% of the tests performed were positive; it is well above the WHO recommended threshold, meaning that the reliability of the resulting data is low, and many cases remain hidden. There are also significant differences in the methodologies of epidemiological data used by countries: while the recording of the Number of Confirmed Cases follows a broadly uniform methodology, there are significant methodological differences between countries in the recording of Reported Covid-19 Deaths, and further indicators; e.g. Number of Serious Cases (who are requiring treatment) and the Number of Cured (and thus Number of Active) Cases. Finally, the spatial detail of data publication also varies from country to country, and it has been changing many times over the last year.

As there is no alternative indicator for the Number of Confirmed Cases, and as the methodology is similar in each country, I used these official data to describe the spatial diffusion and the epidemic situation of Covid-19. However, the indicator for the Number of Reported Covid-19 Deaths has much more methodological problems and the latency may be much higher. Therefore, in addition to official indicator of Reported Covid-19 Deaths, I have used regional (Slovenia and Croatia national) level *Excess Mortality* data downloaded from Eurostat to summarise the (health) impact of the epidemic. The Excess Mortality could be described as "[a]n unusual mortality increase during a specific period, in a given population" (Eurostat 2020). It is calculated by measuring the number of deaths from all causes in a given period with the average number of deaths in the same period in

the last 5 years. Excess Mortality data are available on a weekly basis and therefore fit well with other epidemiological data which were also collected in weekly.

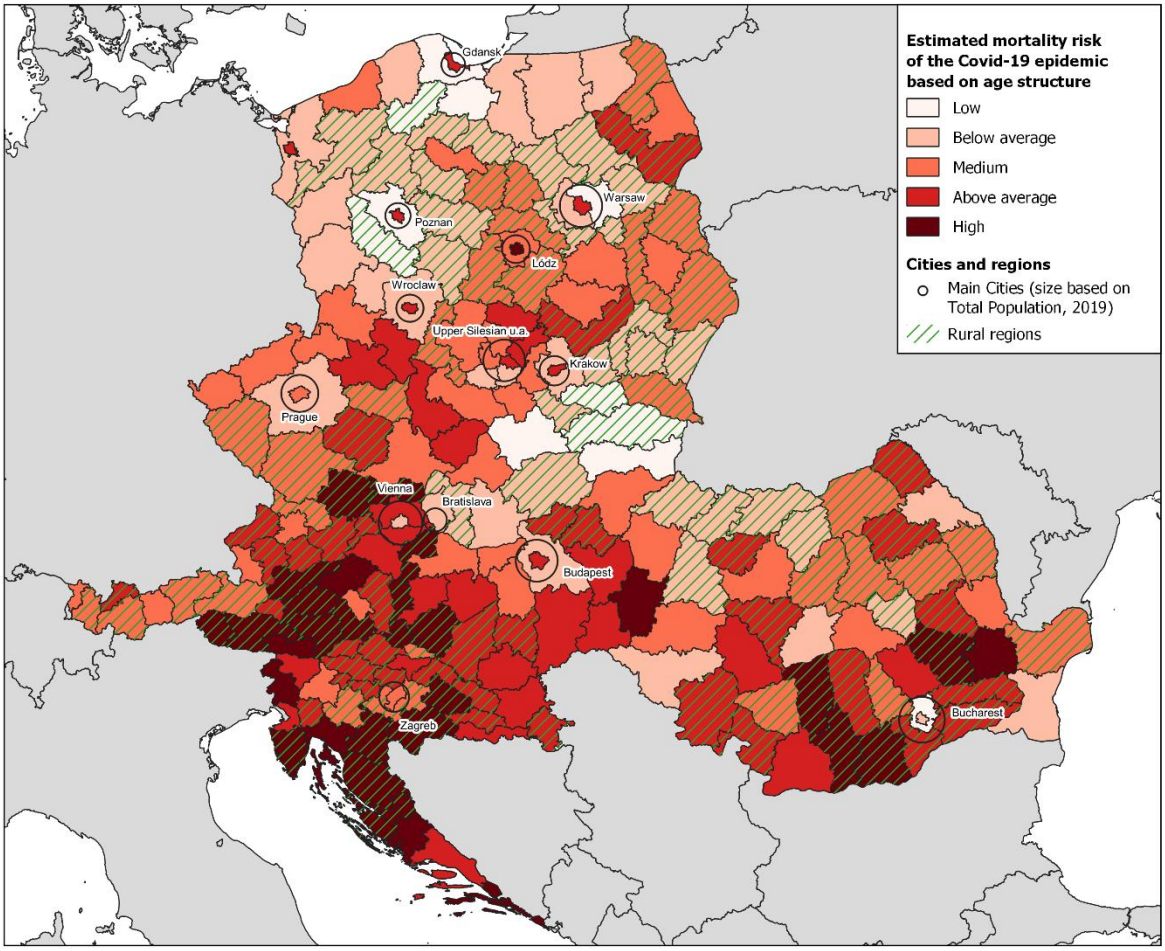
The time frame of the epidemic data is between the date of the first Covid-19 case reported in Central Europe – 23rd February 2020 (Rijeka, Croatia) – and the end date for data collection; 2nd May 2021. However, for Excess Mortality, the data are available with a delay of several weeks, so the time frame for this indicator is from the first Reported Covid-19 Death (12th March 2020 – as these are weekly data, 11th week of 2020) to the end of the second wave (end of January 2021, 4th week of 2021).

Resilience of rural regions in Central Europe

The resilience of regions is a particularly important issue in an epidemic situation. There are many factors on this and many researchers examined this topic related to Covid-19 epidemic (e.g. Balás et al. 2020; Du et al. 2020; ESPON 2020; Kovács, Uzzoli 2020; KSH 2020). This chapter is not intended to summarise or even go beyond this work, but merely to present some possible factors that may influence the resilience of regions to epidemics. The risk of a Covid-19 epidemic depends on a number of factors, such as a higher risk of death with age and certain comorbidities. For this reason, the greater the proportion of vulnerable groups in the population, the lower the epidemic resistance of the regions.

Officially available mortality data for each age group are used to calculate the *estimated age-based mortality risk* for each region. The data are based on Chinese age-based mortality statistics (Worldometers 2020) and, although actual mortality rates vary spatially and over time, these data are satisfying for estimating mortality risk. The regional distribution of this estimated mortality risk is shown in Map 2. Overall, it can be seen that the urban-rural distribution of the indicator differs between countries: while in Poland urban areas have a more aging population (while the agglomerations of these urban areas have more youthful population structure), in Austria, Croatia, Romania and Hungary rural regions have a more ageing population therefore they are more vulnerable from an epidemiological perspective. In Central European perspective, the most vulnerable regions are located in the Dalmatian and Slavonian part of Croatia, in the Alps region of Austria, in the Austrian-Hungarian-Slovenian border region (Burgenland, Pomurska and Zala County) and in Wallachian part of Romania. On the other hand, some Polish regions, Eastern Slovakia and Bucharest-Ilfov are the most resilient part of the Central Europe.

Map 2. Estimated mortality risk of Covid-19 in NUTS 3 regions of Central Europe based on age structure and mortality rates of different age groups



Data sources: Worldometers (2020); Eurostat (2021)

The health quality could be also another important factor in the resilience of the regions. The indicators used may be the incidence rates of certain specific diseases. The latter include metabolic syndrome-related diseases (hypertension, high blood fat, high cholesterol and obesity, which increase the incidence of diabetes and cardiovascular disease), chronic respiratory diseases, or cancer (Worldometers 2020). The example of Hungary shows that the health status of the population in rural areas and in districts of the inner and outer peripheries is generally worse than in urban areas. In particular, the health status of the population living in rural segregated areas is problematic (Pál 2017; Balás et al. 2020). Similar spatial patterns are likely to exist in most of the countries of Central Europe.

Finally, the accessibility of health care, the extent of available hospital capacity, is also an important issue. On the one hand, adequate testing capacities are crucial for timely detection of diseases, which (especially in the early stages of the epidemic) depended on the capacity and spatial pattern of the health care system. On the other hand, hospitals play a key role in the care of patients: the role of hospital capacity (intensive care beds,

ventilators, human resources) is therefore very important, both in terms of individual chances and the resilience of a given region (ESPON 2020; Guzzi, Tradigo, Veltri 2020; Vinci, Polidori, Polidori 2020). As many studies have shown (Hungarian examples: Uzzoli et al. 2019; Uzzoli 2020; Kovács, Uzzoli 2020), there are significant spatial disparities in access to primary health care and hospital care, with rural and peripheral areas also experiencing disadvantages. Similar inequalities can also be observed in specific areas of epidemic control: urban-rural disparities can be observed in testing capacities or even in vaccination: in the Czech Republic and Poland, the vaccination coverage of the population in urban areas is far above the rest of the country.

Spatial diffusion of Covid-19 – Over the world and in Central Europe

Spatial research on the diffusion of epidemics is of outstanding importance, as it provides information for slowing and stopping the spread of them. Research on this topic brings together the results of a number of disciplines (epidemiology, geography-regional science, network research etc.).

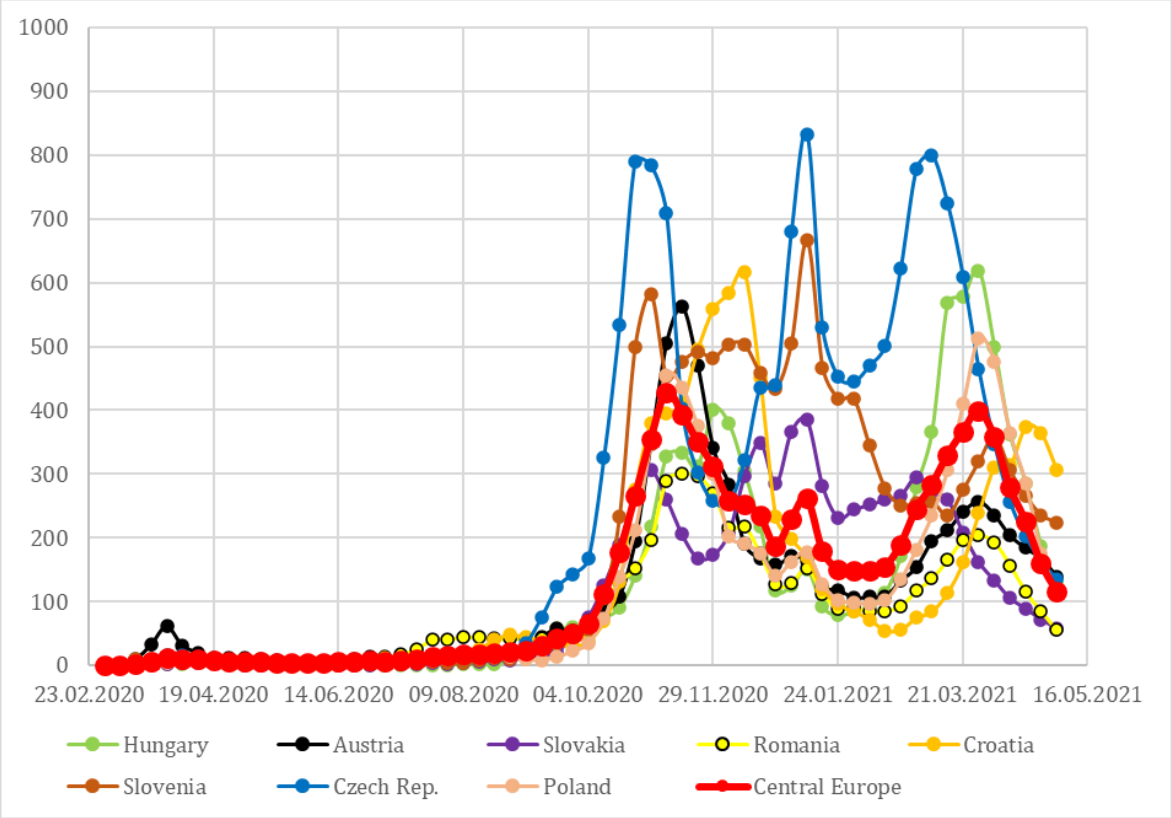
The spatial patterns of epidemic diffusion can be significantly influenced by the circumstances and modes of transmission: in the case of Covid-19, as other drop-borne diseases, the impact of human contacts and thus the mobility of people is very important. This applies at several territorial levels: at the global level, the (air) transport network (Balcan et al. 2010; Brockmann, Helbing 2013; Keeling, Eames 2005), international tourism (ESPON, 2020) and international migration (Kincses, Tóth 2020) can be highlighted, at the macro-regional level, the movement of migrant workers, and at the regional level, the daily commuting flows and urban-rural connections (Kiss 2020).

For all these varied reasons, the spatial pattern of Covid-19 diffusion was also highly variable. While it initially spread from Wuhan to other Chinese cities and then to other countries in the Far East (Taiwan, South Korea, Japan), it spread out of the region via international transport networks: this is why the major international hub cities in Europe were the first to be affected. This was followed by other large cities (usually with major airports) than smaller centres. In parallel, the (winter) tourist centres became important hotspots for infection.

In Central Europe, the first case was confirmed on 23 February 2020 (Zagreb, Croatia), followed by appears of the virus in all other countries over the next two weeks. The spatial spread of the outbreak was influenced by the above-mentioned factors: on the one hand, the outbreak first appeared in the south-west of the region, linked to the hotspot in Northern Italy (Bergamo), and then spread eastwards. Tourism played an important role: Tyrol, a major centre of winter tourism, became the first hotspot in Central Europe. Tourists, students, and commuters travelling by air were also play important role in the diffusion of the epidemic – it is no coincidence that regions with international airports

(usually capitals and other large cities) have experienced relatively early outbreaks. For this reason, the Covid-19 epidemic affected firstly urban areas in Central Europe, and only later reached the rural and peripheral areas of the region. The return movement of migrant workers also triggered several infection chains, as did daily commuting, which contributed to the spread of the epidemic in agglomeration areas of large cities and in border regions.

Figure 1. Weekly newly reported Covid-19 cases per 100.000 inhabitants in Central European countries, since 23rd February 2020 until 2nd May 2021

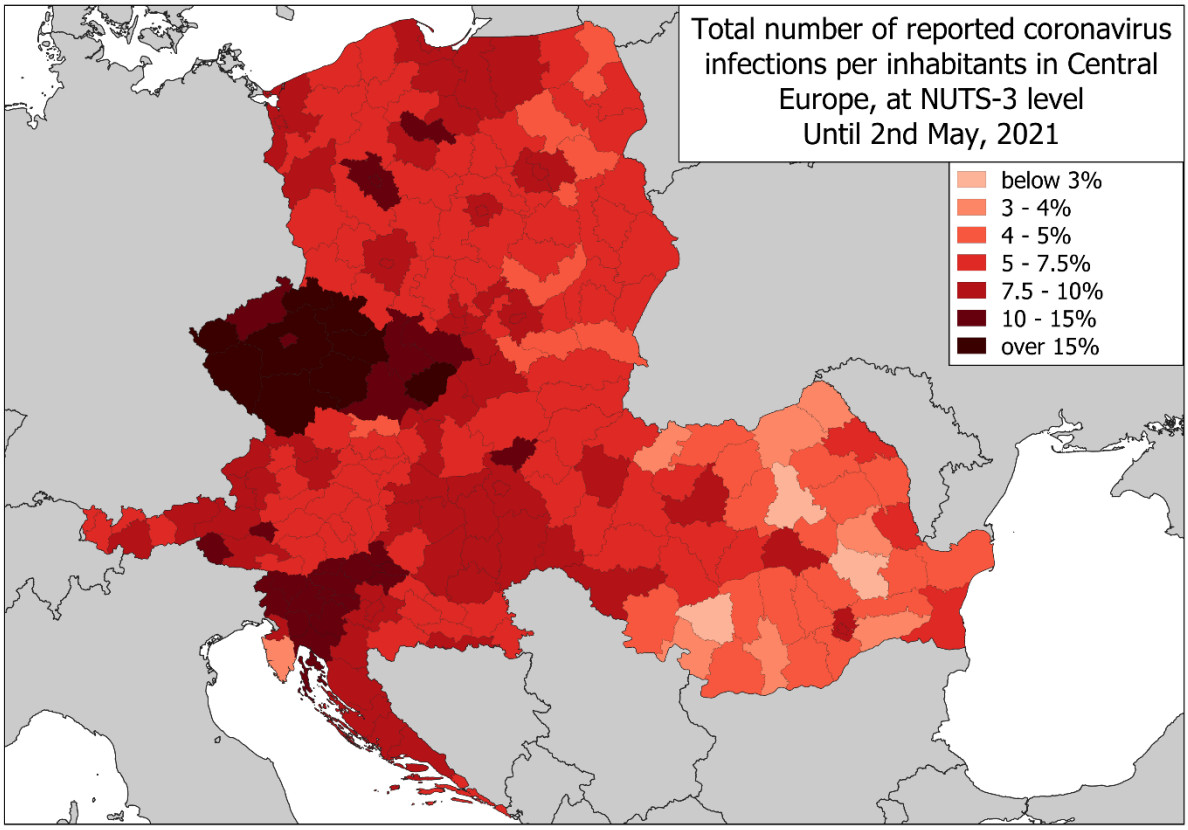


The *first wave* of the outbreak, which lasted until the end of May, caused hardly any cases in Central Europe. This is mainly due to that most countries in the region took strict measures (closing borders, declaring a state of emergency, closing certain services and shops, restricting events) early on after the virus appeared, taking advantage of the fact that the outbreak reached the region a few weeks later than in Western Europe. Only a few regional hotspots emerged, often due to poor management of the epidemic by some hospitals or nursing homes.

At the end of a quieter summer period, the *second wave* of the epidemic started in Central Europe from Dalmatia. Between September and November, the number of cases rose dynamically across the region. In November and December, the health capacity of several countries and regions was struggling to cope with the increasing number of cases requiring treatment. The main hotspots were in the Czech Republic and Slovenia, where the second wave was two-peak, because the premature mitigations.

Finally, the *third wave* began in February 2021, with the emergence and spread of the so-called British mutant. This wave is still ongoing today, with a severity comparable to the second wave in the region. Besides the Czech Republic, Hungary and Poland were hit by it particularly hard.

Map 3. Number of reported cases per inhabitants until 2nd May 2021, in the NUTS3 regions of Central Europe



Data sources: official databases of countries

All in all, by 2 May 2021, a total of 7 million 863 thousand cases had been confirmed in Central European countries, representing 8% of the total population. In most countries, there is no significant difference between the infection rates of urban and rural areas, indicating that although the epidemic appeared firstly in the cities, this difference has disappeared totally over time. Difference only in Poland and Romania is observable between urban and rural areas but this presumably due to lack and unequal distribution of testing capacities in these countries (see in Map 3).

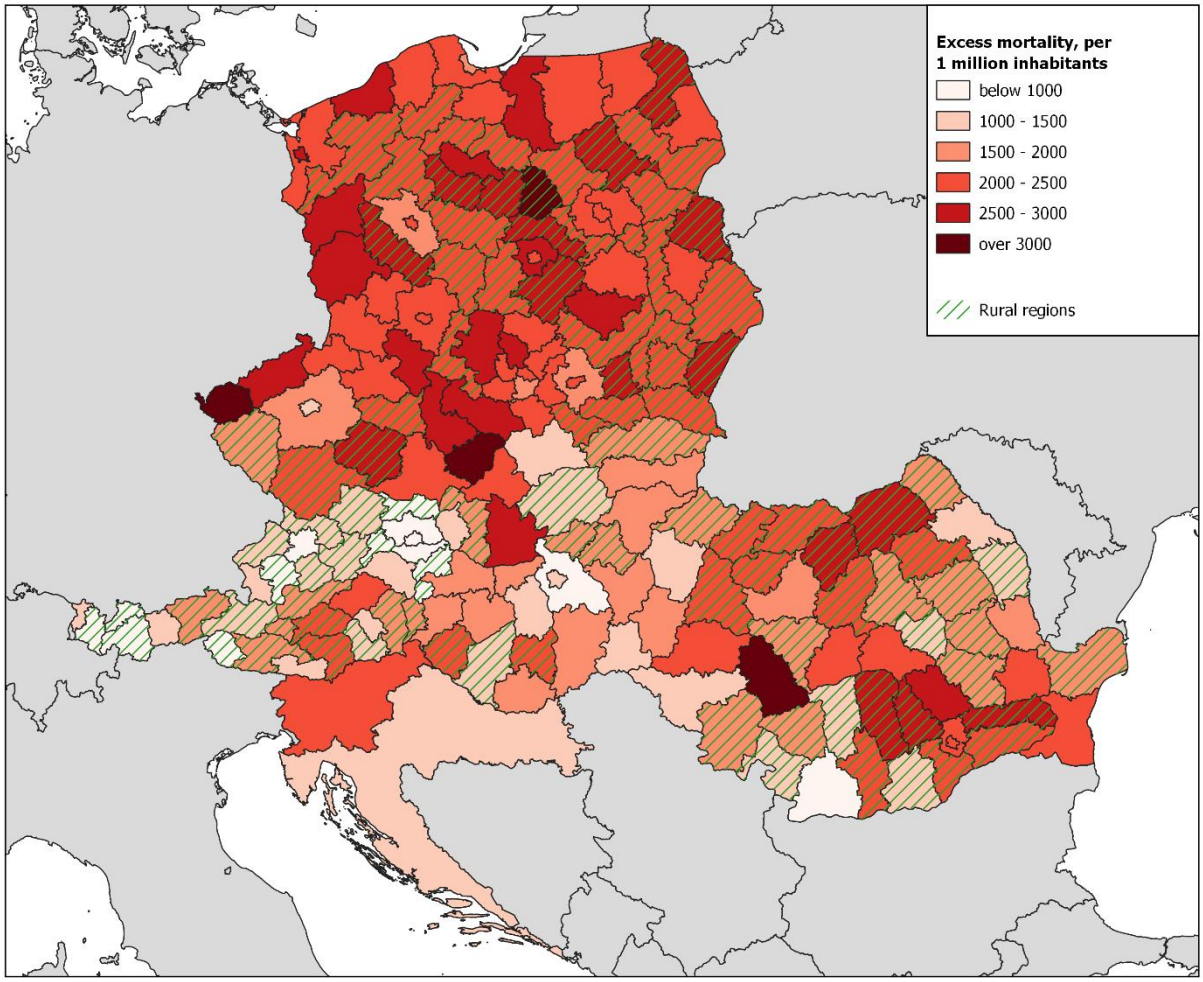
Effects of Covid-19 in Central Europe

As shown in the Methodology chapter, the impact of the epidemic on the population is presented using the indicator of Excess Mortality (both in absolute and relative measure). However, because the delaying of the data, this paper presents only cover the period of the first two waves; the third wave, which hit Hungary the hardest, is excluded from the time frame of this study. Therefore, this kind of analysis of the third wave and of the epidemic as a whole will be due at a later stage.

From the first half of March 2020 to the end of January 2021, a total of 198 thousand Excess Mortality in Central Europe. In contrast, the Number of Reported Covid-19 Deaths was 106 thousand, showing that the impact of the epidemic was higher than official statistics indicate. Poland, Romania, and Slovakia have the highest number of hidden cases, with more than double the Number of Reported Covid-19 Deaths in these countries.

Comparing countries and regions based on Excess Mortality per Population shows that which areas are the worst and least affected by the Coronavirus. In Central Europe, the Excess Mortality per 1 million People were 2018, which means 0.202% of the Total Population. Higher-than-average Excess Mortality Rates were in Poland (0.237%), the Czech Republic (0.228%), Slovenia (0.209%) and Romania (0.204%). In contrast, Austria had a particularly low rate (0.115%), while Croatia (0.140%), Hungary (0.147%) and Slovakia (0.180%) had rates between them. It is important to reiterate, that however in the period since the end of data collection (from 31st January 2021, until 9th May 2021), Slovakia and Hungary have seen the largest increases in deaths, based on the Number of Reported Covid-19 Death data, which will probably be reflected in the intensive increase in Excess Mortality data.

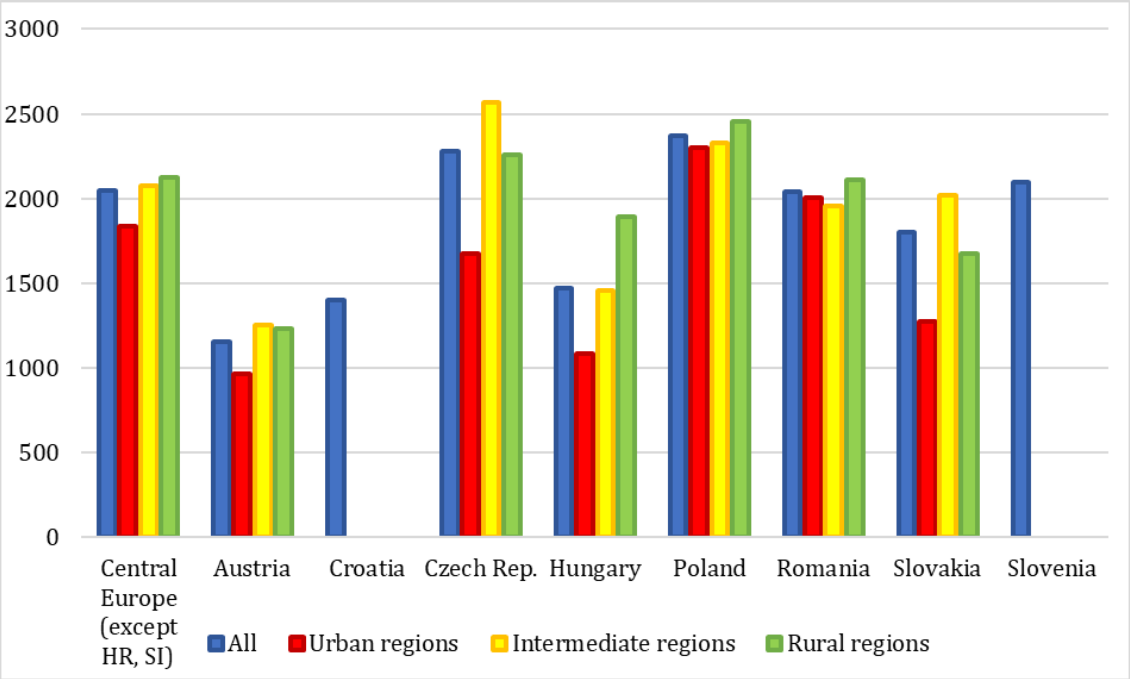
Map 4. Excess mortality per inhabitants, in the NUTS3 regions of Central Europe; since 10th week of 2020, until 4th week of 2021



Data sources: official databases of countries

At the regional level, Karlovy Vary Region from the Czech Republic had the highest value (also for the Number of Reported Covid-19 Deaths); the Excess Mortality representing 0.350% of the Total Population of the westernmost Czechian (and Central European) region. This region is followed by other Czech regions, as well as Romanian and Polish regions and the Nitra District in Slovakia. By contrast, the bottom of the list is dominated by Austrian regions and a few Hungarian, Romanian and Slovak regions. Unfortunately, no regional data are available for Croatia and Slovenia, so sub-national values are not known from these countries. The Map 4 also shows that the Excess Mortality Rate was lower in some big city regions and their agglomerations than the other part of their countries: e.g. Budapest and Pest County, Prague, Vienna and its agglomeration, Bratislava, and agglomerations of Krakow and Poznan (just the agglomerations not the central urban zones) have lower than national average Excess Mortality Rates.

Figure 2. Excess mortality per inhabitants, in Central European countries and regional types; since 10th week of 2020, until 4th week of 2021



Data sources: official databases of countries

However, similar results are obtained not only in individual cases but also on a larger scale. As for the spatial inequalities of Excess Mortality within countries, Predominantly urban regions had lower Excess Mortality Rates than Predominantly rural regions, in all countries, while the values of Intermediate areas were more varied. The most remarkable differences were observable in Hungary, Slovakia and the Czech Republic, while in Poland and Romania the urban-rural differences were more moderate (Figure 2). Overall, in Central Europe, there was a noticeable difference in the Excess Mortality Rate between urban and rural areas during the first two waves. The differences may be due to a number of special (local) reasons, but the vulnerability of rural areas (less resilient, ageing society, more difficult access to health services, obstacles to epidemic control) may played a major role.

Conclusion

In summary, the paper find that the novel Coronavirus epidemic has significantly affected whole Central Europe, but many spatial disparities were observable within it. This paper presented the vulnerability and exposure to the Covid-19 pandemic of the rural areas and compared these with other areas, using a wide range of spatial social and epidemiological data.

First of all, the paper showed that in Central Europe there are many differences between rural/peripheral and urban areas in terms of resilience and vulnerability to the Covid-19 pandemic. This is based on the slightly higher ageing rate in rural areas, the concentration of the incidence of chronic diseases relevant for Covid-19 in peripheral areas, and the fact that access to the health care system is more difficult from the rural and peripheral areas than in urban regions.

Second, related to the spread of the epidemic, it was observed that initially, in addition to tourist hotspots, urban areas were affected, thanks to the global transport network hubs being linked to major cities. This initial (and, as it turned out, not very significant) discrepancy disappeared over time, so that the number and proportion of infected people is not related to the urban-rural difference, but rather depends on the country and the national, regional, or even local measures taken to contain the epidemic. However, the main differences in incidence rate of Covid-19 are mainly found between countries, while within countries, much more moderate differences are observed.

Finally, the impact of the epidemic on society was examined using the indicator of so-called Excess Mortality Rate. It shows that, up to 31 January 2021 (the results may have changed in the period since then), Poland, the Czech Republic, Slovenia, and Romania were the worst affected countries, while Austria was much less affected. Furthermore, differences between urban and rural regions were observed: in all countries, rural areas had higher Excess Mortality Rates than urban areas.

Overall, the paper shows that rural areas in Central Europe were more affected by the epidemic, which may be related to their higher vulnerability than urban regions. Therefore, in the short term, rural areas (and various peripheral areas and also peripheral groups of society) could be an important target for vaccination and other protection measures, while in the longer term, increasing the resilience of these areas could be a priority: through the expansion of the health care network, decentralisation of certain public health functions and programmes to improve the health status of the population.

References

Balcan, D., Gonçalves, B., Hu, H., Ramasco, J., Colizza, V., Vespignani, A. (2010): Modeling the spatial spread of infectious diseases: The Global Epidemic and Mobility computational model. *Journal of Computational Science*, 1., 132–145.

Bengs, C., Schmidt-Thomé, K. (eds.) (2005): *Urban-rural relations in Europe. ESPON 1.1.2 – Final Report.* ESPON, Luxembourg

Brockmann, D., Helbing, D. (2013): The hidden geometry of complex, network-driven contagion phenomena. *Science*, 342., 1337–1342.

Du, Y., Tu, L., Zhu, P., Mu, M., Wang, R., Yang, P., Wang, X., Hu, C., Ping, R., Hu, P., Li, T., Cao, F., Chang, C., Hu, Q., Jin, Y., Xu, G. (2020): Clinical features of 85 fatal cases of COVID-19 from Wuhan: A retrospective observational study. *American Journal of Respiratory and Critical Care Medicine*, 11., 1372–1379.

ESPON (2020): *Geography of COVID-19 outbreak and first policy answers in European regions and cities. GEOCOV – Final Report.* ESPON, Luxembourg

Guzzi, P., Tradigo, G., Veltri, P. (2020): Spatio-temporal resource mapping for intensive care units at regional level for COVID-19 emergency in Italy. *International Journal of Environmental Research and Public Health*, 10., 3344.

Keeling, M., Eames, K. (2005): Networks and epidemic models. *Journal of The Royal Society Interface*, 2., 321–333.

Kincses, Á., Tóth, G. (2020): How coronavirus spread in Europe over time: National probabilities based on migration networks. *Regional Statistics*, 2., 1–4.

Kis, K. (2011): A vidék és a vidéki térségek meghatározásának európai vonatkozásai. *Jelenkori Társadalmi és Gazdasági Folyamatok*, 1–2., 105–112.

Kovács, A., Farkas, J., Perger, A. (2015): A vidék fogalma, lehatárolása és tipológiai kísérlete. *Tér és Társadalom*, 1., 11–34.

Kovács, S., Uzzoli, A. (2020): A koronavírus-járvány jelenlegi és várható egészségkockázatainak területi különbségei Magyarországon. *Tér és Társadalom*, 2., 155–170.

Pál, V. (2017): Egészségünk földrajza: Területi különbségek a hazai egészségi állapotban. *Magyar Tudomány*, 3., 311–321.

Szabó, Sz. (2010): Vidéki térségek Magyarországon, és azok főbb társadalmi-gazdasági problémái. In: Szabó, Sz. (eds.): *Társadalom- és Gazdaságföldrajzi Tanulmányok 5*. Trefort Kiadó, Budapest, 11–71.

Uzzoli, A. (2020): Health inequality and its regional distribution in Hungary with special focus on access to health care. In: Nemethova, V. (eds.): *10th Central European Winter Seminar of Regional Science*. Proceedings, Ekonóm, Bratislava, 1–11.

Uzzoli, A., Pál, V., Beke, Sz., Bán, A. (2019): Egészségegyenlőtlenség, hozzáférés, térbeliség: A szívizominfarktus ellátásának néhány földrajzi jellegzetessége Magyarországon. *Földrajzi Közlemények*, 2., 107–123.

Valanszki, I. (2015): *Vidéki térségek fejlesztését szolgáló indikátorrendszer kidolgozása*. PhD értekezés, Budapesti Corvinus Egyetem, Tájépítészeti és Tájökológiai Doktori Iskola, Budapest

Vinci, D., Polidori, C., Polidori, P. (2020): The healthcare and pharmaceutical vulnerability emerging from the new Coronavirus outbreak. *European Journal of Hospital Pharmacy*, 3., 129–130.

Internet sources

Balás, G., Csite, A., Igari, A., Lőcsei, H. (2020): Melyik magyar járásokat veszélyeztethetik leginkább a nyaralójukba leköltözők? Magas mortalitási kockázatú járások és népszerű üdülőkörzetek Magyarországon. *Portfolio*. https://hetfa.hu/wp-content/uploads/2020/04/%C3%BCd%C3%BCl%C5%91k%C3%B6rzetek_mortalit%C3%A1s_j%C3%A1rv%C3%A1ny_H%C3%89TFA.pdf

Eurostat (2019): *Territorial typologies*. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Territorial_typologies#Typologies

Eurostat (2020): *Glossary: Excess mortality*. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Excess_mortality

Kiss, J. (2020): A magyar koronavírus-térkép – és ami abból következik. *HVG – online*. https://hvg.hu/tudomany/20200408_magyar_koronavirus_terkep_jarvany_teruleti_eloszlas_adatok

KSH (2020): *Területi különbségek a koronavírus-járvány árnyékában*. http://www.ksh.hu/docs/hun/xftp/idoszaki/ter_kul_jarvany/index.html

Worldometers (2020): *Age, Sex, Existing Conditions of COVID-19 Cases and Deaths*. https://www.worldometers.info/coronavirus/coronavirus-age-sex-demographics/

CONCLUSIONS FROM DATA DRIVEN CITIES TO INDICATORS OF SMARTNESS IN VILLAGES

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ABSTRACT
Recently, broad circle of papers deals with data possibilities for city management, however, less is known about using data for rural issues or villages. Data perspective in smartness-related topics usually and primarily comes from the so-called data driven city idea, though it seems obvious that also villages can benefit from the smart data approach. In this paper, conclusions will be evaluated about how to implement urban data empirics in measuring smart performance of villages and in achieving smart rural goals. The paper introduces the digital urban and rural footprint concept, which embrace all data types that are continuously been generated during everyday digital interactions and are related to urban or rural places and activities. Such digital sources then can be used to approximate the local level of smartness or at least to measure selected components of it. As a supplement of traditional ranking methodologies and indicators, some innovative indicator ideas are presented to determine how deeply a village is integrated in the smart way of development.

KEYWORDS
smart city; smart village; data driven city; smartness indicators; smart data; digital footprint

Introduction

Data perspective in smartness-related issues usually and primarily comes from the so-called data driven city idea (Fitzgerald 2016; Bibri 2019), though it seems obvious that also villages can benefit from the smart data approach. In comparison with urban discussion, the latter issue is, however, less presented in the professional and scientific literature (Kalinka et al. 2020; Gackstetter et al. 2021). Many ideas of urban data management can be adopted for villages, but there exist specificities as well, which need to be explored and understood in the rural context. In the following, conclusions will be evaluated about how to implement urban data empirics in measuring smart performance of villages and in achieving smart rural goals.

In general, cities are nowadays permanent producers of data, which have a growing importance in urban management. As Kirby (2013) writes, "cities today are vast repositories of information, endlessly collecting and archiving data. When semantically organised, the data can be exposed, shared, and interconnected. Giving people the right kind of access to this information can spark new applications and services, new ways of

living, creating and being". This statement can also be interpreted as data is always in the background of smart urban issues, and possibly in an increasing way behind smart communities and the rural topics as well. Just to mention some sources as examples on which we can rely when talking about smart data, the urban sensors of air quality, the pollution or water quality sensory data, the movement pattern data of people, the real time traffic monitoring data, the building consumption data, or any kind of equipment tracing data can be cited among others. Of course, large cities have different possibilities compared to smaller ones, and the opportunities of villages differ to some extent. Traffic management or monitoring of air quality with IoT applications is rather an issue for larger cities, since those are attached to size related problems (more or less), but the development of smart lighting or smart waste collection can also be important for smaller communities as well. The "downscaling" of smart solutions from larger to smaller communities can, on the other hand, be beneficial in learning processes. We can also say that it is like a diffusion of smart and data driven theories from the larger to the smaller settlements, since some experiences can be borrowed from cities to villages.

Smart villages can formulate their own smart data needs, too. There are many different data driven solutions already, which are significant in rural management or decision making, and which are less frequently appearing in urban contexts. For example, satellite images can provide information on crop growth or plantation densities, smart agricultural or precision farming data can be applied in measuring farming performance, smart production and consumption data can inform locals on input-output needs in energy or farming, or vehicle trajectory data and logs can be used in monitoring movements in and around the rural area etc. Other examples also strengthen the connection potential of ICT (information and communication technologies) and agriculture. Smart aerial drones may survey the fields, mapping weeds, yield and soil variation allowing precise application of inputs. Specialised agribots (agricultural robots) may be used in weeding, fertilising, or harvesting with precision tasks and high efficiency. Sensors attached to livestock (e.g. sensors on cattle) allow monitoring of animal health and wellbeing. They even can send texts to alert farmers when a cow goes into labour or develops infection (Tagliabue 2012). Naturally, in the background of these processes a lot of data is generated, which can be uploaded to the cloud or to data stores of information systems and can be evaluated in order to support better decisions for the local people.

Digital urban and rural footprints

To better understand the data driven approach in smart development, we should step back and clarify what are digital urban or rural footprints, or what is a digital mark that is useful for a smart city or village. The widely growing diffusion of digital tools (e.g. GPS-enabled smartphones), web services or applications, which are applying or spontaneously generating spatial (urban/rural) information, may provide uncountable amount of new data to analyse social-spatial processes in cities and rural areas. Digital urban and rural

footprints are data, which are continuously being generated in daily interactions or simply during everyday usage of the information world. Such data are inherently digital and passively generated during everyday digital interactions. This huge pile of daily information (many times referred as urban big data), which was considered for a long time just as a virtual by-product, becomes valuable when we manage to connect the large variety of data, including relationships, finding recognizable patterns, and all of which can be assessed to draw conclusions. We may consider it as a real gold mine for analysts and decision makers (because of the large variety of data on shopping, commuting, traffic patterns and others). All of these provide insights both into the individual and social levels of human behaviour. One might also say that this is the industrial revolution of information (Hellerstein 2008) and we can step to an unprecedented historical era of understanding human behaviour (Onnela 2011).

When talking about types of digital urban or rural big data sources, in the first instance those of administrative origin can be distinguished, which can be sourced from state, municipal or other institutional registers (electronic health records, hospital visits, insurance records, school data, bank data etc.). Such data originally intended to support and monitor the organisation's work processes. They can be of commercial or institutional origin, resulting from a transaction between two entities (bank card transactions, online transactions, mobile payments) and, like the previous group, can be used as indirect sensors of human behaviour. However, they can also be of direct physical sensory origin (satellite images, traffic monitors, weather monitor data) or even from tracking devices (route tracking data from mobile phones, GPS devices). Data can also be achieved from online content, which provides information about people's behaviour (website visits, online searches for products, services or other types of information) or about their opinions (comments on social media) (Leetaru et al. 2013). Moreover, useful big data sources can be those in which people are the data providers themselves (community data sources, user maps), although this information is not of passive or sensory origin, but they can still be useful in calibrating and complementing other sources.

The Statistical Division of the United Nations Economic Commission for Europe (2013) recommended an initial classification of big data sources, which is worth considering. Urban and rural big data sources can be parsed, grouped, and searched in a similar way.

- Human-sourced information, or "human sensor" or "people to people" type data, which typically originate from social networking sites. These data are loosely structured and often ungoverned. Main subcategories include social networks (Facebook, Twitter, Tumblr etc.), blogs and comments, personal documents, pictures (Instagram, Flickr, Picasa etc.), videos (YouTube etc.), internet searches, mobile data content (text messages), user-generated maps, e-mail.
- Process-mediated data, or "people to machine" type data, which are typically business process related data, characterised by definite structuring, with relational database systems and metadata. Subtypes cover data produced by

public agencies, like medical records, or data produced by businesses such as commercial transactions, banking/stock records, e-commerce, or credit cards among others.

- Data from automated systems, i.e. machine-mediated or "machine to machine" type data (or data from IoT – Internet of Things), those are essentially derived from the observation of the physical world and are well structured, but their size and pace of generation go beyond traditional approaches. One might consider here data from sensors including fixed sensors of home automation, weather/pollution sensors, traffic sensors/webcams, scientific sensors, security/surveillance videos/images, as well as mobile sensors (tracking data) from cars, vehicles, satellite images or mobile phone location. Additionally, different log data (logs, web logs) from computer systems can be mentioned here.

Smart city/village indicators

All the above-mentioned sources can be used to approximate the local level of smartness or at least to measure selected components of it. Until now, a usual way of doing this was to apply traditional (namely survey-type) indicators such as the number of households with access to the internet at home, the number of individuals who accessed the internet away from home or work, the number of individuals who ordered goods or services over the internet for private use, the number of individuals who used the internet for online banking or the number of people employed in information and communication sector (NACE Rev. 2, J) etc. Those indicators are still available in traditional sources of the Eurostat Digital economy and society database, or the Eurostat Urban Audit etc.

On the other hand, an increasing number of innovative (typically non-survey type, but rather flow-type) sources are available nowadays to measure the level of smartness in cities and villages. Examples like the number of online photo uploads in the city/village, the number of locally posted Tweets in the city/village, the number of Airbnb rental locations in the city/village, the number of locally registered websites in the city/village or the percentage ratio of car/bicycle/pedestrian traffic within the local street network could be mentioned, which are derived from atypical data sources like Flickr, Twitter Streaming API, AirDNA, World Live Whois IP Source or Google etc.

To group new indicator possibilities, it is better to place them into the subsystems of smart cities/villages. There are several subsystem typologies in the literature for smart cities (villages), of those the most widely used is the one developed by the research group of the Regional Science Centre of the Vienna University of Technology, by separating 6 smart city components: economy, environment, people, living, mobility and governance (Giffinger et al. 2007). According to this a city/village can really be said to be on the right track in the process of achieving smart city/village goals if that focuses on all the above-mentioned dimensions of smartness. Also Rob Kitchin (2013) has the opinion that

smartness has components like economy (with keywords like entrepreneurship, innovation, productivity, competiveness), government (e-gov, open data, transparency, accountability, evidence-informed decision making, better service delivery, online presence), mobility (intelligent transport systems, multi-modality, efficiency), environment (green energy, sustainability, resilience), living (quality of life, safety, security), and people (more informed, creativity, inclusivity, empowerment and participation). Consequently, we also followed the six-pillar context of approaching the smart city or smart village topic.

Smart mobility is a key and easy-to-grab issue in smart development statistics. Examples like the share of car-free traffic (cycling or walking ratio) in personal portfolio or in the transportation-mix of the village, the penetration of electric transport (number of e-charging stations, vehicle-to-grid projects), traffic sharing (bikesharing, carsharing) or road safety measures (number and proportion of congestions, number and proportion of traffic accidents) can be mentioned among others. A great potential lies in data originated from location aware tracking devices, which can monitor human spatial behaviour both on the level of individuals but also on the level of the society, hence forming a good base for mobility indicators (Fillekes et al. 2019).

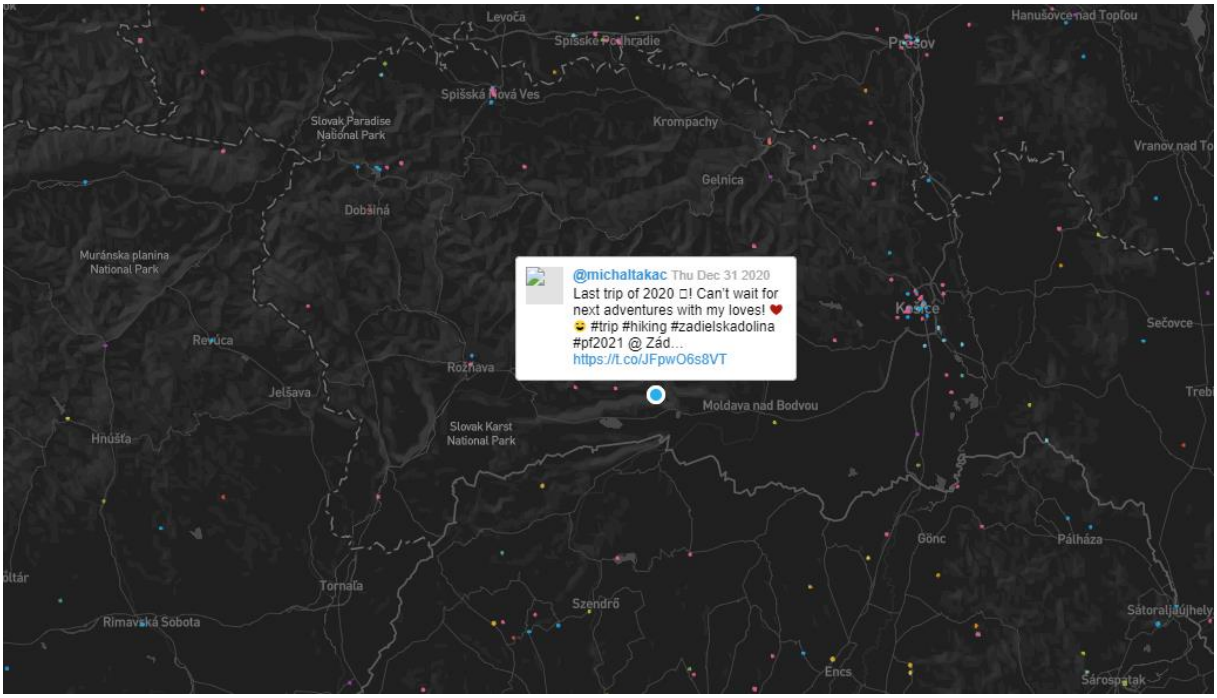
Collecting data on *smart environment* typically focuses on sensory sources like pollution measurements, energy consumption etc., but also on infrastructural development like ratio of green infrastructure or the development of smart networks (smart meters). Home automation provides great variety of localised consumption data (energy saving, lighting control, smart shading etc.) or much information about other home-related issues (smart security, smart gates etc.), which all can be used – on an aggregated level – to measure the smart performance of a locality.

The *smart economy* pillar of smart village indicators is built on the viewpoint that the smart village concept refers to rural areas and rural communities that have built their development strategy on their existing assets and strengths, as well as by pursuing some new opportunities related to new digital technologies, networks and services that support better use of knowledge and innovative solutions (Adamowicz, Zwolinska-Ligaj 2020). This is why here components like the share of ICT-related jobs and employment, the volume of R&D&I (e.g. startups), the e-economy penetration (Internet Banking, e-Commerce, Internet Shopping), the diffusion of circular economy solutions, or the penetration of precision agriculture and smart farming become important. There exist also new, but hard-to-obtain data on commercial transactions (bank card data or online cash register data etc.), which make it possible to approximate local spending profiles of customers, hence providing smart information on economic (commercial) performance (Di Clemente et al. 2018).

The *smart people* side is about how local community is inclusive of ICT technologies, and covers the local openness of people towards digital and smart solutions for example with

indirect measures of the activity in online social media platforms, or about how skilled the peoples are in participating online courses etc. An interesting and indirect example of approximating local online activity is to observe geolocalised contents on social media platforms. From social media information much can be learned about social behaviour by post-processing unstructured shared data. Figure 1 depicts results of geolocalised Twitter messages posted in South Slovakia, which were collected by using the Twitter Streaming API in late December 2020. The image reflects both the pattern of local activity or inactivity of users and their local opinion on various topics.

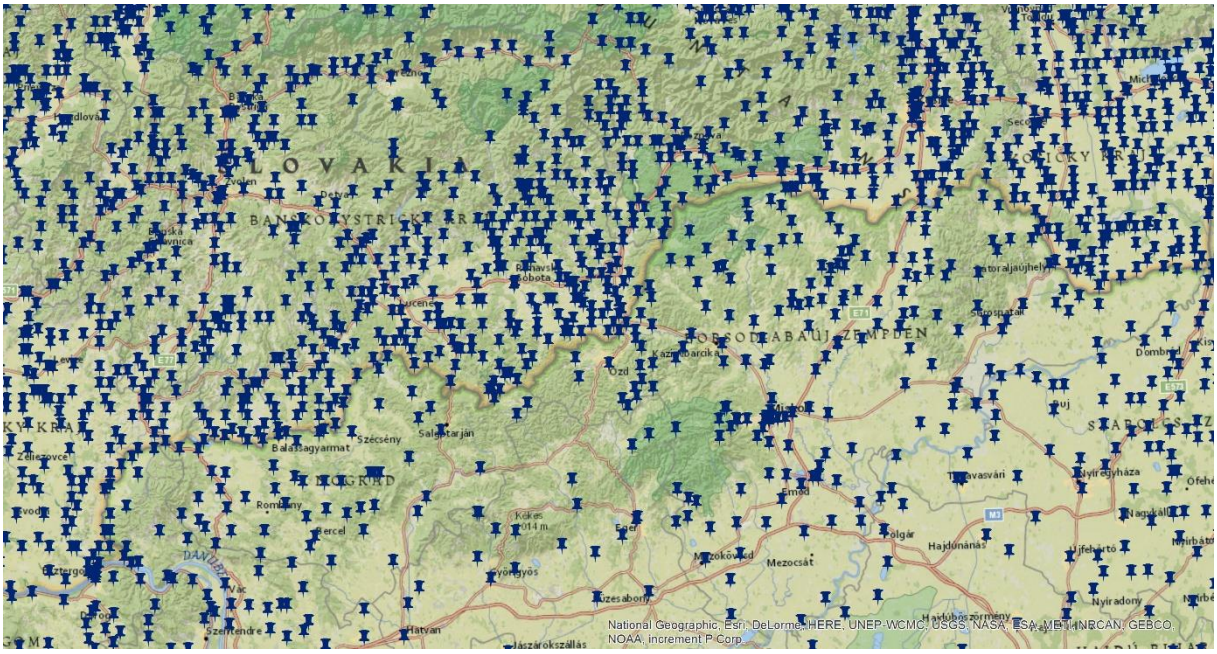
Figure 1. Location of geolocalised Twitter posts in South Slovakia
(data collected between 15.12.2020 and 01.01.2021)



Source: edited by the author using Twitter Streaming API and omnisci.com

The *smart governance* pillar of smart cities or villages can be approximated by using indicators related to local authorities' willingness to apply digital solutions. Naturally, it covers e-governance performance indicators (such as the possibility of online interaction with authorities, any kind of digitalised public administration data, open data etc.), or may include binary indicators of providing free internet locally (or the number of wifi hotspots). It may also cover simple data on online presence of cities and villages, such as the existence and quality of Wikipedia articles, or the number of Facebook likes of local webpages among others. Figure 2 illustrates regional differences of online presence of local authorities, by mapping settlements of having geolocalised Wikipedia articles. The image mirrors notable differences between the South Slovakian and North Hungarian cities and villages in this regard.

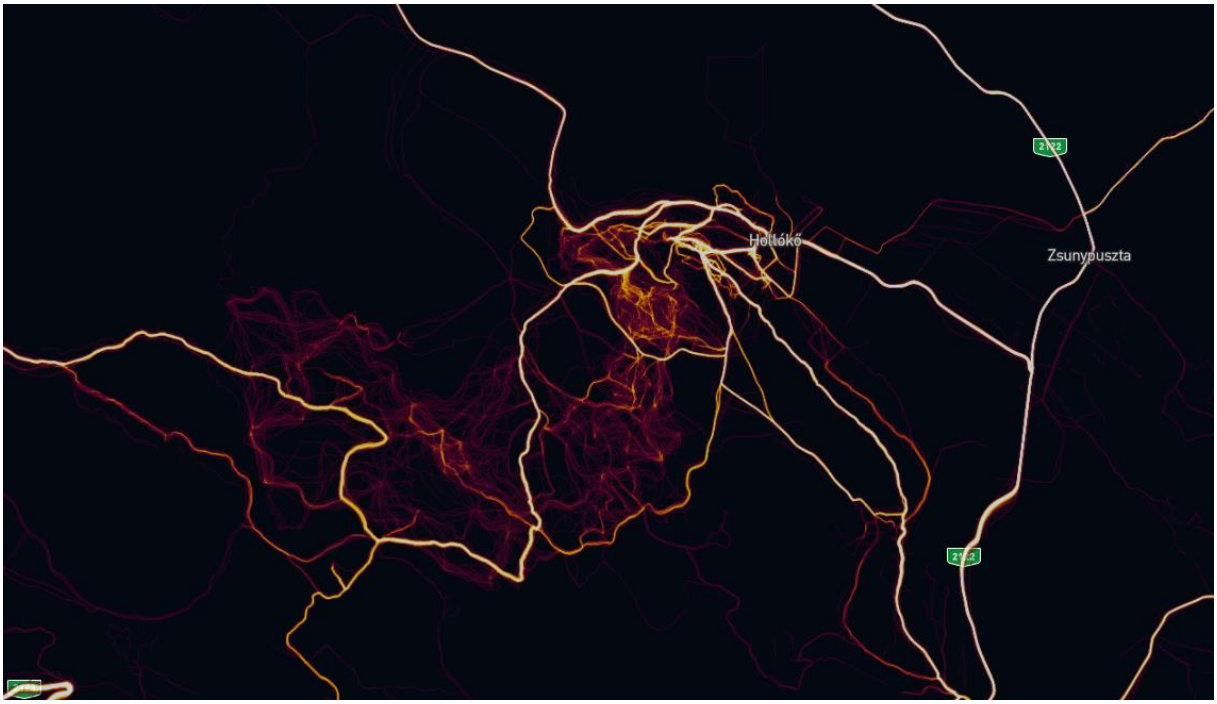
Figure 2. Location of geolocalised Wikipedia articles
in South Slovakia and North Hungary



Source: edited by the author based on Dbpedia data

Finally, the *smart living* component covers indicators reflecting conditions of the living environment and social wellbeing from data of health-related issues (like medical data, patient data, drug consumption data or data of mass sports) to social cohesion-related data (e.g. the number of e-inclusion projects), security-related data (criminal data) or tourism data (online reservations) just to mention some. As an example of how smart living-related data can be collected or applied, Figure 3 was created by using data of an increasingly fashionable sports and leisure application. The application, which can be installed on smart devices (mostly on smartphones), collects location data determined by the built-in positioning system during leisure sports activities (running, cycling). The device also records the route travelled by the athlete. If many users record their data, it will also be possible to identify local spatial trajectories and frequently visited locations of sports and leisure activities by simultaneously mapping of routes. The figure depicts leisure activity trajectories around the village of Hollókő, a UNESCO World Heritage Site in Nógrád county located in North Hungary. Here, brighter lines represent the most frequently used roads, while darker areas refer to less visited parts of the region. Images like this are based on sensory data and can be interpreted also as tools for local decision makers to understand visitor movements or spatial habits of locals.

Figure 3. Trajectories of leisure sports activities (running, cycling) near Hollókő, North Hungary



Note: thick lines indicate denser, thin lines indicate less frequently used road sections.
Source: www.strava.com (revised detail map)

Why the smart data perspective can be useful for villages?

As we have seen, each of the above-mentioned main fields of smartness can be well supported by innovative data solutions and possibly by new indicators, too. Technically speaking, to get real applicable indicators smart data needs to be transformed into smart indicators. There already exist pilot examinations on defining "smart village indicators" (Kalinka et al. 2020; Maja et al. 2020), though most of them are simple indicator sets or composite indicators of survey-type data. An innovative way could be if those were completed with new non-survey type data as well. It would give the possibility to measure smart village performance more adequately or could support ranking methodologies for novel award systems. Beside local decision support, these data can serve also as useful inputs or suggestions for official statistics just to mention one example of usefulness.

It seems, smart data perspective is beneficial for villages since "no amount of data will lead to accelerated impact, if it is not used to inform decision making. When an initiative is data driven, quality information is available to the right people when they need it, and they are using those data to take action" (Principles for Digital Development 2017). "For managers and leaders of smart villages to make effective decisions, they need to access accurate data quickly and efficiently. Data is a strategic asset for all decision-makers. This

means that you need to establish effective data systems as an integral part of the smart village system" (International Telecommunication Union 2020).

Already the European Union have recognised the opportunities of applying smart village indicators in surveying and evaluating the digital maturity of a village or rural area (European Network for Rural Development 2020). The recommendations follow the line that firstly, a usual method is used to assess the level and quality of digital resources, and then secondly it is also important to assess the digital functions that rural settlements are able to carry out both locally and within wider digital ecosystems. Such needs are very well supported by the smart data and smart indicator approach.

References

Adamowicz, M., Zwolińska-Ligaj, M. (2020): The "Smart Village" as a way to achieve sustainable development in rural areas of Poland. *Sustainability*, 16., 6503.

Bibri, S. (2019): The anatomy of the data-driven smart sustainable city: Instrumentation, datafication, computerization and related applications. *Journal of Big Data*, 6., 59.

Di Clemente, R., Luengo-Oroz, M., Travizano, M., Xu, S., Vaitla, B., González, M. (2018): Sequences of purchases in credit card data reveal life styles in urban populations. *Nature Communications*, 9., 3330

European Network for Rural Development (2020): Smart Villages and rural digital transformation. https://enrd.ec.europa.eu/sites/default/files/enrd_publications/smart_villages_briefs-smart_villages_and_rural_digital_transformation-v07.pdf

Fillekes, M., Giannouli, E., Kim, E., K., Zijlstra, W., Weibel, R. (2019): Towards a comprehensive set of GPS-based indicators reflecting the multidimensional nature of daily mobility for applications in health and aging research. *International Journal of Health Geographies*, 18., 17

Fitzgerald, M. (2016): Data-driven city management: A close look at Amsterdam's smart city initiative. *MIT Sloan Management Review*, 4.

Gackstetter, D., Moshrefzadeh, M., Machl, T., Kolbe, T. (2021): Smart Rural Areas Data Infrastructure (SRADI): An information logistics framework for digital agriculture based on open standards. In: Meyer-Aurich, A. et al. (eds): *Informations- und Kommunikationstechnologien in kritischen Zeiten*. Lecture Notes in Informatics (LNI), Gesellschaft für Informatik, Bonn, 109–114.

Giffinger, R., Fertner, C., Kramar, H., Meijers, E., Pichler-Milanovic, N. (2007): *Smart Cities: Ranking of European medium-sized cities*. http://www.smart-cities.eu/download/smart_cities_final_report.pdf

Hellerstein, J. (2008): *The commoditization of massive data analysis*. University of California, Berkeley. http://radar.oreilly.com/2008/11/the-commoditization-of-massive.html

International Telecommunication Union (2020): Building Smart Villages: A blueprint. As piloted in Niger. https://www.itu.int/dms_pub/itu-d/opb/str/D-STR-SMART_VILLAGE.NIGER-2020-PDF-E.pdf

Kalinka, M., Geipele, S., Pudzis, E., Lazdins, A., Krutova, U., Holms, J. (2020): Indicators for the smart development of villages and neighbourhoods in Baltic Sea coastal areas. *Sustainability*, 13., 5293

Kirby, T. (2013): City design: Transforming tomorrow. *The Guardian*, 18 April 2013. http://www.guardian.co.uk/smarter-cities/transformingtomorrow

Kitchin, R. (2013): *Framing smart cities*. NIRSA, National University of Ireland Maynooth. https://www.create.ac.uk/wp-content/uploads/2015/06/Rob-Kitchin.pptx

Leetaru, K., Wang, S., Cao, G., Padmanabham, A., Shook, E. (2013): Mapping the global Twitter heartbeat: The geography of Twitter. *First Monday*, 5–6.

Maja, P., Meyer, J., Solms, S. (2020): Development of smart rural village indicators in line with industry 4.0. *IEEE Access*, 8., 152017–152033.

Onnela, J. (2011): Social networks and collective human behavior. *UN Global Pulse*. http://www.unglobalpulse.org/node/14539

Principles for Digital Development (2017): Be data driven. https://digitalprinciples.org/principle/be-data-driven/

Statistical Division of the United Nations Economic Commission for Europe (2013): *Classification of types of big data*. UN Economic Commission for Europe. https://statswiki.unece.org/display/bigdata/Classification+of+Types+of+Big+Data

Tagliabue, J. (2012): Swiss cows send texts to announce they're in Heat. *New York Times*, 1 October 2012. https://www.nytimes.com/2012/10/02/world/europe/device-sends-message-to-swiss-farmer-when-cow-is-in-heat.html

ONLINE SALES OF LOCAL PRODUCTS IN HUNGARY

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ABSTRACT
Local products have become very popular in Hungary in the last 10 years. Of the parts of the short supply chain, producer markets are the most popular. In addition to markets, shoppers also want to buy a local product online. Shopping communities provide an opportunity for shoppers to buy many local products using the internet. Purchased local product can be picked up by customers once a week. Shopping communities are mainly run by non-governmental organisations in Hungary. In this study, I examine the online communication of shopping communities. The prevalence of online shopping is growing all over the world. It is important that local products are also available online. The study attempts to define conceptually the shopping community among the novel forms (Szabó 2014) of the short supply chain. In addition, it intends to present its operation in practice. The study primarily examines the characteristics of the shopping communities operating in Hungary and identifies the most important steps of the evolution of these communities in Hungarian cities. The aim of the study is to present the impact of the social media activity of the shopping communities in Hungary.

KEYWORDS
short food supply chain; farmers' market; shopping community; local product

Introduction

In the last decade, one of the most important and characteristic products of the Hungarian countryside has become the local product, which has become available to a wide range of social groups as a real movement (Tóth-Kaszás et al. 2017).

The emergence of direct sales with the element of trust in mind – and the growing interest of customers – was also followed by legal regulations. The Small Producers Regulation, adopted in 2010, offered a number of new opportunities for those interested in the short supply chain, allowing the short supply chain to be expanded with new elements and new actors.

An examination of the role of intermediaries in facilitating the relationship between producers and consumers in the short supply chain is not usually included in the studies, although their role is essential. The importance of local solutions is shown by the fact that a record number of orders were received in Hungary for certain forms of sales within the short supply chain in an emergency caused by the coronavirus.

Theoretical background

Regarding short supply chain studies, we find several country-specific studies (Galli et al. 2015; Schupp 2016; Sylla 2017; Todorovic et al. 2018; Zhang et al. 2019). In recent years, several researchers have tried to define the short supply chain in Hungary and internationally (G. Fekete 2009; Czene, Horkay, Ricz 2010; Handlerné et al. 2012; Kápolnai 2017; Ritter, Nagy, Tóth 2013; Helyi Termék Kézikönyv 2015; Renting et al. 2003, 393.; Tregear 2011; Martinez et al. 2010).

The beginning of the short supply chain was in the first part of the 20th century, until the emergence of community-supported agriculture (CSA). The roots of community-supported agriculture go back to the 20th century. It was first established in Western Europe, Japan, and North America. It appeared in Central and Eastern Europe in the 2000s. In Hungary, the translation of the name used in the United States and the United Kingdom has become a common name (Réthy, Dezsény 2013).

The most influential French AMAP economy (Associations pour le maintien d'une Agriculture paysanne), which managed to organise a network at international level in addition to France. AMAP has member organisations in many countries around the world. A farmer or community using the AMAP farming form can be said to be widespread. In the case of an AMAP farm, the farm undertakes to comply with the following principles: small-scale production respecting natural processes; maintaining transparency from the beginning to the end of the food chain; direct relationship between producer and consumer without intermediaries; long-term commitment of consumers to producers (even through contracts), thus ensuring the sharing of production risks.

Figure 1. Community-supported agriculture around the world

Country	*Name*	*Beginning*
Germany	Solidarische Landwirtschaft	1920s
Japan	Teike	1960s
United States	Community Supported Agriculture – CSA	1990s
United Kingdom	Community Supported Agriculture – CSA	2000s
France	AMAP	2001

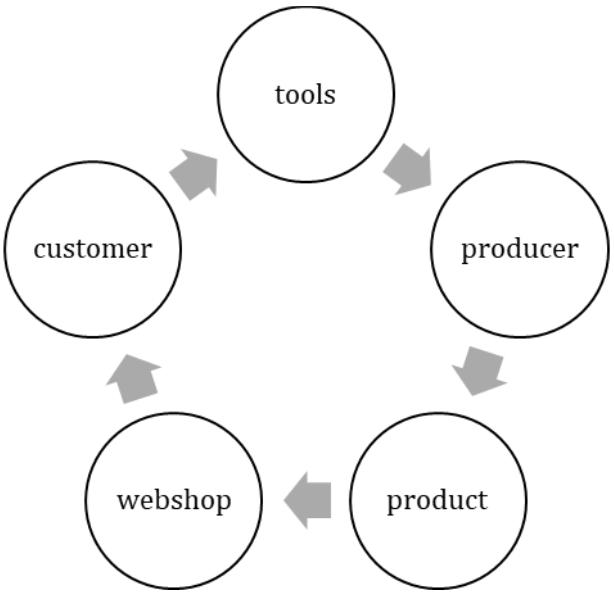
Source: Réthy, Dezsény (2013)

Defining shopping communities

A shopping community should be defined as an organisation / grouping dedicated to the development of the short supply chain that helps to connect producers and consumers through marketing and communication tools. The shopping community displays the offer and maintains a sales channel (webshop, producer market and store).

"Shopping community for us means a group of people come and cooperate together on the same goals and values and for their own demands and request they purchase food together. Members of the community can share their opinion, take part in the organisations and/or logistic task" (SZATYOR Shopping Community website). The functioning of the shopping community requires five basic factors: buyers, producer, webshop, tools, products (Figure 2).

Figure 2. Shopping communities' system



Source: Shopping community of Nyíregyháza

The legal framework for the operation of shopping communities is typically provided by some kind of NGO or religious organisation. It is important to note that under the Small Growers Act, buyers can place a pre-order. The shopping communities' website can be used to place an order. After a successful order, volunteers or employees from the shopping community forward the requested orders to the producers. Producers shall deliver the requested quantity to the place of delivery before the delivery time. The place of delivery must comply with food storage legislation, such as refrigerated storage and hygiene regulations.

Customers can usually pick up the product for 2 or 4 hours on a pre-determined time frame on the delivery day. Payment is made on-site, so buyers and producers have to trust each other. The lack of takeover was experienced only marginally by shopping communities. The shopping community can take over the product from the producer as a commission, payment is on a one-week schedule.

Interestingly, the authorities NÉBIH, NAV staff have not yet encountered a system similar to shopping communities. It seems that over time it will be necessary for the proper functioning of shopping communities to formulate terms and operating rules that can be interpreted by the authorities (following the oral communication of Ildikó Palicz). Volunteers from the shopping community put together a package ordered by shoppers, volunteer work in the case of shopping communities employs volunteers almost without exception. Major products available in shopping communities: vegetables (fresh herbs, beans, sprouts, fresh vegetables, seeds, pickles), fruit (dried fruit and fresh fruit), dairy products (yoghurt, cheese), meat (chicken, pork).

Shopping communities in Hungary operate in Budapest and populated rural cities. They work the same way. An important part of the successful operation of shopping communities is continuous contact with customers. Currently, shopping communities can communicate with customers using facebook. Shopping communities want to get customers to order a local product from the shopping community on a weekly basis.

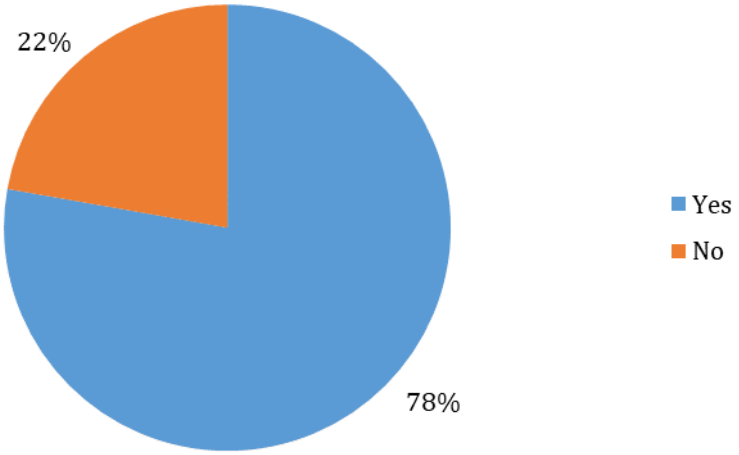
Materials and method

Shopping communities are not yet collected by official Hungarian statistics, which also shows the novelty of the phenomenon. Government bodies dealing with rural development and the agricultural economy also use a database created by a non-governmental organisation, the Association of Conscious Costumers. I gathered shopping communities in Hungarian cities with the help of social media. I conducted interviews with leaders of several shopping communities.

Results

There are 36 shopping communities in Hungary. In addition to the webshop, the primary communication interface of shopping communities is social media, and the promotion of products through customers also takes place. More than 70 percent of the communities in the Hungarian shopping community database have a Facebook page (Figure 3).

Figure 3. The presence of shopping communities in Hungary on the facebook community page (2020)



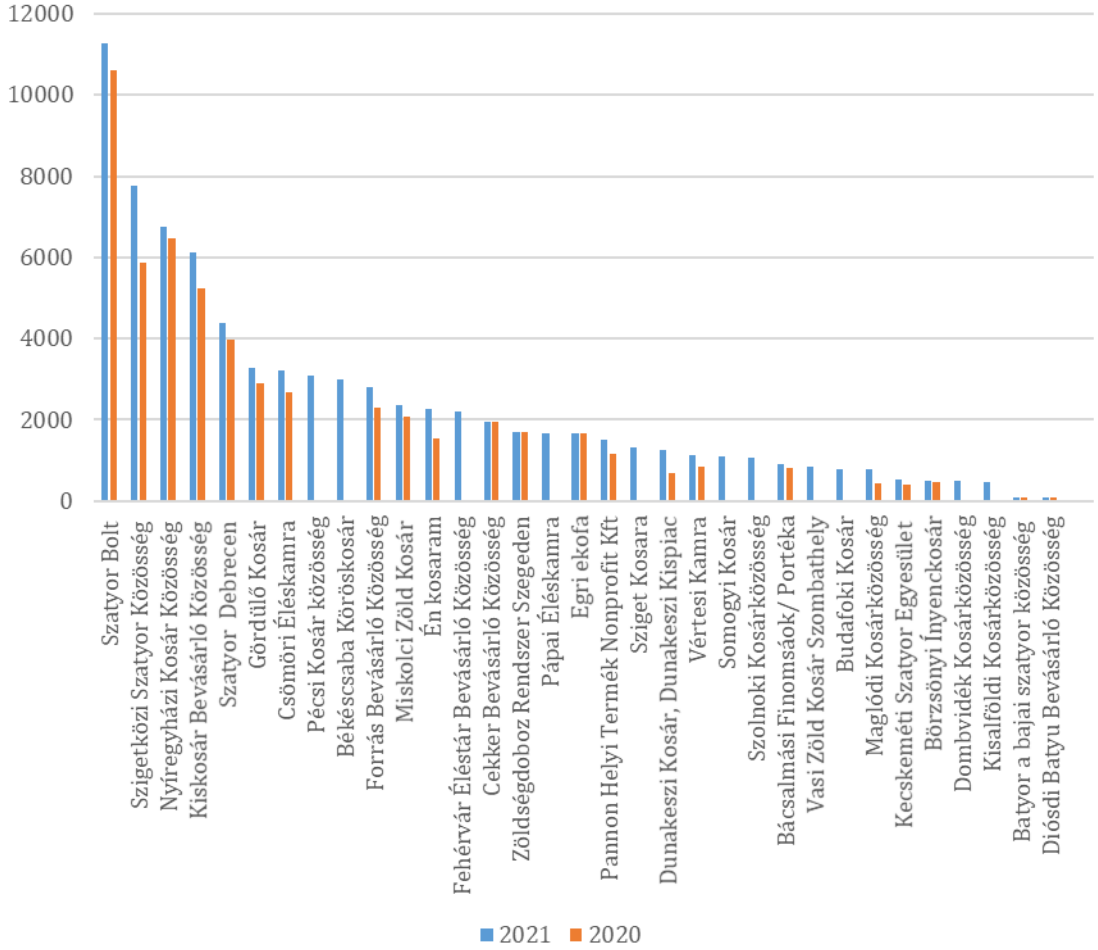
Data source: the author's collection

It is clear that the use of social media is a key element in the functioning of shopping communities. 8 of the domestic shopping communities do not have a facebook page. In order to understand how the shopping community works, it is also useful to analyse these communities with some indicators. Five of the eight shopping communities without a facebook page were founded between 2010 and 2013, so they belong to the first generation of shopping communities. In seven of the eight shopping communities, neither a functioning webshop nor an up-to-date website can be found. Without a Facebook page, there is no shopping community in Hungary. Facebook pages cannot be replaced by shopping communities.

In addition to the existence of facebook pages, their quality and the number of potential consumers and interested people who are regularly available to them are also important aspects in the operation of shopping communities. I gathered the number of fans of shopping communities with a facebook page. Knowing these, we get a more detailed picture of the appearance of shopping communities on social media. Szatyorbolt, one of the first and several shopping communities to follow the Facebook pages of shopping communities, has the most fans, which means almost 12 thousand people. The shopping community in Budapest is followed by rural centres. The second is the Nyíregyháza Kosárközösség Shopping Community, which is currently the most proactive shopping community in Hungary and is striving to promote networking. The Szigetközi Szatyor shopping community, which operates in and around Mosonmagyaróvár, and the Kiskosár shopping community from Esztergom, which also participated in the preparation of the Ministry of Agriculture's short supply chain publication, have many fans. The number of facebook fans of the four rural shopping communities mentioned above is between 4 and 8 thousand users.

The Szatyor in Debrecen, the Gördülő Kosár Shopping community in Tatabánya, the Éleskamra in Csömör, the Forrás Shopping Community in Tata and the Zöld Kosár shopping community in Miskolc have 4000 and 2000 fans on the Facebook community page. The number of shopping communities based in 2020 will reach a maximum of 3,000 people. The number of followers on the Facebook page of 14 shopping communities is less than 2,000. Shopping communities with between 4,000 and 8,000 lovers were located in county capitals or in the capital, while shopping communities with less than 2,000 lovers operate in smaller settlements (Figure 4).

Figure 4. The number of followers of shopping communities with a facebook page between May 2020 and May 2021



Data source: own collection, based on the facebook pages of shopping communities

Conclusion

Shopping communities use local interfaces to sell local products. Community communication works using social media. Shopping communities are usually located in large cities in Hungary. There was no spectacular increase in the number of followers of

social media sites during the coronavirus epidemic. Communities provide an opportunity for farmers in rural areas to sell their products in larger cities in a short period of time.

References

Czene, Zs., Horkay, N., Ricz, J. (2010): Helyi gazdaságfejlesztés: Ötletadó megoldások, jó gyakorlatok. *Területfejlesztési Füzetek*, 2.

Együnk helyit (2021): *A helyi élelmiszer és a fenntartható gazdaság*. https://egyunkhelyit.hu/helyi-elelmiszer-fenntarthato-gazdasag/

Galli, F., Bartolini, F., Brunori, G., Colombo, L., Gava, O., Grando, S., MarescottI, A. (2015): Sustainability assessment of food supply chains: An application to local and global bread in Italy. *Agricultural and Food Economics*, 3, 21

G. Fekete, É. (2009): *Helyi termékek, szolgáltatások elismertségének erősítése a Borsod-Torna-Gömör Akciócsoport területén*. http://helyitermek.btge.hu

Handlerné Makkos, D., Ónódi, Zs., Schwertner, J. (2012): Kincs ami nincs: Esettanulmány mint módszer a helyi gazdaság-fejlesztési kezdeményezések értékelésében és tervezésében. *Falu Város Régió*, 1–2., 25–32.

Kápolnai, Zs. (2017): A kiskereskedelem és a szolgáltatások térbeli jellemzői Pest és Nógrád megye aprófalvaiban. *A Falu*, 1., 59–68.

Kujáni, K. (2015) Hogyan működik a rövid ellátási lánc Magyarországon: Kistermelői élelmiszerek útja a fogyasztókhoz? Országos nyári szakmai konferencia 2015. Környezettudatosság a mindennapokban.

Martinez, S., Hand, M., Da Pra, M., Pollack, S., Ralston, K., Smith, T., Vogel, S., Clark, S., Lohr, L., Low, S., Newman, C. (2010): *Local food systems, concepts, impacts, and issues*. ERR 97, U.S. Department of Agriculture, Economic Research Service, May 2010

Rapkay, B., Illés, S., Stárics, R. (2013): A helyi gazdaságfejlesztés egyes gondolati előzményei és következményei. *Földrajzi Közlemények*, 1., 28–39.

Renting, H., Marsden, T. (2003): Understanding alternative food networks: Exploring the role of short food supply chains in rural development. *Environment and Planning A*, 3., 393–411.

Réthy, K., Dezsény, Z. (2013): *Közösség által támogatott mezőgazdaság*. ÖMKI, Budapest

Ritter, K., Nagy, H., Tóth, T. (2013): Hátrányos helyzetű vidéki térségek éshelyi fejlesztési lehetőségeik egy észak-magyarországi példán keresztül. In: Lukovics, M., Savanya, P. (eds.): *Új hangsúlyok a területi fejlődésben*. JATEPress, Szeged, 224–242.

Schupp, J. (2016): Just where does local food live? Assessing farmers' markets in the United States. *Agriculture and Human Values*, 4., 827–841.

Sylla, M., Olszewska, J. Świąder, M. (2017): Status and possibilities of the development of community supported agriculute in Poland as an example of short food supply chain. *Journal of Agribusiness and Rural Development*, 1., 201–207.

Szabó, D. (2014) A rövid ellátási láncban rejlő lehetőségek és veszélyek Magyarországon. *Acta Carolus Robertus*, 2., 1–9.

Todorovic, V., Maslaric, M., Bojic, S., Jokic, M., Mircetic, D., Nikolicic, S. (2018): Solutions for more sustainable distribution in the short food supply chains. *Sustainability*, 10., 27

Tóth-Kaszás, N., Keller, K., Ernszt, I., Péter, E. (2017): Helyi termék: Biztos megélhetés vagy keresetkiegészítés? *Gazdálkodás*. 4., 335–354.

Tregear, A. (2011): Progressing knowledge in alternative and local food networks: Critical reflections and a research agenda. *Journal of Rural Studies*, 4., 419–430.

Zhang, X., Qing, P., Yu, X. (2019): Short supply chain participation and market performance for vegetable farmers in China. *Australian Journal of Agricultural and Resource Economics*, 2., 282–306.

SUCCESSFUL SETTLEMENTS IN NORTH HUNGARY

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ABSTRACT
Since the systemic change until today there has been a strong interest in the interpretation of the positions occupied in the Hungarian settlement network. Some of the examinations handle the issue of success in a complex way, when analysing success, authors pay attention to a broader range of influencing factors at the same time. Others focus on some selected aspect of success, instead, creating their opinions about the settlements on this ground. The goal of this paper is to demonstrate, using layered questionnaire surveys the judgement of the Hungarian settlements as residential places or business locations, to describe the changes of the evaluations in time, and to make a typification attempt, simultaneously allowing the comparison with research findings on the basis of statistical data. Because of sustainable economic growth and high quality of life valid simultaneously for smart settlements, among the factors taken into consideration special attention is paid to transportation, infrastructure supply, quality of the residential environment, health services, public safety, characteristics of the housing stock and the urban policy of the municipal self-government.

KEYWORDS
success; residential place; business location; Hungary

Interpretations of competitiveness and success

The interpretation of competitiveness during a survey is not restricted to an exclusively economic approach to the concept; it is seen as a broader, more complex issue also involving social and environmental aspects (Alderson, Beckfield, Sprague-Jones 2010; Camagni 2009; Lengyel 2006, 2012). Expanding the concept of competitiveness, successfulness also seems to be a concept suitable for the comparison of the development levels of regions and cities. In Lengyel's opinion, being successful is a category broader than competitiveness and lasting for a longer duration of time: "…regional competitiveness relates to the economy of the region, the actors of its economy and the closely related social factors, i.e. a category of regional economics, comprehensible in the short and middle run and strongly influenced by market cycles and innovation waves. Success, on the other hand is a longer-term category, also including extra-economic factors like the region's society, environment, settlement stock, geographical position etc." (Lengyel 2003, 290.).

In successfulness, the importance of non-quantifiable characteristics in addition to measurable factors is emphasised by Boddy when attributing a special importance to the effective operation of local administration and the level of business services (Boddy 2002). Under regional institutional system we can mean institutions themselves, the effective system of relationship among them, the quality and efficiency of, and trust in public administration, the so-called social capital. These characteristics will probably not differ much within a country but may very much different across nations, however.

The existence of the following actual factors can make a settlement or a spatial unit successful (Cheshire 1999; Enyedi 1997, 1998; Jensen-Butler 1997):

- ability to change the economic structure (with special regard to the spread of sectors with value increasing and multiplier effect),
- high proportion of so-called value increasing sectors in the service industry (presence of high-level business and financial services, research and development, higher education, high-level cultural services),
- knowledge-based production is typical (in connection with the significant consumption of the highly qualified labour, with their above-average demand for a high-quality settlement environment, quality of life and services),
- the presence of innovation capacity and research and development is strong (chance of technology transfer),
- successful cities are cities that have power, decisions are made in successful cities, these are the places where corporate and financial centres are concentrated (concentrating thereby highly qualified employees with high incomes in the respective settlements),
- presence of strong and growing middle class (with above-average qualification and income), with favourable urban social structure (paradoxically, in practice this can coincide with significant social polarisation and emerging social conflicts),
- valuable settlement environment, adequate urban policy and provision of high-quality public services (related to the non-material needs of the population),
- successful conflict management at a level acceptable for the public opinion, with the intention of preserving the social environment,
- significant external (international) relations, embeddedness in the urban relationship system of an international macro-region (which may be occasional trade relations as well as long-term information and network relations, and the development of external relationships requires background criteria like transport junctions, airline and railway connections or hotel capacities with adequate quality and quantity),
- increasing incomes and employment, as an effect of which significant amounts of development sources are raised from locally collected taxes (provided that the centralisation of taxes by the central state budget is not excessive, as in this case gaining the sympathy of the redistributing central power forces the application of totally different methods, separating urban development and the development of the local economy from each other).

In the cases success is not an isolated phenomenon, but leads to the birth of successful regions, development axes which will bring the competitiveness of a whole country or group of countries in the long run. It is a fact that the so-called global cities work in a network, and by being active participants in the (goods, financial and economic) decision-making processes of the world economy, their development is affected by intensive external forces. Their economy is basically of service character, while their society is multicultural and strongly layered. By today a clear division line has appeared in the developed countries between cities working inside global networks and cities excluded from these networks (Enyedi 2012).

Hungarian settlements as residential places or business locations

We made a layered questionnaire survey in 2004–2005, consisting of two parts. In the first part of the research one thousand private persons responded to our questions (the five aspects taken into consideration during the survey were as follows: breakdown of the Hungarian population by regions and, within this, by settlement size categories; breakdown of the inhabitants by gender, age groups and educational attainment). In the second part of the research, we received replies from one thousand entrepreneurs and business leaders to our question (the three aspects considered were as follows: breakdown of the Hungarian businesses by regions, company size and sectors). We wanted to find the answer to the following questions: what aspects do Hungarian citizens/ businesses prefer when choosing their place of residence/ business location, which Hungarian settlements are considered successful by the respondents and why? (Koltai 2006, 2007)

In the light of the results, we repeated our survey first in 2012–2013, then in 2016–2017, allowing thereby the comprehensive evaluation of a period of ten years. In the second phase of data recording, we used the method of a layered questionnaire survey again.

Evaluation of the attractions of residential places

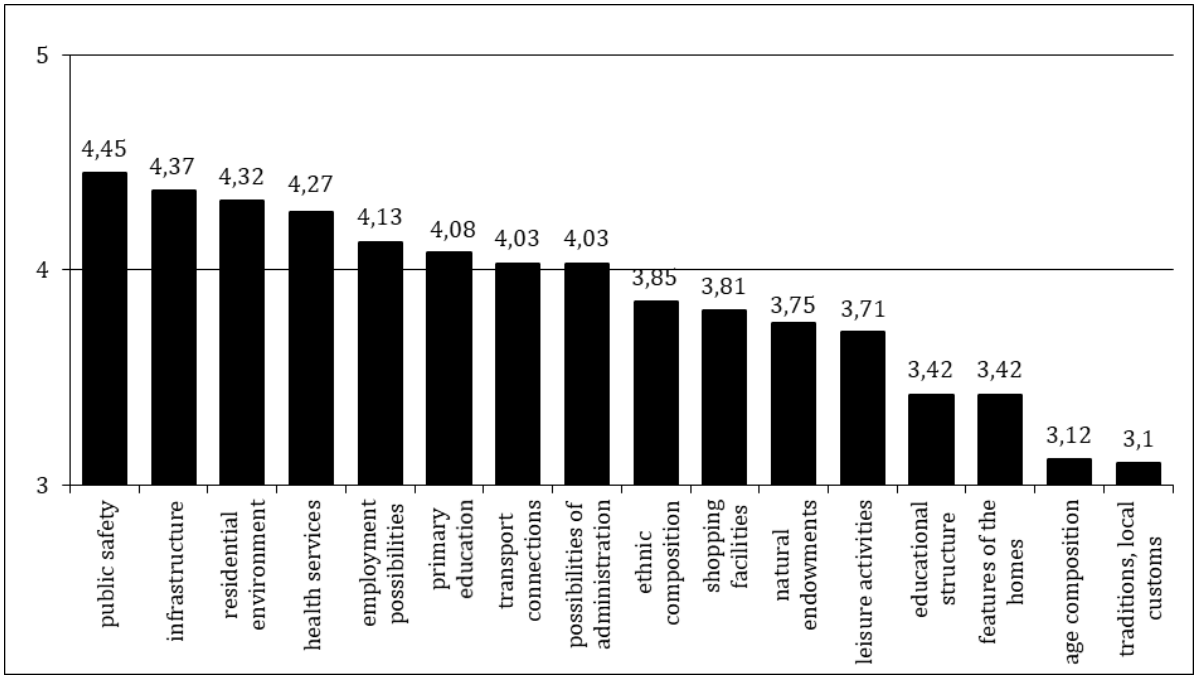
The list of factors influencing the attraction of settlements in our 2012–2013 research is as follows:

1. Complexity of health services (from general practitioner to in-patient hospital care, all services are available in the settlement).
2. Existence of kindergarten and primary education.
3. Existence of complete educational structure (institutions from primary education to higher education).
4. Infrastructure in the settlement on the whole (public utilities, roads, possibilities of mass communication).

5. Development level of shopping facilities (existence of larger shops, supermarkets).
6. Existence of the possibilities of administration (e.g. public institutions, bureaus – in addition to the mayor's office).
7. Quality of the residential environment (e.g. size of green areas, cleanliness, volume of environment pollution).
8. Natural endowments of the settlement (climate, orography, river).
9. History, traditions, local customs of the settlement.
10. Demographic features – age composition of the population.
11. Demographic features – ethnic composition of the population.
12. Existence of transport connections (proximity of national roads and railways, accessibility of Budapest).
13. Employment possibilities and circumstances (number and quality of jobs, level of wages).
14. Possibilities of leisure activities (e.g. education, culture, sports, restaurants).
15. Features of the homes (age, type and number of residential buildings).
16. Public safety in the settlement.

Based on the findings of our research conducted in 2004–2005, our first hypothesis was that attractions of still primary importance were "condition of the settlement infrastructure", "transportation possibilities", "employment circumstances", "complexity of locally available health services", and "quality of the residential environment" in general.

Figure 1. Importance of attractions of residential place,
based on the responses of Hungarian population, 2012–2013



Source: questionnaire survey of the author (2012–2013)

During the evaluation of the data of the 2012–2013 survey (Figure 1), the highest values were given to the factor "public safety in the settlement" (4.45), followed by "infrastructure of the settlement" (4.37), "quality of the residential environment" (4.32) and "complete range of health services" (4.27). On the five-grade scale, another four factors were ranked above 4 (employment possibilities and circumstances, existence of kindergarten and primary education, transport connections, and possibilities of administration). This shows that within the services of education the role of kindergarten and elementary education was appreciated (the category "educational structure", as a single category in our previous research had been given a score 3.83, this time it was broken into two markedly different parts), while the division of the category "urban functions" tells us that that the existence of administrative services and public institutions is somewhat more important for respondents than the shopping facilities within the settlement. In addition, there was a slight increase in the score given by the respondents to the quality of the residential environment and to health services.

The second group of attractions of the residential places, seen as less important, is led by "ethnic composition of the population" (3.85), the last factors in the order are, as in our previous research, the "age composition of the population" and the "history, traditions, local customs of the settlement". Compared to the previous survey, a factor slightly more appreciated was "natural endowments of the settlement", while in the category "other" it is only family relations and friendships that are worth a mention (even though with a negligible, below 2 per cent frequency).

Our hypothesis was then partially verified, as public safety as an attraction of the settlement unexpectedly ranked first.

National competitiveness rankings – Residential places

Similarly to our research in 2004–2005, the second and third question of the questionnaire allowed us, on the one hand, to make national settlement rankings, and, on the other hand, to see the characteristic features of the respective settlements, the similarities or differences of their position judged within the country or the region.

We reserved our previous hypothesis that in Hungary there is a very strong correlation between success and the position of towns and cities in the rank of the settlements, and it is still big cities in Hungary that are the most competitive. Towns and cities on the lower levels of the hierarchy may be elevated to the next level of competitive settlements by their favourable regional location or their special endowments.

The frequency of mentions given by the sample of 1,000 persons gave the following order, with two settlements from North Hungary, Eger and Miskolc (in the table only settlements mentioned in at least 5% of all responses are featured). (Further order of settlements that

reached a minimum 2% threshold are: Siófok, Kaposvár, Zalaegerszeg, Keszthely, Hévíz, Esztergom, Balatonfüred and Budaörs.)

Table 1. Ranking of Hungarian settlements as residential places, based on the responses of Hungarian population, 2012–2013

Rank	*Settlement*	*Mentioned*
1.	Budapest	823
2.	Győr	449
3.	Debrecen	395
4.	Pécs	367
5.	Szeged	339
6.	Sopron	239
7.	Székesfehérvár	170
8.	Kecskemét	129
9.	**Eger**	**110**
10.	**Miskolc**	**85**
11.	Veszprém	84
12.	Szombathely	67
13.	Szolnok	52
14.	Nyíregyháza	50

Source: questionnaire survey of the author (2012–2013)

As we can see from Table 1, the 5% threshold of mentions was exceeded by only one non county seat (Sopron in position 6), and in the top twenty there are only four such settlements (in addition to Sopron these are Siófok, Keszthely, Hévíz and Esztergom, among which Siófok and Hévíz also ranked similarly favourable positions in the 2004–2005 research).

The proportion of responses mentioning Budapest is still outstandingly high. The number of mentions of Budapest in the first place increased from the previous 410 to 624, and the capital city still definitely represents a separate category among the settlements taken as competitive in Hungary. The second group consisting of four members is led by Győr and Debrecen; the other two cities are Pécs and Szeged. A significant change compared to the survey done almost ten years ago is the above-average strengthening of the positions of Győr and Debrecen (due to which they improved their rankings by several positions), and while Szeged was able to keep its positions, Pécs and Sopron fell behind in the order. The latter city is no longer part of the respective group and now makes a transition to the three-city category made by Székesfehérvár, Kecskemét and Eger. Looking back to the data of 2004–2005 survey we can see that Kecskemét has caught up by now to the other two cities, the position of Székesfehérvár is stable, whereas Eger, as the only one among the cities in the table, was given less mentions than during our previous data collection. (We can say of course that the decline registered in the case of Eger – 8 per cent – is

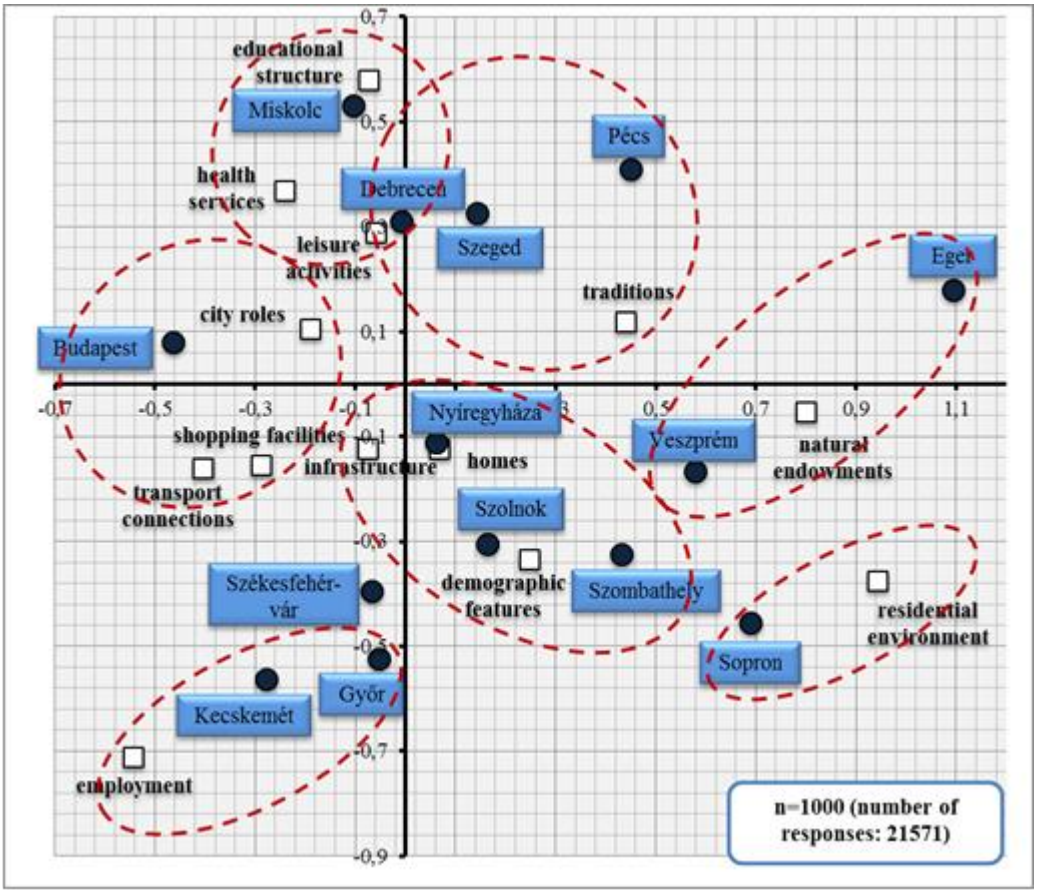
negligible, but we also have to consider that during the same period the number of those who considered Győr and Debrecen competitive doubled, and the number of mentions of Pécs, Székesfehérvár, Kecskemét and Szeged also grew by 40 to 80 per cent.) Like in 2004–2005, a separate group is made by Miskolc, Veszprém and Szombathely, together with Szolnok and Nyíregyháza.

Our second hypothesis was verified inasmuch as the next level is represented by cities and towns (in addition to a few more county seats, these are Siófok, Keszthely, Hévíz, Esztergom, Balatonfüred and Budaörs) that do have favourable regional location or other special endowments.

Assessment of the attraction of Hungarian cities as residential places

As in our previous research, we also found it interesting to look at how a town or city is assessed by respondents from all over the country, and also within their own regions. We made a time series in which we compared baseline data from almost ten years ago to the topical ones, thereby looking at the dynamism of changes. Of course, both geographical comparisons (regional opinions vs. national assessments) and the temporal ones (changes experienced since 2004–2005) make it difficult for us to create homogeneous groups of settlements. Nevertheless, we looked at the factors typical for towns and cities given at least 50 mentions, to see if the various factors showed any relation to the towns and cities. On the basis of the chi-square test (chi square=1122.6; degree of freedom=156; p-value<0.001) we found a significant correlation between the features manifesting the attraction, and the towns and cities. Figure 2 visually demonstrates the characteristic features of the correlation.

Figure 2. Correspondence map,
based on the responses of Hungarian population, 2012–2013



Source: questionnaire survey of the author (2012–2013)

Miskolc, Szeged, Debrecen and Pécs show partial overlaps, the intersection being leisure facilities, whereas educational structure and health services are stronger attractions for Debrecen and Miskolc, the history and traditions of the settlement are more frequently mentioned in favour of Pécs and Szeged. Regional characters complementing these show that Debrecen, Pécs and Szeged are judged almost the same, in fact, their regional overrating shows similarities, but the temporal survey definitely marks the improvement in the values of Debrecen most dynamically, while in Pécs several factors are already stagnating or have even worsened since the survey of 2004–2005.

Eger and Veszprém are seen as attractive mainly for their natural endowments, while Sopron is renowned most for the good condition of its residential environment. In the case of Sopron and Eger, respondents of their respective regions complement this with educational structure; on the other hand, the assessment of Eger within its own region is better. The good position of Eger in Hungary is due to two marked features: history of the city and its natural endowments. The respondents of the North Hungary added to these the educational structure, the leisure facilities, the good infrastructure of the city and the quality of the residential environment. Compared to the 2004–2005 baseline figures of

Eger we saw a stagnation of the national data, the regional assessments are somewhat better than ten years before.

Evaluation of the factors of the business locations

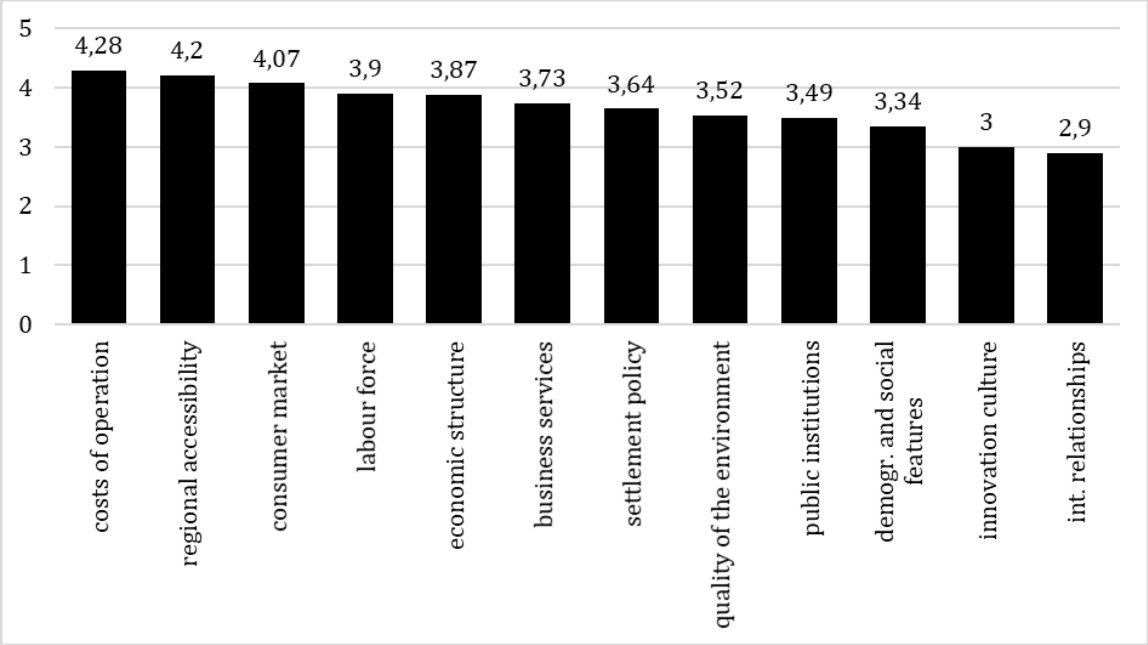
From the answers given to the first question we wanted to find out how much the location factors that we had collected were important when designating the place of operation. The aspects of our previous research were supplemented with two new factors (demographic and social endowments, the international relations of the settlement), further increasing this way the range of possible answers. We asked respondents to evaluate the twelve aspects of competitiveness below on a five-grade scale:

1. economic structure of the settlement (e.g. sectoral breakdown, connected industries, suppliers' connections),
2. innovation culture and intellectual capital potential of the settlement (e.g. research and development capacities, presence of higher education institutions, number of research institutes),
3. regional accessibility relating to the geographical position of the settlement (e.g. transport infrastructure, accessibility of Budapest),
4. costs related to operation (e.g. wages, taxes and tax allowances),
5. activity of the municipality, settlement development policy (e.g. investment policy, city marketing, conflict resolution),
6. quality of the urban environment (e.g. attractiveness of residential place, natural environment, available medical, educational and recreational institutions),
7. supply of public institutions in the settlement (e.g. public services, operation of offices),
8. business services of the settlement (e.g. banking network, industrial parks, operation of business development offices),
9. qualification of labour force (e.g. schooling, language skills, work productivity, data of labour market),
10. the settlement's current or potential status as a consumer market (e.g. consumption potential, spending power, market size),
11. the demographic and social endowments of the settlement (age pyramid, migration processes, density of population),
12. international relations of the settlement (foreign businesses and investments, twin city relations, tourism).

As our third hypothesis we expected the continued primacy of previously highly rated factors (regional accessibility, consumer market character), while we presumed that among the newly introduced aspects it would be the significance of the international relations of settlements that would be important, the latter especially for the middle-sized and large companies.

The findings of our new research show the costs related to operation are in the first place, followed by the regional accessibility and the consumer market character of the settlement (Figure 3). The next group is led by the competence and efficiency of labour force, before the economic structure of the settlement, business services, the settlement policy of the local municipality, the quality of the environment and the supply of public institutions. Factors rated as the least important still involve innovation culture, and both of our new aspects, i.e. demographic and social endowments, and the international relations of the settlement can be found at the end of the list too.

Figure 3. Importance of factors of business location,
based on the responses of Hungarian businesses surveyed, 2016–2017



Source: questionnaire survey of the author (2016–2017)

All our previous factors, with no exception, were given higher scores. A growth above the average could be seen at explanatory power of the settlement policy of the local municipality, the costs of operation, the competence of the labour force, the innovation culture of the settlement and the quality of the environment. We can state that the Hungarian businesses have become more cost sensitive in the past decade, on the one hand, and the existence or absence of skilled labour has been significantly appreciated for them, on the other hand. These changes are accompanied by the increased significance of the settlement policy activity of the local municipalities, which is visible from micro-businesses to large enterprises. Our third hypothesis was only partially verified, as the costs related to operation unexpectedly got position one in the ranking, also, the international relations of the settlements were rated as less important than we had expected.

National competitiveness rankings – Business locations

The next question was designed to collect information on which settlements Hungarian companies see as the most competitive. As Budapest represents a separate competitiveness category in the economic sense within the Hungarian urban network, the capital city was not included in the survey.

The order of the competitive countryside cities in Hungary is led by Győr, followed by Debrecen and Székesfehérvár, and then other county centres like Szeged, Kecskemét and Pécs (Table 2). Respondents indicated a total of 12 cities that reached a minimum 5% frequency of mentions, only with Miskolc from North Hungary. Győr is a category on its own, Debrecen, Székesfehérvár, Szeged and Kecskemét are slightly different from Pécs and Sopron. While the evaluation of the last two cities and Székesfehérvár was slightly worse compared to their previous positions, all three cities of the Great Plain are currently more well appreciated. Finally, a separate group is made by Szombathely, Nyíregyháza, Miskolc, Veszprém and Budaörs.

According to companies of North Hungary, the city of Győr with outstanding indices is followed not by the regional centre, Miskolc but by Debrecen, then, somewhat surprisingly, Sopron, Székesfehérvár, Kecskemét and Szeged. On then come the two county centres on the list: Miskolc and Eger. The bottom of the regional rank contains Hatvan and Ózd, whereas the third county centre, Salgótarján is not even here.

Table 2. Ranking of Hungarian settlements as business locations, based on the responses of Hungarian businesses, 2016–2017

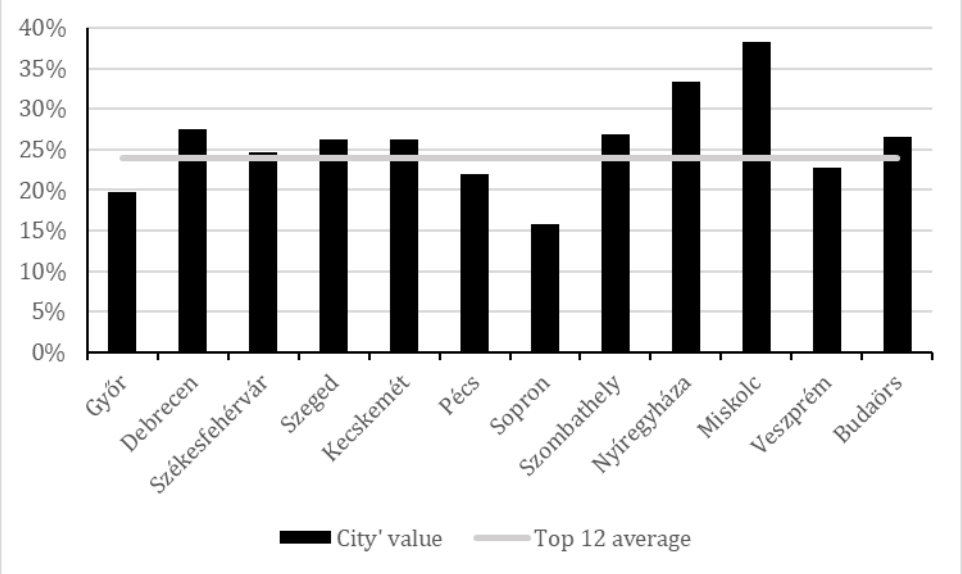
Rank	*Settlement*	*Mentioned*
1.	Győr	707
2.	Debrecen	382
3.	Székesfehérvár	360
4.	Szeged	344
5.	Kecskemét	324
6.	Pécs	269
7.	Sopron	235
8.	Szombathely	108
9.	Nyíregyháza	81
10.	**Miskolc**	81
11.	Veszprém	66
12.	Budaörs	64

Source: questionnaire survey of the author (2016–2017)

Assessment of the attraction of Hungarian cities as business locations

If the respective settlements are compared separately for all locational factors, certain positive (and of course also negative) trends can clearly be seen in the rankings, depicting this way the characteristic features and the deficiencies of the respective settlements. It must be emphasised that above-average values in this sense only indicate that a given locational factor is more emphatic among the reasons of the competitiveness of the respective settlement than it is in other settlements. We believe that the larger number of locational factors in which a settlement has above-average, characteristic feature, the more likely its competitiveness seems. In *Miskolc* there is only one factor (operation-related costs) that elevate the city above the average (Figure 4), whereas 9 other factors can be detected which serve as reasons for competitiveness much less frequently than the average. Since the survey of 2004–2005, the urban policy of the municipal self-government is gone now; the explanatory power of the favourable geographical location of Miskolc remained, on the other hand. The latter is matched with the supply of public institutions, business services, the purchasing power of the city and, as a unique feature, the adequate operational costs. For the businesses of North Hungary, the schooling level of the labour force is less emphatic than it was before. (Lux 2013 also emphasises satisfaction with the services offered by the university, and with the natural environment of the city.)

Figure 4. Assessment of the costs of settlement operation, 2016–2017



Source: questionnaire survey of the author (2016–2017)

Summary, conclusions

In Hungary, there is still very close correlation between the favourable assessment of settlements and their positions in the settlement hierarchy. It is still true that primarily the Hungarian big cities are considered as successful residential places and business locations.

The goal of measuring success in the territorial sense in my opinion is to assess the position of a given territorial unit as objectively as possible, and on this ground to look at what needs to be done for its development. It is important to realise in what a respective settlement differs from other settlements of similar size and functions, because the competition among towns and cities has many actors of similar endowments, therefore some speciality must be found. If we accept that the goal of competition is to enhance the well-being of the local residents, we can also say that the tool of successful participation in the competition is a special, but flexibly modifiable development programme based on the partnership of and operating in the coordination of local politics, businesses, the civil sector and the academic sphere; a development programme that the local stakeholders know and support as well.

Features of successful settlements may be quite varied, from flexibly modifiable economic structure through highly qualified labour force and favourable social structure right to the environment of the settlement. Those European regions have become really successful that were able to define and operate a strategy on the basis of their own indigenous endowments. Such a strategy must always be closely related to the competitive advantages of the local businesses, so first we have to explore the potentially competitive sectors and also collect the factors from which their real competitive advantages can be derived from. Regions that are incapable of making programmes on their own can only temporarily stabilise their positions, and even that usually happens from the use of some central support, only.

The goal of the research was to provide information for the elaboration of such a development strategy based on real local needs. The findings clearly demonstrate that the different parts of Hungary are not only characterised by different endowments and very diverse relative positions, but often also by population with diverse needs. Of course, we are aware of the fact that a considerable group of the attractions of the settlements is not exclusively formed by local decision-makers, and that only longer-term programmes can lead to favourable changes in many cases. Nonetheless we think that responsible development concepts that are specific, maybe concern exact target groups in the settlements and strive for long-term economic success can never neglect personal experiences, and the utilisation of them in a complex regional view.

References

Alderson, A., Beckfield, J., Sprague-Jones, J. (2010): Intercity relations and globalisation: The evolution of the global urban hierarchy, 1981–2007. *Urban Studies*, 9., 1899–1923.

Boddy, M. (2002): Linking competitiveness and cohesion. In: Begg, I. (ed.): *Urban competitiveness: Policies for dynamic cities*. Policy Press, Bristol, 33–53.

Camagni, R. (2009): Territorial capital and regional development. In: Capello, R., Nijkamp, P. (eds.): *Handbook of regional growth and development theories.* Edward Elgar, Cheltenham, 118–132.

Cheshire, P. (1999): Cities in competition: Articulating the gains from integration. *Urban Studies*, 5–6., 843–864.

Enyedi, Gy. (1997): A sikeres város. *Tér és Társadalom,* 4., 1–7.

Enyedi, Gy. (1998): Sikeres régiók. In: Kereszty, A. (ed.): *Tények könyve: Régiók*. Greger-Delacroix, Budapest, 409–411.

Enyedi, Gy. (2012): *Városi világ.* Akadémiai Kiadó, Budapest

Jensen-Butler, C. (1997): Competition between cities, urban performance and the role of urban policy: A theoretical framework. In: Jensen-Butler, C., Shachar, A., van Weesep, J. (eds.): *European cities in competition*. Averbury Publishing Company, Aldershot-Brookfild, 3–42.

Koltai, Z. (2006): A magyar lakosság és vállalati szféra lakó-, illetve telephelyválasztásának szempontjai. *Területi Statisztika,* 3., 240–254.

Koltai, Z. (2007): A magyarországi városok versenyképességének vállalati megítélése. *Tér és Társadalom,* 2., 23–42.

Lengyel, I. (2003): *Verseny és területi fejlődés: Térségek versenyképessége Magyarországon.* JATEPress, Szeged

Lengyel, I. (2006): A regionális versenyképesség értelmezése és piramismodellje. *Területi Statisztika,* 2., 131–147.

Lengyel, I. (2012): Regionális növekedés, fejlődés, területi tőke és versenyképesség. In: Bajmócy, Z., Lengyel, I., Málovics, Gy. (eds.): *Regionális innovációs képesség, versenyképesség és fenntarthatóság* JATEPress, Szeged, 151–174.

Lux, G. (2013): Kritikus tömeg alatt: A fejlesztési együttműködés lehetőségei a kisebb nagyvárosokban. *Tér és Társadalom*, 4., 52–74.

DEMAND RESPONSIVE TRANSPORT IN RURAL AREAS – EXPERIENCES FROM MULTIPLE EU COOPERATION

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ABSTRACT
Public service provision in peripheral rural areas particularly in border areas makes a real challenge for decision-makers and public authorities. In order to find efficient and financially sustainable solutions numerous EU Interreg territorial cooperation projects have been elaborated recently. The topic is now supported by a wide range and rapidly growing literature which is reviewed briefly in order to identify the key challenges and solutions of Demand Responsive Transport (DRT). The overall aim of this paper is to give a methodological overview about demand responsive transport from rural areas supported by the empirical evidence gained from real-life pilot actions. By adapting them to the local characteristics these transferable best practice solutions might be implemented in other areas with similar challenges.

KEYWORDS
demand responsive transport; DRT; rural areas; peripheral access; Central Europe

Introduction

Rural areas definition and delimitation options are not unique (Kovács et al. 2015). There are different approaches in regional planning to delimitate urban and rural areas. Peripheral areas are typically characterised by complex socio-economic indicators rather than simply locational attributes. Peripheral areas depending on their distance to bigger regional centres require larger efforts to provide general public services to their population. The own settlement structure which is today reminiscent of earlier historical and economic processes pre-defined by natural conditions makes completely different challenges in the case of some larger lonely towns or villages spread in regular distances in flat areas (e.g. inner peripheries of the Great Hungarian Plain near central sections of river Tisza or certain re-settled areas of Banat area after Turkish rule) or sparse settlements spread around predominantly hilly areas (Western Hungary's Őrség National Park area). In the case of Nógrád county, the hilly terrain favourited smaller settlements linked by few access roads. The industrialisation of processes of the 19–20th centuries was

concentrated along the main transport corridor where most of the raw materials (mostly brown coal) was minded and connecting industries developed. This paper's conference topic is focused on the remaining hilly small and micro-village areas public service and more specifically public transport problems namely the background and opportunities of implementing rural area Demand Responsive Transport (hereinafter DRT). The paper continues with a theoretical background based on international literature review and continues with pilot action experience of Peripheral Access project funded by Interreg Central Europe on-demand responsive transport in the sparsely populated rural border area of the Trieste Karst Plateau.

Literature review

Services of General Interest (healthcare, education, workplaces etc.) and basic amenities should be accessible to all including that varying share of the minority who is resident in sparsely populated areas (Lieszkovszky 2018). Compared with urban and suburban areas, provision of access is more difficult and less economic in low population density and sparse rural areas due to limited travel demand (Kiss 2012). Over the past decades of welfare states, different solutions developed over time. One possible way is to bring service into the virtual space available to anyone who has access to the internet regardless of the user geographic position. The growing number e-/tele-service of many kinds of the different public (e.g. tax administration, request of e-certificates for legal matters etc.) and also commercial (e.g. streamable movie access) and for the critical number of the aggregated needs timely adjusted food or other kinds of deliveries (or just ingredients) are becoming an option in more and more rural areas too (Litman 2018). These services can be ordered via phone in many cases but there is a growing tendency for e-self-service. Traditional states supported moving post, moving shop, or even vaccination military buses all tailored to the special needs of the rural areas by bringing the services locally for at least a certain time slot.

A recent study made by the Organisation of Economic Development Countries dedicated organ the International Transport Forum (ITF 2021) analysed different geographical rural areas around the world and distinguished direct and indirect measures to the transport operators or the residents or the general infrastructure provision (Table 1).

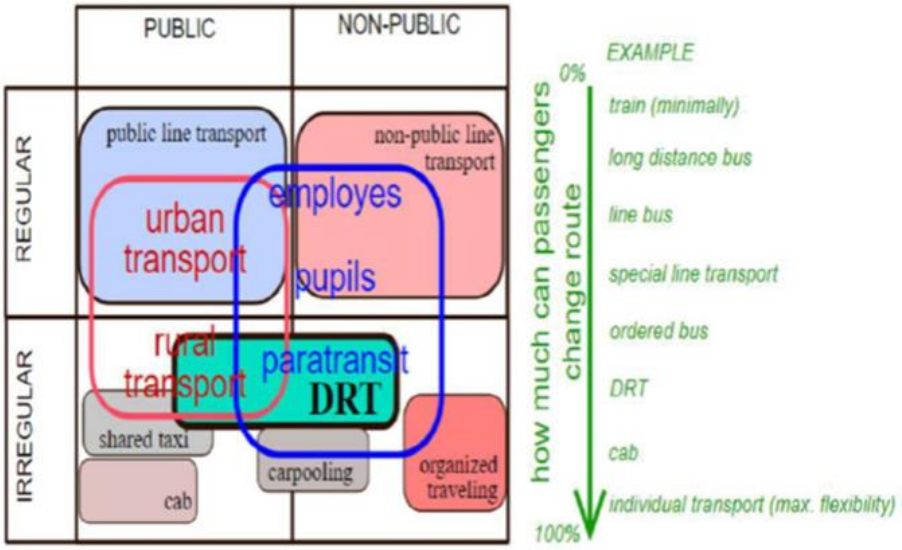
Table 1. Taxonomy measures for supporting rural areas mobility needs

	Taxonomy of measures	Support to operators	Support to residents	Support for infrastructure
Direct	Direct subsidies and discounts	Route-based compensation Operator-based support Start-up aid for airlines Capital acquisition subsidies (e.g. for aircraft used to serve remote islands) Support to loss-making state-owned or community-owned airlines or ferry operators	Passenger compensation and medical travel reimbursement Passenger discounts for children/students/elderly Fuel cards for residents Driver licencing programmes	Infrastructure funding State aid to ports and airports (operational and capital expenditure) Support to loss-making state-owned or community-owned airports and ports Cross-subsidisation within national airport networks
Indirect	Tax expenditures	Tax breaks for operations in remote areas Landing charge discounts	Air passenger duty exemption for children under the age of 12 (UK)	-
	Transfers of risk to government	Preferential loans to acquire capital Revenue guarantees	-	Preferential loans for new infrastructure
	Induced transfers and shadow subsidies	Slot ring-fencing at airports Monopoly or restricted competition on a certain route/area Exemption from licensing or competition rules to pursue freight and passenger transport	-	Provision of certain support services (e.g. Australia's Remote Aerodrome Inspection programme)

Source: OECD-ITF (2021)

Based on the official definition of the United States Department for Transport for Microtransit "[a] privately owned and operated shared transportation system that can offer fixed routes and schedules, as well as flexible routes and on-demand scheduling. The vehicles generally include vans and buses" (US DOT). Contrary to US explicitly private ownership service operator definition in Europe public transport service provision is often belongs to a publicly owned operator which can be a municipality or even a national transport operator company (e.g. Volánbusz in Hungary). It worth to note that other parts of the world market base are still often the case of Marshrutka (ex-Soviet republics) or Maxitaxi (Romania), Dolmus (Turkey), most developing countries of the Global South. The next Figure 1 shows the two main categories of being public and non-public or in other words, only designated groups can take the service.

Figure 1. Main service categories of passenger transport



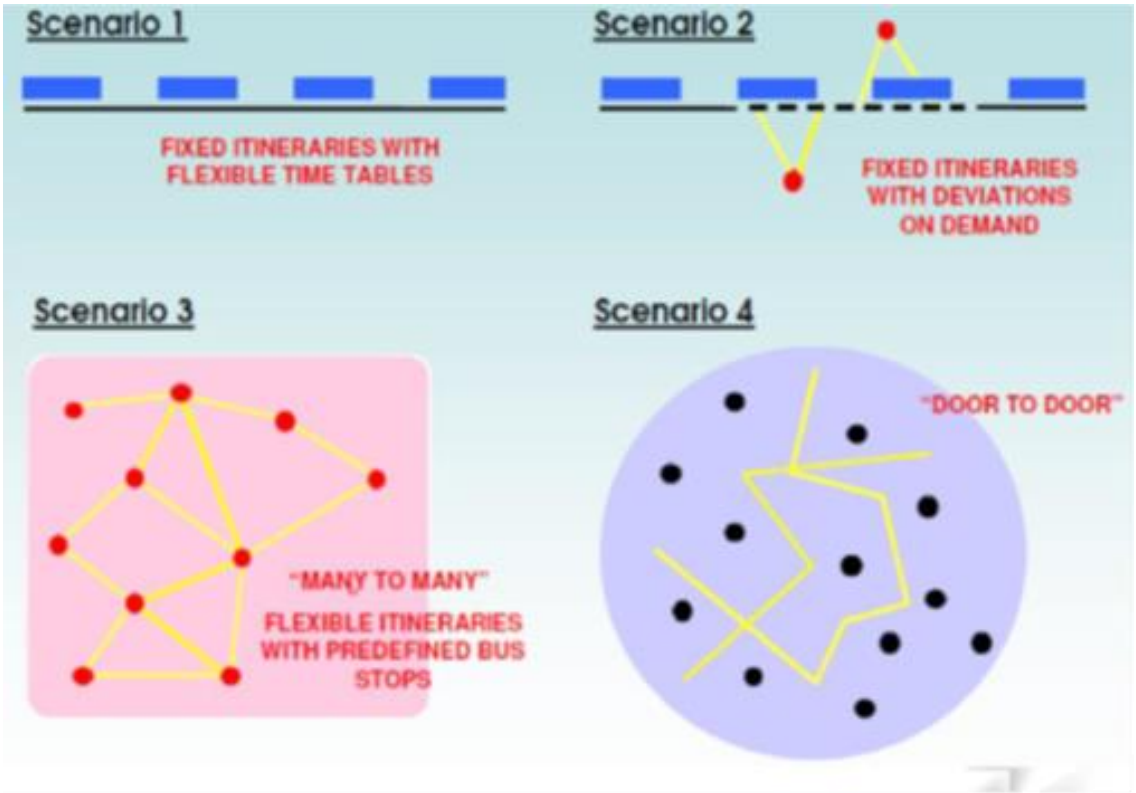
Source: Interreg CE Smacker

If we focus on the core DRT part we can define non-public DRT which is rural areas that work as a so-called "village bus" (falubusz in Hungarian) financed by the Ministry of Interior for public service purposes but only to specific social groups resident in the small- or micro village. Contrary there is a public version of this service on a much-limited scale in Hungary mostly working temporarily as project pilot actions unless a municipality (e.g. Zergebusz in Zalaegerszeg outskirts from Interreg CE Shareplace project) or the Ministry for Innovation and Technology orders and finance is based on route permission or Public Service Contract (PSC) which needed in Hungary according to the 10. § (7) Law XLI. of 2012 on Passenger Transport.

Based on the route organisation Figure 2 we can identify the following service planning options:

- Normal bus offer with facultative runs (off-peak, late hours etc.)
- Same as above plus facultative deviations within limits (e.g. on-demand to branch villages)
- Stop/pick-up point fix but schedules and routes flexible
- Completely flexible both time and operation area ("co-financed shared taxi")

Figure 2. Main passenger service planning options



Source: Interreg CE Smacker

In all of the above cases, there is a need for some form of interaction between the driver or the service dispatcher and the future passenger. The most traditional way is standing by the road or "known" points and stopping the service usually by hand signs. More advanced methods include phone call smartphone applications which are becoming more common since 2010 particularly in the Developing countries generally younger population but also the more and more digitised elderly EU rural population. Regardless of the way of ordering the service cancellation deadline has to be set at any operational terms of use as sometimes happens that the individual found other ways to travel meanwhile or due to any other reasons misses to appear at the agreed time and place.

The importance of reliability from both passenger and also service provider's aspect in rural areas where average travel distance to any point of interest is larger than in urban or suburban areas. The unnecessary runs and their direct emission is a crucial system advantage of DRT versus scheduled public transport. Their environmental role is even more important when they may prevent or shift trips taken previously by a more flexible but more pollutant private car. Typical DRT passengers are overrepresented in rural areas where other kinds of traditional scheduled normal bus capacity provision are not sufficiently cost-efficient.

Based on a comprehensive legal, policy, political/financial background assessment needed careful and time-consuming preparation is needed which may last up to two years.

They may focus on the following categories, but their categories often overlap. Table 2. shows that different traveller's group and trip purpose combinations are public or available to only a specific focus group (e.g. school bus, specific employer's bus, medical transfers, commercial centre's customers etc.).

Table 2. Demographics and trip purposes of different passenger service segments

<table>
<tr><th>Demographics/Trip Purpose</th><th>Youth
< 18</th><th>Adult
18–64</th><th>Elderly
65 and over</th><th>Persons with Disabilities</th><th>Low-Income Persons</th></tr>
<tr><td>Work</td><td colspan="5" rowspan="2">Low Potential for Flexible Public Transportation</td></tr>
<tr><td>School</td></tr>
<tr><td>Non-Emergency Medical</td><td>High</td><td>Medium Potential</td><td colspan="3" rowspan="4">High Potential for Flexible Public Transportation</td></tr>
<tr><td>Shopping/Groceries</td><td colspan="2">Low</td></tr>
<tr><td>Shopping/ Other</td><td rowspan="2">High</td><td rowspan="2">Low</td></tr>
<tr><td>Social</td></tr>
</table>

Source: Interreg CE Smacker

DRT is often treated as a local/micro-regional challenge (see Wang et al. 2015). It is often not taken into account that in many cases they are part of a bigger picture serving as feeder function can be important for long-distance travel mode choice (Alonso-González et al. 2017). In case the last mile or first-mile access is not provided there is a higher likelihood that the full long-distance trip will be done by the less sustainable private car use.

Concerning the tariff system, they can be free or per person charge for the passengers. Of course, different public or private financier interests and rare cooperation willingness often lead to shut-down the services sooner than expected particularly if the specific financier source is over (e.g. the EU project finishes).

Lessons learnt from service failures

Several reasons can be distinguished for service failures one of the main types is organisational: lack of coordination with other municipalities in the area (SMACKER project). Too ambitious service plans, temporal-spatial mismatch of travel demand, too much waiting time and other quality factors include bad service level due to informal detours and missed connections which can be significantly improved by online tracking.

Technical factors include not the right (e.g. traditional too big normal bus) vehicle deployed as the operator had no other available vehicle. In the case of smaller vehicles average cost per passenger is higher than with bigger capacity vehicles and if no innovative co-finance options are employed such as integrated small freight services (e.g. post) soon the State/regional/municipal co-finance might be not enough and due to the limited or the complete lack of market competition makes service costs high. The financial situation too can be worsened by too cheap ticket prices or free of charge service which may result in extra runs, potential cannibalisation of scheduled services if they exist for at least partially.

Volunteer community-engaged drivers in few developed countries e.g. Japan or Germany can contribute to making the operation cost lower and in some smaller rural communities, the solidarity is on a higher level than the societal average. Still the other human factor namely the difficult ordering process for those passengers who cannot use smartphone applications (if any) due to not answering dispatchers can be a service hampering factor. Spatially not necessarily local (someone might answer the call in another country or even continent) shared service centres dispatcher or customer service may offer solutions that may provide the needed support reliably and professionally.

All in all, passengers get used to a new service slowly particularly in the DRT focus groups peripheral rural areas and trust (primarily from service reliability) can be lost easily but it can be gained back only slowly if at all.

In the next chapter, a real-life rural DRT pilot service example from the Interreg Central Europe Peripheral Access project will be presented.

Lessons learnt from a DRT pilot service

SmartBus is an on-demand bus service operating on the Trieste plateau (Karst) and at the same time, a pilot action of Peripheral Access project. Within the pilot area, the focus of pilot activities was on 5 municipalities of the Karst plateau: Sgonico, Duino-Aurisina, Monrupino, San Dorligo della Valle and partially Trieste (see Figure 3).

Figure 3. The pilot area of SmartBus

Source: Interreg CE Peripheral Access

The service which represents the third level of DRT (see Figure 2) has been authorised by the Friuli Venezia Giulia Region and managed by Trieste Trasporti (the local public transport company). It operates every day of the week, including holidays, from 8:30 to 21:00 and can be booked through the website and the call centre. Two buses are deployed

to carry out the service: one operating in the western part of the plateau (between Opicina and Borgo San Mauro) and the other in the eastern part (between Opicina, Cattinara and Draga Sant'Elia). The network design includes the existing routes and stops of Trieste Trasporti. Unlike traditional services, it operates only by reservation and along a route that, from time to time, is planned according to the user's requests.

Trieste Trasporti represents the local public transport company, which is subject to regional legislation and planning. According to the Regional Public Transport Plan, Trieste Trasporti and the Friuli-Venezia Giulia Region signed a Service Agreement to deal with the provision of public transport services in the regional area. The Service Agreement includes the pricing policy. Based on that, the proposal of an additional public transport service must be agreed upon between the two bodies. Thus, Trieste Trasporti had to be formally authorised to carry out a new on-demand service by the Region. Trieste Trasporti and Friuli-Venezia Giulia Region met several times to eventually come up with the necessary authorisations to implement the pilot activities. In particular, the whole process was rather articulated, since in PERIPHERAL ACCESS not already existing (e.g. innovative) services are at stake and no previous experience exists in the whole region.

The booking system of the Smartbus is based on the selected IT platform. In particular, it can be accessed either through the Trieste Trasporti website or a dedicated call centre (which was made operational in a later stage of the pilot). Booking can be made by users up to 2 hours before departure. Confirmation is received 10 minutes after the request, displaying stop and departure time. Some additional booking choices about departure time are also provided. The booking system delivers routing and scheduling programmes according to requests. Payment methods include tickets, prepaid cards and smart ticketing systems relying upon the Smartbus mobile app.

Smartbus operations relate to a specific network design, routing and scheduling in the selected areas. In particular, as it was mentioned before, two interconnected sub-areas are identified to run the service, covering the Western ("ADD West") and Eastern ("ADD East") sections of the Karst plateau respectively. A major interchange hub is identified in the village of Prosecco. Overall, the Smartbus routing and network design include 68 stops in the Eastern areas and 199 stops in the Western ones. The service uses the existing stops and routes, but it is operative only upon requests by users.

Smartbus was provided for free until 15th September 2019 to all users. Afterwards, a fare of 2 €/run was introduced. The service remained free for annual subscribers in 2019. Users can access the service by buying tickets or prepaid cards (coupons of 2-6 €) or they can use the Smartbus mobile app (smart ticketing).

Several barriers leading to further improvements and corrective actions at a later stage have been identified from pilot outcomes so far. Overall, they refer to the need to improve

some “flexibility” features of the on-demand service by addressing several current constraints, as follows:

- The need to improve the operational synchronisation of the service at interchange nodes. Currently, Smartbus is designed to be a “feeder” service in selected peripheral and rural areas, thus, its operations must be further enhanced by optimising the management of passenger flows at interchange hubs. In doing so, some features of mobility patterns (e.g. the role of internal vs radial flows) should be further considered.
- The need to optimise the size (and overall technical characteristics) of the vehicles employed. So far, pilot activities have been conducted (indeed, the service is still operational) by employing traditional buses (10.5 meters long). However, more options must be considered in the future to optimise the performance, including mini-buses, minivans and electric options (to increase also the capillarity of the service). Indeed, some corrective actions are still in place to replace traditional buses with minibuses by this year.
- Additional options would consist of the design of a broader governance framework encompassing the integration (utilising ad hoc agreements) with taxies and car rental with driver (NCC) companies.
- The need to move on with such further options and governance schemes is also supported by some collected performance indicators (reported in this document), which clearly show how passengers’ choices and preferences should be optimised by employing smaller vehicles – which seems to be the ultimate goal when serving peripheral and rural (e.g. weak-demand) areas.
- The need to further promote communication efforts. There is the need to change users’ overall attitude (a kind of “cultural” corrective action) toward public transport, going from a supply-driven (“waiting for the bus”) to a demand-driven (“calling the bus”) approach. Despite remarkable communication efforts made during the pilot activities, some inertia is still in place by users. Further communication efforts should be made to highlight the opportunities and benefits of “flexible” solutions.
- The need to address the overall financial sustainability of proposed flexible solutions. Although reported KPIs are mostly in line with other EU and non-EU experiences in peripheral and rural areas (both in absolute terms and depending upon population size), the Smartbus service turns out to be rather expensive (which is, in turn, something in line with other experiences reported). Other similar initiatives – to be found in previous PERIPHERAL ACCESS deliverables – show ticket revenues accounting for some 20% to 70% of overall costs (thus, a rather broad range).
- Importantly, financial sustainability should lead to the development of broader governance schemes. Many similar initiatives at EU and non-EU level show how the overall financial burden of on-demand services is taken not only by public transport companies but also by relevant organisations benefiting from an

improvement in accessibility in peripheral and rural areas. They include, for instance, both economic activities (shops, restaurants, banks etc.) and municipalities. Quite often, relevant stakeholders promote associations to deal with the support of on-demand services. Some estimates show that such associations can cover up to 50% of the overall costs of the on-demand service.

- At the same time, it should be noted that such broader governance schemes face some constraints within the current regulatory framework in our areas. In fact, public transport services (of any type) are provided by the public transport company based on a regional public tender – in other words, the public transport company operating the services are selected through such a procedure. Thus, rooms to include additional stakeholders in the operations cannot currently be proposed. As such, there is a need in the future to address such regulatory issues as well.
- The opportunity to address further potential markets. Based on pilot outcomes and stakeholder meetings, some further opportunities are envisaged, including the provision of the Smartbus services to university students. The University of Trieste is located close to the selected peripheral areas and it would represent a concrete opportunity to further develop the service. Moreover, night/evening extensions – targeting mainly students – would be beneficial for the service as well. Actually, a "night bus" service is already envisaged by Trieste Trasporti in co-operation with the University of Trieste.
- The need to optimise (and revise) overall network design. Pilot activities have been performed so far by considering Smartbus as a complementary solution concerning existing services in the selected areas. A possible major revision of the role of Smartbus as a – at least – predominant choice for users in the areas should be considered. Consequent positive impacts on users' demand would follow.
- Finally, the need to further enhance cross-border synergies. Although the approval of innovative cross-border solutions between Italy and Slovenia relies upon international agreements, whom currently significantly restrict such opportunities, nevertheless operational synergies coming out from Smartbus are still in place. (For instance, cross-border users can directly access the service – e.g. at major interchange hubs – and Arriva, a major shareholder of Trieste Trasporti, operates also some cross-border services.)
- This pilot action allowed us to point out the constraints related to the bilateral agreements between cross-border countries especially in terms of "cabotage" and vehicle types. Cabotage restrictions force the passenger to cross the border; in other words, it is forbidden to board and alight in the same Country. This constraint leads to the need for doubling the services (given that national mobility cannot be served by cross-border services) thus worsening any economic assessment. Also, the main features of the vehicles are fixed (for example in some cases urban busses are prohibited). In the context of the European Union, a strong recommendation towards a simplification of international regulations (even updating existing bilateral Agreements) may arise.

Conclusion

Several policy recommendations can be drawn from the DRT service of SmartBus, eventually on different levels. On the *local and regional level*, following the official recognition of Smartbus as (the first ever) "3rd level regional public transport" and based on positive pilot results, the extension, replicability and scalability of on-demand transport solutions are recommended at the regional level – within the time horizons of the existing Regional Plan - targeting additional peripheral and rural areas (for instance, some Northern – Carnia, Eastern – Pordenonese – and North-Eastern – Goriziano – areas).

Revisions of the current regulatory framework should be addressed to allow additional stakeholders to support the development and financial sustainability of on-demand services, according to various EU and non-EU similar initiatives. Also, revisions of the current regulatory framework should be promoted to allow the coordination and integration of the local public transport company with other transport operators (taxies, car rental with driver companies) to achieve an overall optimisation of the on-demand service by enhancing its "flexibility". Such revisions would in turn represent significant and strategic policy innovations to realise a pro-active attitude of "public" mobility organisations.

Significant further communication efforts should be made to change users' attitude towards flexible public transport solutions.

On the *EU level*, despite several operational synergies still in place regarding cross-border services, revisions of the current regulatory framework for Italy-Slovenia cross-border operations in the field of public transport should be addressed to relax current constraints.

On a *thematic level*, based on pilot results and the experience gained in PERIPHERAL ACCESS by project partners, the development of "IT ecosystems" should be crucially promoted to pragmatically foster innovation in the field of public transport. IT systems (IT platforms, mobile apps etc.) are at the heart of innovation processes in the field supporting the planning (strategic level), management (tactical) and control functionalities necessary to implement innovative solutions.

References

Alonso González, M., van Oort, N., Cats, O., Hoogendoorn, S. (2017): Urban demand responsive transport in the mobility as a service ecosystem: Its role and potential market share. In: *Thredbo 15: Competition and Ownership in Land Passenger Transport* (Vol. 60)

Kovács, A., Farkas, J., Perger, É. (2015): A vidék fogalma, lehatárolása és új tipológiai kísérlete. *Tér és Társadalom*, 1., 11–34.

Kiss, J. (2012): Hátrányos helyzetű rurális térségek elérhetőségének változásai (1984–2008). In: Nemes Nagy, J. (ed.): *Térfolyamatok, térkategóriák, térelemzés*. ELTE TTK Regionális Tudományi Tanszék, Budapest, 61–79.

Lieszkovszky, J. (2018): Introduction to the theoretical analysis of social exclusion of public transport in rural areas. *Deturope*, 3., 214–227.

Litman, T. (2018): *Evaluating accessibility for transport planning: Measuring people's ability to reach desired goods and activities*. Victoria Transport Policy Institute, Victoria. http://www.vtpi.org/access.pdf

Wang, C., Quddus, M., Enoch, M., Ryley, T., Davison, L. (2015): Exploring the propensity to travel by demand responsive transport in the rural area of Lincolnshire in England. *Case Studies on Transport Policy*, 2., 129–136.

Internet sources

- https://ops.fhwa.dot.gov/publications/fhwahop16022/apb.htm
- https://uj.njt.hu/jogszabaly/2012-41-00-00
- https://www.interreg-central.eu/Content.Node/Peripheral-Access.html
- https://www.interreg-central.eu/Content.Node/Pilot-region-Zalaerszeg.html
- https://www.interreg-central.eu/Content.Node/SMACKER/06-Grasso-Level-of-service.pdf
- https://www.interregeurope.eu/fileadmin/user_upload/tx_tevprojects/library/file_1534255803.pdf
- https://www.interregeurope.eu/fileadmin/user_upload/tx_tevprojects/library/file_1584011621.pdf

INFORMATION AND LOGISTICS IN SPATIAL DEVELOPMENT

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ABSTRACT
Globalisation involves much of the world's capital, its management and operation. This mechanism divides societies, occupies a significant part of the world's territories, and neutralises nation-states in a substantial portion of its transactions. Wherever we live, we see areas avoided by globalism in crisis. This poses a challenge to Europe, to regional development strategies, including to the disadvantaged regions of Central and Eastern Europe. Basically, we assume that bringing together villages with a small market area and cities with significantly reduced functional content (in any type of combination) can create a spatial development system of any size for any size of space. Our knowledge so far is not complete. This dissertation explores whether there are opportunities to implement such initiatives.

KEYWORDS
globalisation; spatial development; indivisible information; soft space; spatial crisis; incomplete logistics

Introduction

This paper is only a good indication of how the regions of Central, Eastern and Southern Europe, which are behind the developing spatial economies created by the embedding of globalisation, should be treated. They have been living in a developmental vacuum for five to six decades and are at a severe disadvantage in terms of both economic efficiency and social equity. Today, we can see when we see the different dimensions of these "space-specific crises". Thus, they can be paralleled with the components of "new development paradigms and trends in the world". The correlations between malignancies and the self-destructive circles formed by the interactions of negative externalities can be well demonstrated. They trace back to the regenerative conditions of underdevelopment, the management of which places an increasing burden on local, state and EU governance. It seems natural, therefore, to seek interventionist solutions that eliminate the accumulated problems.

Many years of experience show that, due to its congestion, scarce EU and national governance and support practices, both in theory and in real terms, are insufficient to address the decades-long problems of "disadvantaged areas". Therefore, it is inevitable, and even a social interest, for problem-solving abilities to be activated in development,

which have remained hidden in local and regional communities, precisely because of the deteriorating conditions and disorganisation.

Our research has long focused on this direction. They would like to point out that influencing the situation of the lagging regions of Central and Eastern Europe must now be based not only on endogenous development (of course), but also on the business, market, economic, environmental and IT needs of the global world, scientific, educational, and social innovation. (Deliberately using the concept of information.) These innovations are in the II. After World War II, they reached and were fundamentally rewritten and are still rewriting the world order until the mid-1980s (warning that this knowledge also provides signals of the world's finite growth).

Not to mention the political upheaval that is attacking globalisation, we have to face the fact that transnationalism is interweaving the world and without it, effective development in neither the economy nor in society is now unthinkable.

The disadvantaged space today has only one opportunity, to climb up to global processes, or their ideals, and to describe a development trajectory in which it explicitly expresses "what needs to be done" and "how to achieve it." the economy, the society of science are unprepared. Therefore, the answer takes a long time, it takes a long time to take practical steps, and often the plans waiting to be implemented fail. Thus, apparently, there is no acceptable result.

This paper seeks to point out that there is a potential for rural outbursts. However, in order to achieve this compared to the current situation, the development integration needed to make the space marketable, and the innovation-driven transformation of the economy are needed. These, of course, present societal challenges, but with the right strategy, they can be transformed into drivers of prosperity.

So, we are dealing with a serious problem in a very tight content environment. Therefore, we keep our thoughts at a high level of abstraction and use representative concepts such as: state; space, company, country, individual etc. We want to study the micro- and macro-level tendencies and processes of spatial development through the behaviour of the representative actors of the spatial economy. First, we give an answer to the "what" question, in a theoretical approach, and second, in a practical direction, we try to explore the possibilities of the "how", and finally, in summary, we call attention to the proliferation of applications.

What should be done?

The concept of spatial development is not an arbitrary thought model. Here and around this, for decades, only one strategic goal has floated in front of everyone's eyes: real-world

companies, work and knowledge must be embedded in space (region, county, city, village) (Józsa 2016, 2018, 2019). In this respect, the aspirations of a significant part of the state and large cities are valid and their impact is indispensable (Not to mention the embedding system and the further development opportunities of the incorporated companies.). The problem is that they are left out of the embedding and are caused by their weight. Actions must therefore be focused on this direction.

Basically, we assume that bringing together villages with a small market area and cities with significantly reduced function (any type of combination) can create a development system for any size of space, in any format, whose professional task is three-way:

1. Develops a development strategy based on the economic, social, and environmental system and ensures its implementation.
2. The space considers the active participation of the population in the development work to be fundamental in the development of the community (learning by work).
3. It shall do so in the widest possible cooperation with the State and the EU.

The basis of the assumption: the integration that forms the basis of spatial development does not violate the general competence of the participating local governments, companies, schools, institutions, their participation affects the scope of the economic development mandate. In the light of these ideas, some professional pillars of regional development – integration as a subsystem – are characterised.

1. System operation and income generation (Increasing wealth locally and jointly)
You have to accept unusual things. The specificity of space is that it defines its structural relations itself. If you have the power to set preferences and turn them into activities to achieve your development goals, you have hopes of survival. If it is not, it will be ruined. Today, most of the disadvantaged regions of Central and Eastern Europe, almost immeasurably, live in such economic conditions. Their fate depends solely on the carrying capacity of state and EU support systems. System- and community-based thinking and action are of a low standard, and the area is pulled by the centralised application system. Science has a huge debt to clarify the issue of a viable rural space (Arrow, Marshak, Savage 1951; Kornai 1999; Carver 2018).

2. Cooperation between public administration and the private economy
A significant obstacle to the development of space is the one-plane rigid functional arrangement of public service organisations (municipalities). The spatial economy in the modern system requires primarily local governments to acquire and copy corporate practices, especially in order to increase joint developments, market collaborations and joint project activities. It is in the common interest of the units of the economy and the local governments to expand the network development and increase its size. There is little progress in this area. There is a significant difference between municipal and corporate

efficiency. This "gap" can later be considered as a significant intellectual reserve (Robson 1997; Józsa 2019).

3. Institutionalisation of local spatial development management

The results of our research and the ongoing "Smart Community" part of the tender prove that the fragmented settlement systems, with their help, are able to cooperate in the development of serious strategies, if they see the hopes for their implementation. The possibility and the need to organise regional co-operation are given, but we have to face the realities of the current conditions. This calls for the simultaneous rehabilitation, catching up and development of the economy and the transformation of local society. All of this requires strong government and EU support and a high-capacity intellectual background. According to local hopes, there are basically two obstacles to this program:

1. Successful solution of the socialisation of the new world economic spirit and approach
2. Financing future developments

The organisational issue of the institution can be traced back to the previous ones. Namely, how their leadership positions can be distributed among the interested organisations and how the changes should take place over the time horizon, since we are talking about essentially different levels of local governments. At the real level, most of the spatial development is work-oriented. Of course, the question also arises as to whether the central structure and management of the institution should be provided by an external professional organisation.

4. Market

The biggest challenge for future development is to create marketable structures. This means that space must operate in three basic segments: global; state and local (internal) market. For these, adaptive strategies need to be built. Special marketing skills are lacking. These spaces must not be at risk. So, any development must provide market security in order to meet financial obligations. The foregoing indicates that space is also a market player as an intermediary and as a real factor.

5. Information, logistics

There are two basic backgrounds to spatial development. The lack of knowledge of qualitative information in both disciplines is a serious shortcoming. Today, this is indirectly absolutely lacking in the younger generation. Incidentally, it is also a major obstacle to the spread of digitisation. (model, structure, organisation, individual, decision). The potential of logistics is essentially unexplored in disadvantaged areas. It can be assumed that the future of spatial development will be greatly supported by a new kind of interdisciplinary research-user approach.

We consider "what" thoughts as a conceptual proposition. The detailed background is set out in the next chapter, "how to implement it". (The ideas are based on the fact that four

Hungarian regions are among the poorest in the EU. NUTS2; GDP-based settlement measured in purchasing power parity.)

How to achieve spatial development through network governance of villages and towns

Thus, we assume that bringing together villages with a small market area and cities with significantly reduced functional content (any type of combination) is capable of creating a development system for any size of space, in any format. In the following, we review four essential sets of approaches. In fact, it illustrates the process of creating a spatial development system:

1. Space delimitation
The delimitation of the space is done by a community, in this present sense the local governments, as the members of the community decide on the purpose and object of the cooperation. In this case, a groundwork study is required, determined by the needs of the collaboration. This study is a fund that essentially informs about the spatial feasibility of potential business transactions (Ocskó 2019; Carver 2017; Szabó 2019).

Spatial delimitation is a diverse option because a municipality can participate in a wide variety of collaborations. In spatial development, borders can be formed by the co-operations of public administration areas, these can be called hard spaces, at the same time sets of areas can be created which, as part of different public administration spaces, can be called soft spaces (Salamin, Péti 2019; Lados, Barsi 2011; Nemes Nagy 2016).

2. Systematic spatial development
The community of spatial development cooperates with the state, the EU, companies, other states, schools etc., but also cooperates with its own members in order for the development of the Space and its economy. This development is not an end in itself. The overriding goal of development is to continuously increase the income of the population, the village, the city, the county etc., which is due to the increasingly complex work and organisation. This is called simply to ensure an increase in living standards. Thus, in order for this desire to be fulfilled, all members of the world economy today must understand the code of work and external and internal relations (information paradigm shift; knowledge). This code: the system and the information behind it. So, it is an essential tool of value production, without which successful spatial development cannot be achieved.

We do not perform a complex system analysis, we only want to show the strength of the system. When we talk about the basis of the spatial system, the system of the spatial economy, we have to face the fact that it has preferences, more simply, it has goals and there are many of them. If these are to be addressed, models need to be built and tested to see what the operation of an economy costs and whether the spatial system can finance

it. The essence of the system is that it can calculate the corresponding expenditure needs for each goal and is able to decide to what extent it supports the implementation of each application. If we examine the spatial system itself, we can conclude that

- the number of subsystems the system will have, the more appropriate monitoring it will have,
- the subsystems operate according to the rules of the system,
- this decentralisation is maintained by information because people have finite capacities to gather and process information, so
- increasing information processing means increasing staffing and costs

Thus, in order to understand the essence and purpose of spatial development, it is necessary to know the most important connections of the spatial system as a whole. In this topic we use different sciences, different subjects. As a general management principle, we apply the diversity of behaviours related to the optimal allocation of resources, which is well known in economics.

First, "[w]e assume that we are looking at an economy whose goals are well defined and operate within a system. We therefore assume that the preferences of the economic system can be incorporated into a utility function that depends on the output of goods (goods in a broad sense). The available primary resources, for a given technology, limit the various possible output combinations to a certain extent. The task of optimal resource allocation is to select from all the permitted combinations of production processes the one that maximises the benefits available to the economy" (see Arrow 1960; Sadovsky 1974; Bertalanffy 1950; Simon 1982; Dawn 1973).

Maximising the utility function of an economic unit (economic system) is a calculation task, which is also an evaluation of one's own operation. Of course, we know that all this presupposes the connection between the operation, the organisation, and the related IT processes.

Secondly, what has happened so far has been the foundation of market access for the system. The market process competes with economic agents, performs resource allocation decentralisation, and creates balance in the Pareto sense. "At each step of the gradual approach to market processes, each entity modifies its experimental production plan to use only current experimental prices and knowledge of its own technology as information. However, changes in experimental prices depend only on aggregate demand and supply. These are simply the sum of the production (and consumer) plans of each company, plus the original existing offerings of basic resources. Thus, the information required by issuers and consumers consists solely of their own technology and utility functions, as well as their prices, while price changes are solely individual decisions. The virtue of decentralisation is precisely to minimise the information needs of all those involved in the economy" (Walras 1954; Pareto 1927; van der Wee 1984; Hurwicz 1954; Samuelson 1947; Arrow 1960; Kornai, 1982).

These so-called basic laws are of great importance to space because they create the primary market resource allocation of all local economic actors, thereby giving the local population an income (simplified: wages and state redistribution). This vulgarly means it is good to live in spaces where there are many well-functioning economic units, and this increases the income of the population as well as the sustainability of the space.

The market regulation of spatial economies operating according to a utility function has been gradually transformed since the 1970s. Due to the unequal development of space, the allocation of secondary market resources on the information ground is developing more and more strongly. This is able to divert the allocation of resources belonging to the Pareto optimum of the primary market balance in favour of the region, above all on an IT and social basis. For spatial development, especially in disadvantaged areas, this means that information has become the most important tool for development. Information in the strictest sense of the word means knowledge. In practice, secondary market instruments are used as incentives as an additional resource. Some well-known tools: application; aid, soft loans, installation of new productive investments, business development etc. With their help, those who can get it avoid the ruthlessness of primary market competition to some extent. This opportunity gives less developed regions an equal chance to develop. All this draws attention to the importance of spatial development (see Paróczai 2001, 2002, 2003, 2004, 2013; Arrow 1973; Frisch 1962; Van der Wee 1984).

So far, attention has been drawn to the fact that the spatial economy is in fact a system competing in the market, with a mindset more similar to that of the private sector than the established "we live for the population but have no money because they do not give" self-government practice. They confirm that the municipal leadership needs to be transformed:

- systematic practice should be increasingly reflected in the work of local government organisations,
- there must be a rapprochement between the private and public sectors,
- management must manage the transition and
- must operate according to a "quasi-utility function".

The co-operation of disadvantaged areas is spectacularly necessary only if the collaborators are able to build a system model in which continuous experimentation can be carried out to see what development would take place in the increased space. There are four basic elements to a system that promises more investment and greater efficiency.

1. Purpose

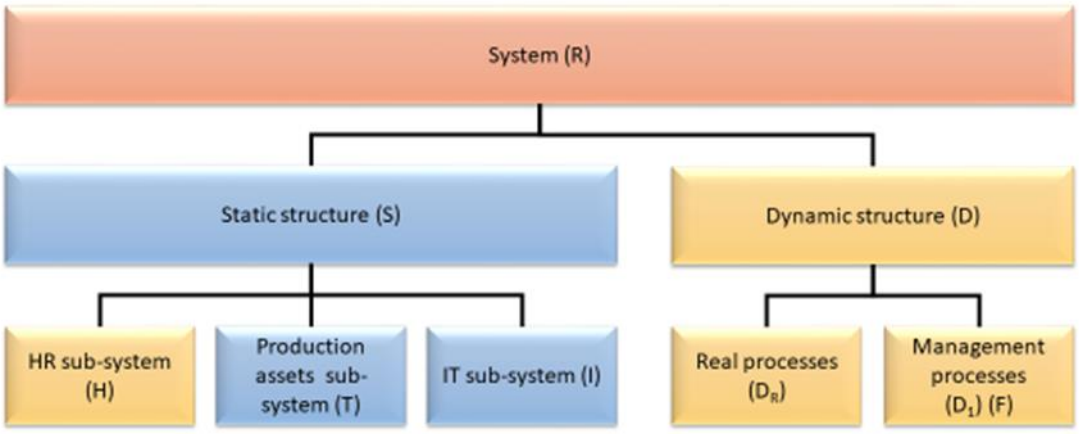
It formulates the qualitative and quantitative values of the environmental connection of the system and the challenges of the internal operation. It takes many forms. Its significance is much greater than is generally assumed. This is especially true in a morally declining area where doubt is a ground state (Frisch 1974).

2. Structure

Based on the above, a formal description of the room for manoeuvre is not a problem. Suppose that the space economy has a quasi-utility function that, of course, depends on the outputs of the system, called Y. The quantity and quality of the emission depends on the available primary resources, it represents a certain technical standard, this is illustrated by the state E = {H, T, I}. H stands for human, T for means of production, I for IT resource sets. Denote by D the set of process combinations that the system can produce depending on the state of the primary resources. Naturally, the spatial system has a control function that is able to select the process combination that is optimal for the purpose in order to achieve the goal. Control is represented by the F function.

The system model interprets three structures: 1. Classification structure, the system analyses the properties of elements. 2. Static structure, the set of elements of a system those are unchanged over time. 3. Dynamic structure, a set of elements that change as a function of time. (Figure 1)

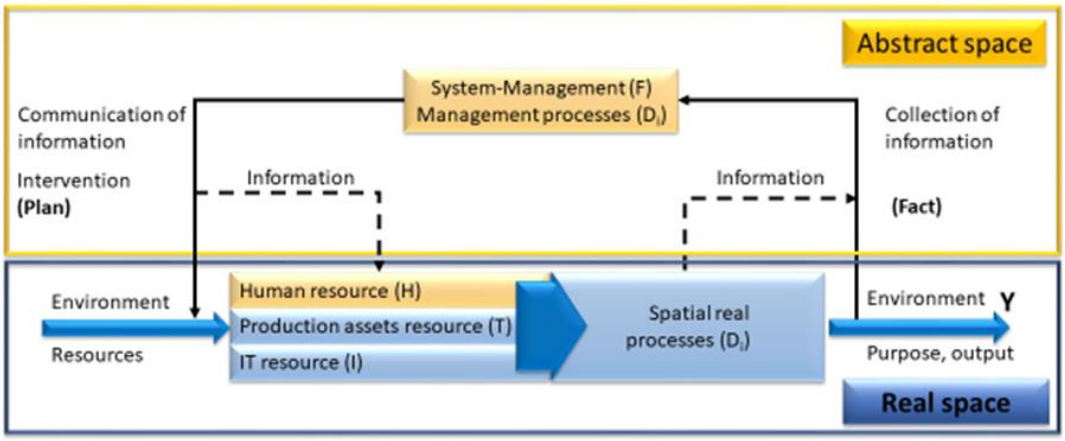
Figure 1. System structures



3. Management

By fitting the two structures of the system model, it is possible to characterise the static and dynamic states. Thanks to this, it is possible to create cooperation between management and controlled subsystems, management itself (Figure 2).

Figure 2. Control systems



4. Information, organisation

In order to develop a new system model, the information needed for management is not provided. The question arises that most of the information gathering has been avoided from local governments, so information needs to be obtained for new types of decisions. Increasing system management capacities and creating a multi-purpose digital centre are essential for more efficient work.

Development based on the principle of globalism

Central and Eastern Europe, but primarily Hungary, embedded in Europe, live to a significant extent from globalism. The changing nature of Europe, due to the nature of globalism, is difficult to follow. Understanding this is also difficult for experts and an annoying and heavy burden for the uninformed commoner. The situation is even more intolerable for any national society if the internal flaws of national policies can be easily transferred to EU policy. This obscures an understanding of the real situation at the societal level and does not encourage society to self-actively improve its destiny. This is spectacularly typical of disadvantaged areas.

Globalisation involves much of the world's capital, its management and operation. This mechanism divides societies, occupies a significant part of the world's territories, and neutralises nation-states in a substantial portion of its transactions. Wherever we live, the areas avoided by globalism are in crisis. This poses a challenge to European development strategies at all levels. For anyone to embark on any organisational, institutional, and business initiative in these areas, there are three living aspects to consider: 1. Mass production systems have already covered a significant portion of the markets. 2. The professionally well-trained workforce has already been drawn to global spaces. 3. In contrast, with clever compromises and knowledge, state and EU support can be gained to seek outbursts.

So, this paper, linked to the previous goals, further illustrates how globalism works and what its methods are. It encourages us, once it is finally clear that there is no possibility of opposition, how to work with it and take advantage of the pragmatics we have learned. The following are methodological descriptions with figures to illustrate the point.

Structure and management

The FACTORY, which is changing as a result of the rapid technological development, has become a central factor in the development of the global economy:

- At the beginning of the 20th century, production organised within a factory, based on a value chain, and controlled by an assembly line, was the culmination of development (Fordism). At this stage in the development of technology, huge, mass-produced factories (companies) have been set up within the national framework (later also with national support), the output of which has, of course, already become worldwide. This transformation of the factory meant that the world market was dominated by competition between nations and trade relations, and even the development of the world economy was determined by the joint development of nation-states.
- At the end of the 20th century and at the beginning of the 21st century, the FACTORY concept, which had prevailed for about a hundred years, was transformed. With the help of information theory and the development of information technology, a modelling skill is created in the existing factory giants, which enables the modelling of the factory's complex value chain-based production and the associated business efficiency. In this model, by breaking down the value chain into sub-activities, it becomes possible to identify those value chain elements that cannot be produced economically within the factory. As there is worldwide price, cost, quality, and time competition, it seems appropriate to outsource these sub-activities to a location (towards suppliers) where the cost of the sub-activity is much lower than if it had been done in-house.
- The FACTORY becomes a MULTINATIONAL COMPANY (Postfordism) at this point, because the supplier is no longer searched for and commissioned on a national basis, but worldwide, so it is possible for a multinational company to operate worldwide without noticing geographical constraints, operation. Not to mention the shortcomings of this system, it must be recognised that multinational companies act according to the usual economic considerations (increase profits) and their location policy contributes to the deepening of the territorial-based international division of labour and the expansion of globalisation processes. The exit of the multinational company from the old factory structure therefore means that the factory is split in two:
  - suppliers carry out production and final assembly activities, which are outsourced according to the worldwide distribution and distributive manufacturing approach (Figure 3), while

- brand owners control product design, development, sales, marketing and financial activities, as well as system-wide alignment (Figure 4).

This simplified small process seeks to show that globalism is a spatial development system with unparalleled efficiency in terms of output (efficiency, design etc.). Because the system is efficient, it is worth studying and benchmarking.

Figure 3. Supplier space development

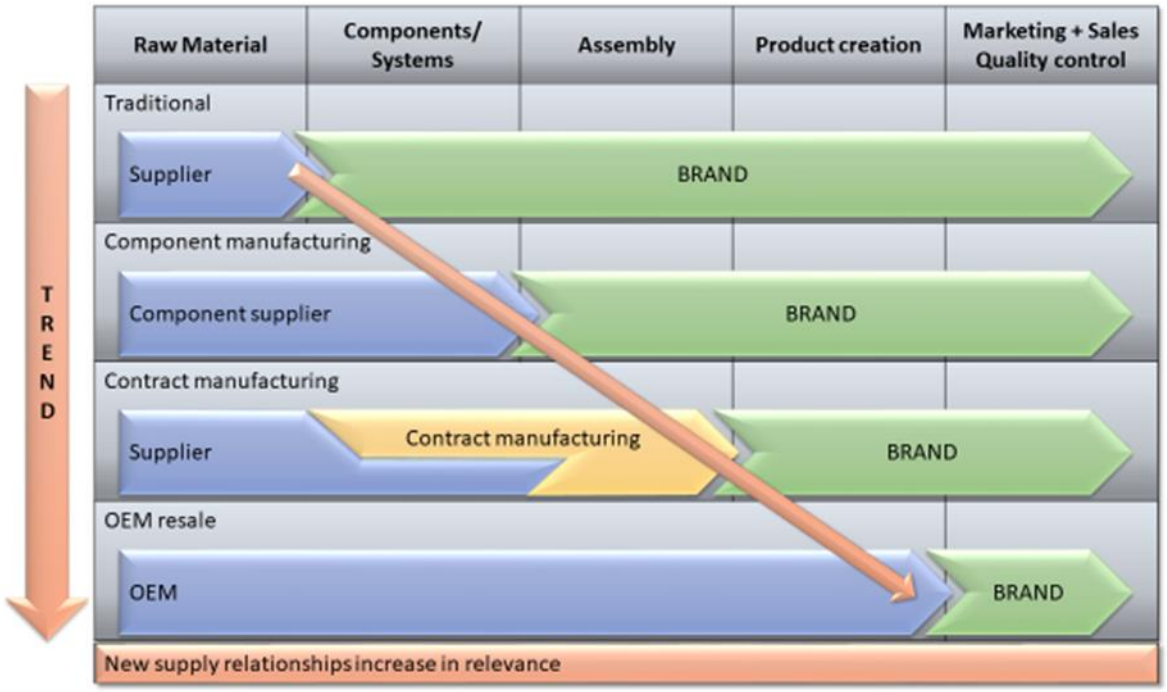
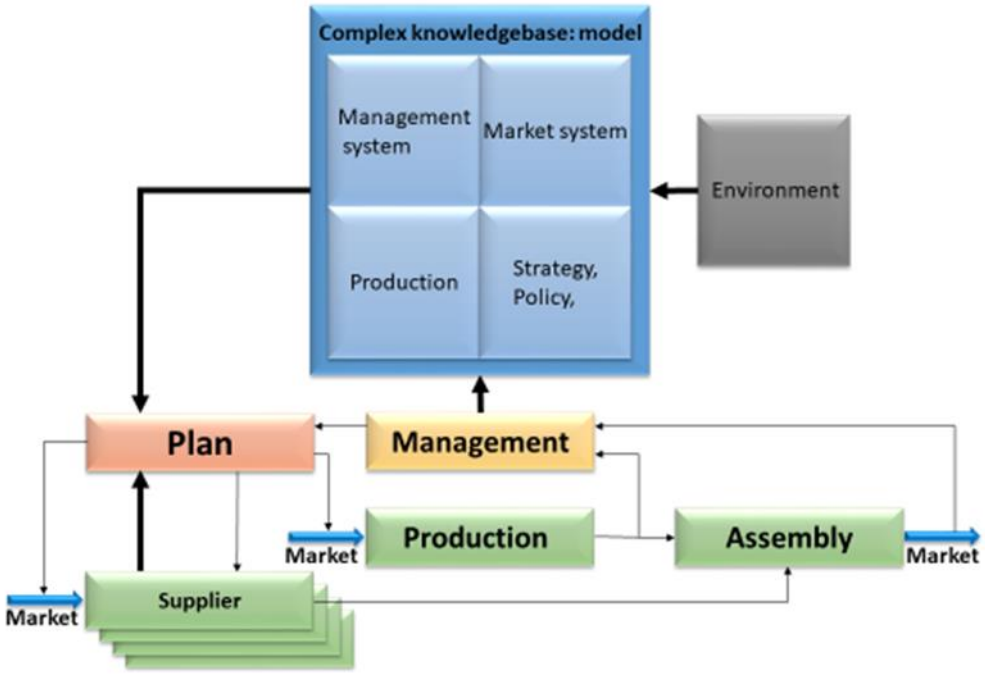


Figure 4. Supplier system management



The learnable model?

What do we see? Postfordism built a model for a new type of capital production and could even test it because it worked well. The experiments have matured the new goal, pointing out the process combination possibilities that can maximise output through a reasonable diversity of production. This decided the new production structure on which the management structure was built. All of this is supported by a system for collecting and processing the information needed for modelling, system operation, and decision making. The development of the global system has given a huge impetus to various branches of science. For example: Informatics, computer systems, information technology, logistics, quality, manufacturing technology.

All of what we have described so far is true, but it is feared that, due to the theory of its foundations, it cannot be reproduced in disadvantaged areas. Three key areas need to be reinterpreted:

- First, a better understanding of the theory of indivisible information, (Arrow 1979)
- Second, the diversity of production areas and
- Third, the importance of real-world economic initiatives.

All three are extremely interesting issues. You may want to return to these later.

Spatial development as a subsystem of the spatial system

Due to the standard of dealing with disadvantaged spaces, even in science, it is worth referring to the concept of subsystem. Today, we mix the use of its content one by one, but we can trust that the concepts are based on a systems approach.

The coming to the fore of the IT paradigm shift (knowledge, approach) transforms the social, economic, environmental and opportunities of the "space", as the equal opportunities provided by the world information network also open the gates of competition at the regional levels. This particularly affects the most vulnerable villages, towns and counties in real terms, which are underdeveloped, which is why they are tied to state redistribution and the EU with many threads.

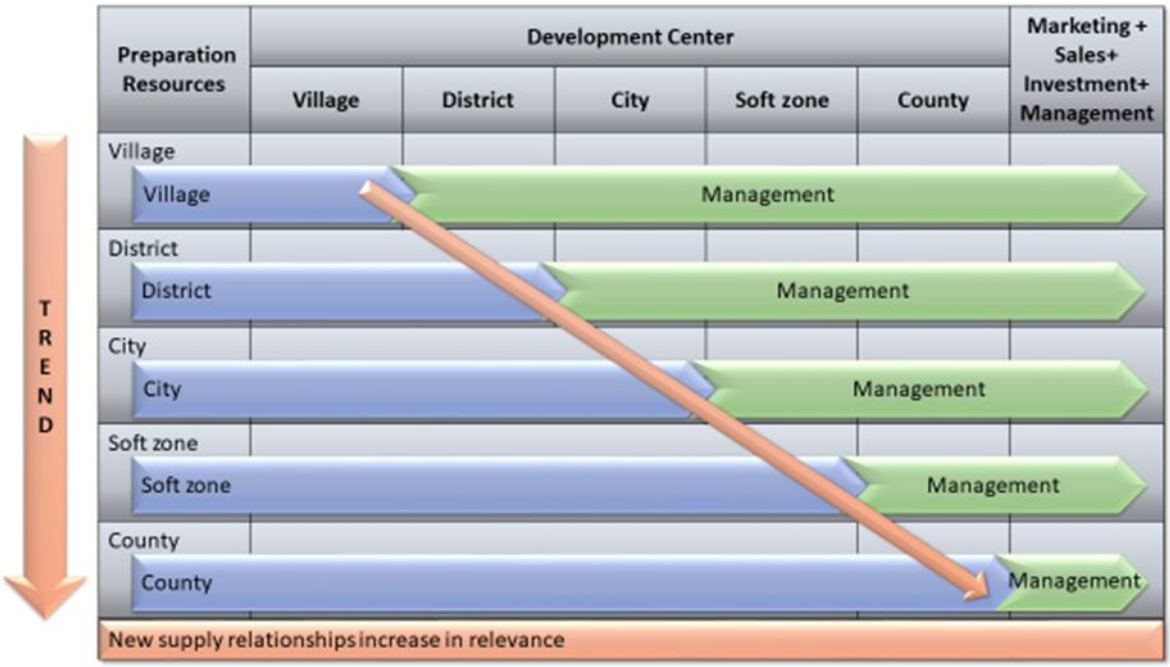
This situation could generate serious changes in Central and Eastern Europe. Shift transforms instinctive-central social control. It can be replaced by a new type of central-decentral information flow and decision-making mechanism. Local communities, states and the EU have a major role to play in this (similar to the EU's core regions).

Spatial development and the shaping of spatial development can be served by a wide range of planning structures, or rather by a variety of applications of a scientifically demanding, complex planning structure. We can simply say that the development of space

(planning, method, and management) is effective if it fits well into the system of the space to be developed and is able to maximise or optimise the emissions of the space unit over a planning period. This means nothing more than the resources of a geographical area - land, means of production, human resources etc. – choose (decide) from all the emission combinations interpreted that best serves the interests of the space.

And isn't every space different… and is it information, knowledge, organisational knowledge… intangible assets. The structure and management of disadvantaged spatial system development are illustrated in Figures 5 and 6. It seems necessary to say that we fully agree with the global system in this regard.

Figure 5. Participation of spatial elements in development



Analysis of the market mechanism of the global economy in its quasi-centralised and decentralised form can also provide a lot of useful advice to the actors of the spatial economy. The clumsy attitude of the broad administration to the networking and complementarity of towns and villages is worrying (information; knowledge) (Szalavetz 2004). Market management is based on a very broad knowledge base. Decentralised spatial development, no matter how well it works, builds on two factors: people and information. Figure 7 characterises some segments of the market for illustration only. In a village elementary school, a seventh grade, one or two English or computer science lessons, with a little preparation, can look for market information from the other end of the world or a village two villages away. Why don't we do it, that is, why don't we teach?

Figure 6. Development management

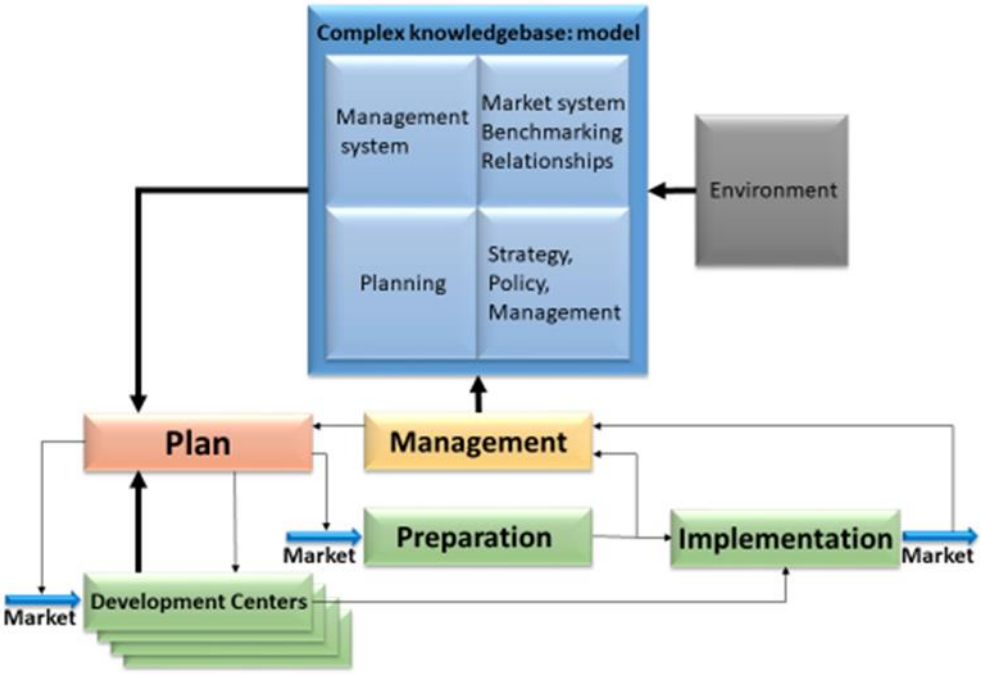
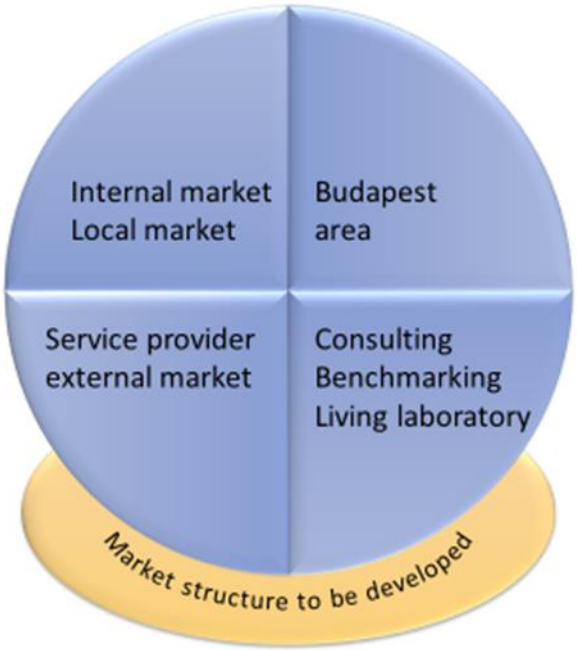
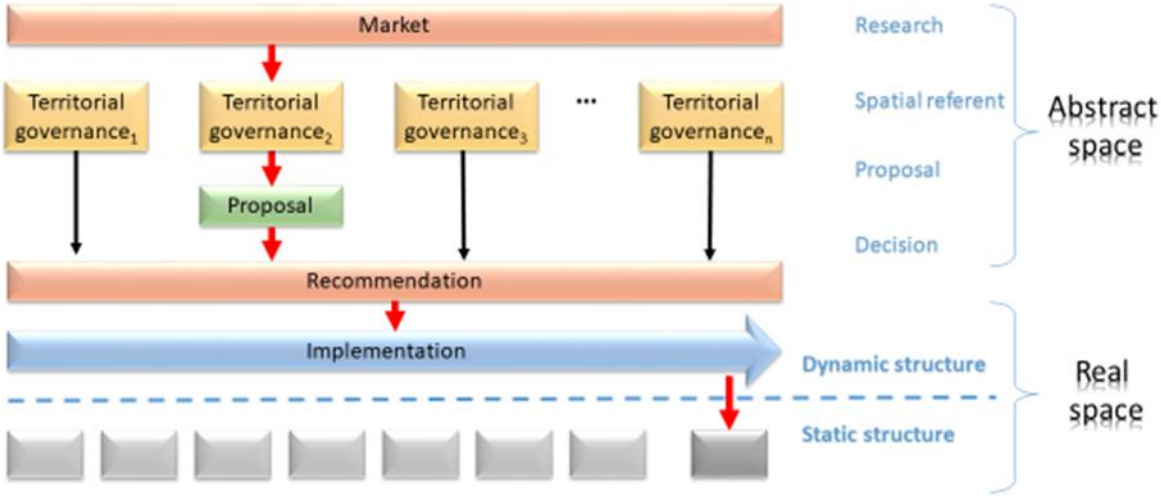


Figure 7. Market segments simplified



Following the figurative logic, Figure 8 finally outlines the completion of a development process. Subject: Investment in a village smithy producing steel lifting hooks for 14 people In the size range of 0.3-5.5 tons. The plant has been handed over. The example is that by thinking together, managing skilful businesses and municipal leaders, wherever they can launch community initiatives, the world is heading for that.

Figure 8. The result of community spatial development



Summary

This paper is about the renewable nature of disadvantaged areas, the related planning and systematic nature. The issue of renewable is open, the other two concepts as tools are indispensable. Taken together, the three concepts show little experience in this field in Central and Eastern Europe, a low level of organisational knowledge and a strong lack of social trust. In contrast, the world has changed incredibly. Above all, changing the paradigm of information and space can put space in a decision-making situation. It is simply a matter of paving the way for disadvantaged spaces to improve their own destiny. At the same time, it is also worth considering that, sooner or later, they will have to share in an increasingly heavy public burden due to the manageability of global change. Today, such an initiative could create a small integration of EU-STATE-SPACE as a reward for experimentation.

Of course, this problem is not unknown in the EU, science is prepared to receive and support such difficulties. The discussed Space is actually a general knowledge loser, so the central issue is the application of development solutions that are able to integrate external knowledge as well as knowledge-based practice, create and operate an innovation mechanism. It is also a condition that the organisational units of the Space and the community must operate continuously, in a normal course. You have to learn and take part in the development work, because the Space, at the same time as its operation, also serves the experiments of development. Simply put, the representatives of Space, its Community, External Knowledge and Practice, and the Market need to transform into the (Living) Laboratory of Space.

European trends suggest that Europe's regional problems can be solved despite growing global influences. The emphasis should be on trust, cooperation and an institutional

network that simultaneously supports development, functioning and forms of communication in society. Relationships should not lack a system-based approach to factors that necessitate the development of a structured planning process. It focuses on system-based economic planning.

Therefore, our paper characterised the structures of the system and the basics of system management within the framework of the Systematic Spatial Development chapter. It also interprets the design, according to which it must be assumed that there is a control force F (t_i) for the economic system, which calculates the optimisation previously interpreted on the resources E(t_i) and determines the combination of processes D_j (t_i) that emits Y_{ij}. maximises.

$$Y_{ij} = D_j\left[F_j(t_i)(H(t_i), T(t_i), I(t_i))\right]$$

In the same way, you can also plan for the possibility that the system intends to use the additional resource A (t_i):

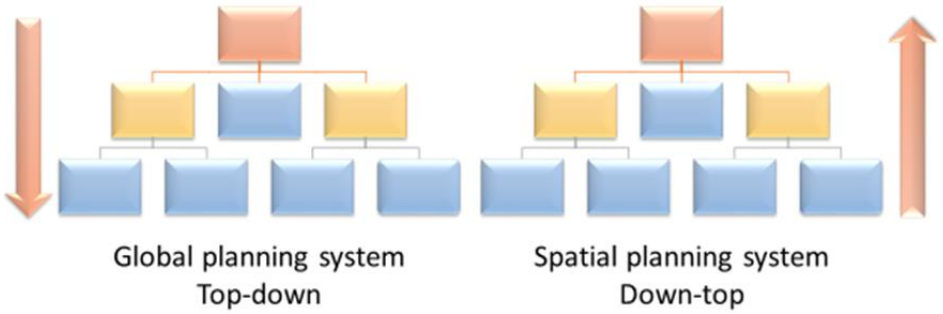
$$Y_{ij} = D_j\left[F_j(t_i)(H(t_i), T(t_i), I(t_i), A(t_i))\right]$$

where i is 1, 2… n, j is 1, 2… k, t is the time.

If we rethink planning, it becomes apparent that along with emissions, the society of space can be reorganised. After all, a large proportion of the elementary parts of dynamic processes installed on static structures are human actions. In other words, actions beyond value creation can also be valuable to regional society. This momentum can also become an unlimited repository of design.

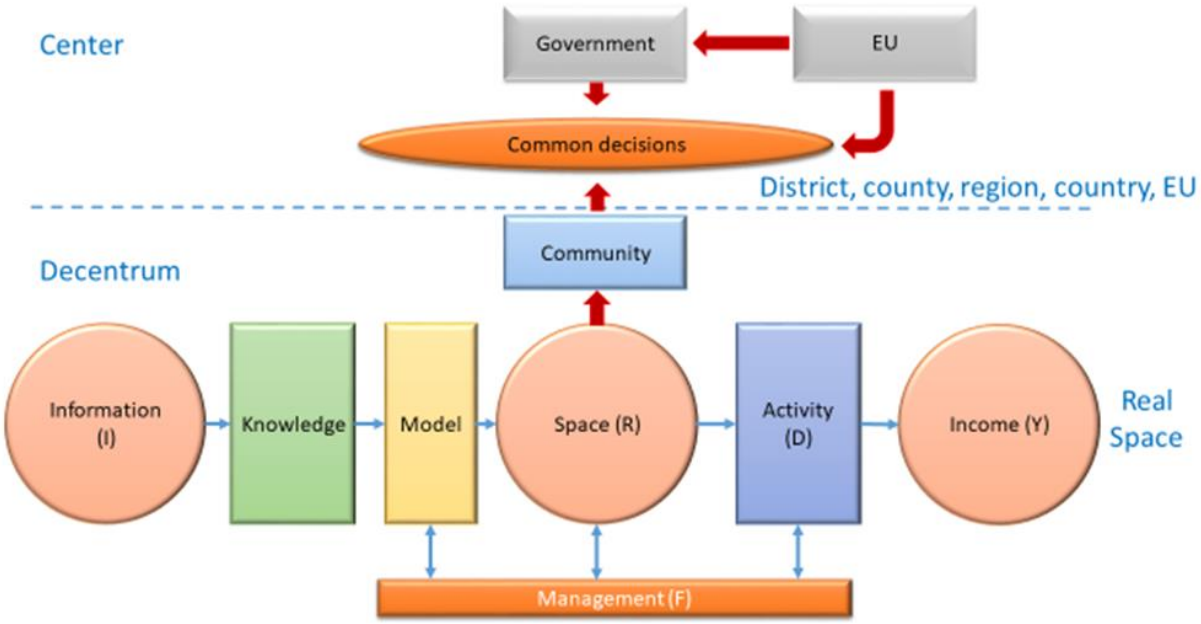
Figures 3 and 4 illustrate the operation of the global production and management system. Its organisation, based on indivisible information, is a Top-Down system. The point is that after the parts and assemblies of a single product are manufactured, they are assembled in your warehouse with the help of logistics and then sold. Basic goal: capital production. The production distribution of the system, the positioning, purchase, and sale of the sites are in central competence. The whole system is programmed from above: production, troubleshooting, administration, and input-output operations. This is illustrated by the Top-Down side of Figure 9. The spatial development technology and organisation of globalism is exemplary.

Figure 9. The direction of the economic development of the space



In contrast, the low degree of organisation of Space, which the present signifies as an initial state. This can be strengthened by the spatial development integration of towns and villages by launching a self-sustaining spatial development practice with an internal market of at least 200,000 people, an indefinitely expandable external space and a real space of at least 2,000 km² real value -creating and logistics structure (Miszlivetz 2012). Aim: To develop the system of spatial development, this aims to increase the level of value production on a network basis. Figure 9. provides guidance on how a knowledge base can be built during development, which will become a constantly evolving base for the structural transformation of the entire spatial system. Simply put, the dialectical system development mechanisms of global development and operation must be followed. Figure 10 serves to illustrate the special role of real space. This is the formation of structure, and at the same time the basis of value creation.

Figure 10. Development of the real space of the economy



Finally, referring to Figure 9, at some level of development, the space side may also move to the Town-Down organised form, but it should never be forgotten that even real space will extract the money (see Global Corporate Spatial Development Policy).

References

Arrow, K. (1979): *Egyensúly és döntés*. Közgazdasági és Jogi Könyvkiadó, Budapest

Faragó, L. (2017): Autopoietikus (társadalmi) terek koncepciója. *Tér és Társadalom*, 1., 7–29.

Frisch, R. (1974): *Kvantitatív és dinamikus közgazdaságtan*. Közgazdasági és Jogi Könyvkiadó, Budapest

Józsa, V. (2019): *A vállalati beágyazódás útjai Magyarországon*. Dialóg Campus Kiadó, Budapest

Kornai, J. (1999): A rendszerparadigma. *Közgazdasági Szemle*, 7–8., 585–599.

Nemes Nagy, J. (2017): Tér, függés, kohézió, hálózatok. *Területi Statisztika*, 1., 3–23.

Paróczai, P. (2004): *A multinacionális nagyvállalati rendszer irányítástechnikai megoldásai*. BGF Tudományos Évkönyv, Budapesti Gazdasági Főiskola, Budapest, 53–62.

Simon, H. (1982): *Korlátozott racionalitás*. Közgazdasági és Jogi Könyvkiadó, Budapest

Szabó, P. (2018): Térszerkezeti kihívások és fejlesztési térségek Magyarországon. *Tér – Gazdaság – Ember*, 6., 35–50.

MINIBUSES – UNSYSTEMATIC TRANSPORTATION MODES THAT CONTROL RURAL MOBILITY IN THE SYRIAN GOVERNORATE OF LATAKIA

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ABSTRACT
As the transportation system is one of the main factors in urban sprawl and the urbanisation of rural settlements, smart mobility has become one of the solutions for controlling and directing this mobility. However, could smart mobility be applied in all rural areas? How far the used transport modes and the local infrastructure could limit applying smart solutions in rural mobility? To answer these questions, this paper will present a non-systematic transportation mode in the rural areas of the Syrian Governorate of Latakia. This overview begins with presenting the used transportation mode and its characteristics. Then, it observes the effect of this transportation on the surrounding rural areas. It ends by presenting the factors that restrict the development and implementation of smart mobility in Syria.

KEYWORDS
minibuses; transportation; rural mobility; Syria; Latakia Governorate

Introduction

The technological development of transportation modes, especially private cars and buses, resulted in magnificent changes in urban structure. These changes were a result of the people's movements towards the surrounding areas of the cities as they were no longer required to be close to their workplaces (Newman 1992). The increasing problems of urbanisation and urban sprawl towards rural areas were an essential motivation to develop the urban infrastructure and to increase the efficiency of transportation networks. Smart mobility appeared as one of the main solutions in this regard (see Munhoz et al. 2020). It provides flexibility and efficiency for the passengers of rural areas (Porru et al. 2020) and a great improvement for the city systems (Munhoz et al. 2020). It also provides useful information for better movement choices (Lyons 2018).

Applying smart mobility demands a high level of development besides the use of Information and Communication Technology (ICT) (Munhoz et al. 2020; Orlowski, Romanowska 2019). The external forces and technological development affect urban areas significantly (Bosworth et al. 2020). Data sharing should be enabled for producing and analysing this data (Lyons 2018). However, could smart mobility be applied in all

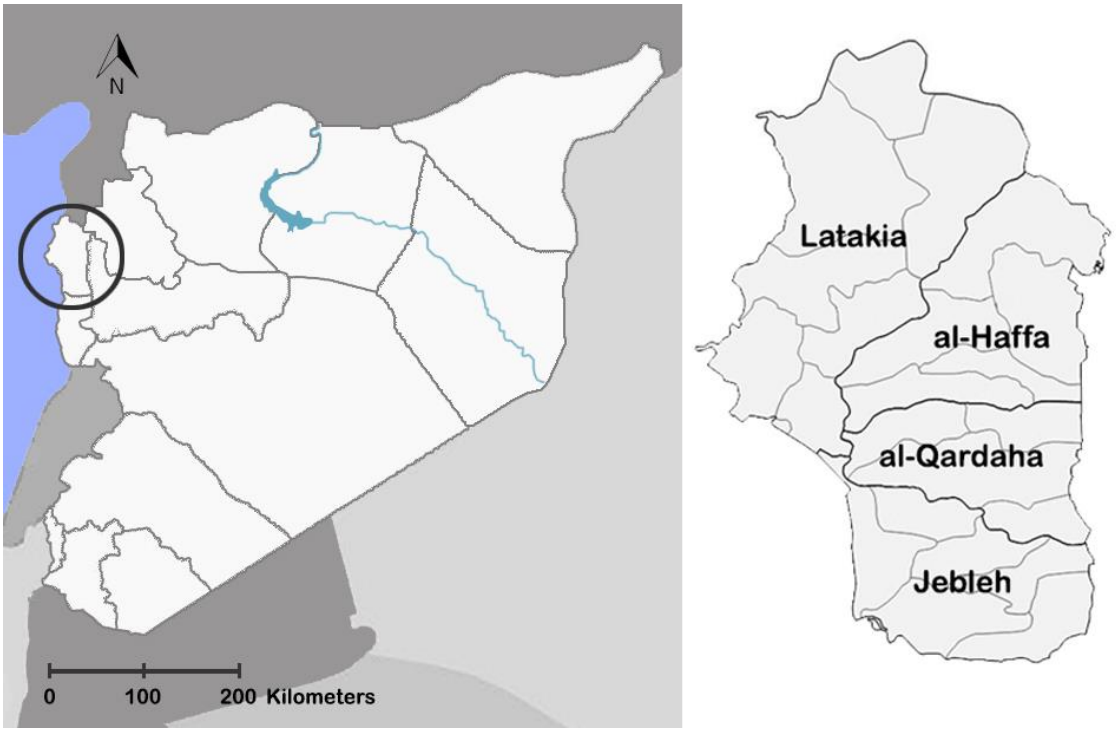
rural areas? How far the used transport modes and the local infrastructure could limit the applying of smart solutions in rural mobility?

To answer these questions, this overview presents an example of the used transportation mode in the rural areas of the Syrian Governorate of Latakia. It observes the used transportation modes which connect Latakia city with the rural areas, analyses their operation and conducts their effects on city urbanisation and transformation of rural areas. This analysis presents the obstacles and difficulties of applying smart mobility solutions in the rural areas of Latakia Governorate and Syria in general.

Latakia Governorate

Latakia Governorate is located to the northwest of Syria on the Mediterranean Sea. It consists of four administrative districts which are: Latakia, Al-Haffa, Al-Qardaha, and Jableh ("Syrian Arab Republic: Governate Profiles" 2014) (see Figure 1).

Figure 1. Latakia Governorate



Source: own elaboration

The population of Latakia Governorate reached 1.2 million in 2020 (Syria: Security and socio-economic situation in the governorates of Tartous, Latakia and Quneitra 2020). Each administrative district consists of the main city and its rural areas. The main city in the governorate is Latakia. It is the main administrative centre of the governorate and the main port of the country. It contains Tishreen University which made the city one of the main educational centres in the country. Latakia city is connected to the rural areas of the

administrative districts of Latakia, Al-Haffa, and Al Qardaha. It is also connected to the main cities in each other administrative districts. The used transportation modes in rural areas are minibuses (microbuses) (see Figure 2).

Figure 2. Minibuses in Latakia

Source: http://wehda.alwehda.gov.sy/

These modes of transportation are working along different paths in Latakia Governorate. According to the transportation directorate, minibuses have started their operation at the beginning of 1990s. Before the mentioned year, only limited numbers of buses and private cars were used to connect Latakia city to other rural areas. Minibuses present an example of the used transportation modes in all the rural regions of Syria. They also show the effect of unsystematic systems on the urbanisation of urban and rural areas.

Methodology

To observe the used transportation modes and their effect on the urbanisation of Latakia city and the rural areas of Latakia Governorate, several steps were achieved as the following:

- Collecting data about the numbers and destinations of the used transportation modes from the transportation directorates until the date of conducting this research in 2019. It is very important to mention here that transportation directorates have no plans or detailed maps for these paths. The available data is limited to the numbers and destinations of each line of transportation.
- Drawing maps of the transportation network after revising the collected data by observing the satellite images and making some field trips and interviews with the drivers to specify the exact path of each line.
- Specifying the starting and ending point of each line and determining the most important paths.
- Collecting data about the changes in Latakia city borders from the literature reviews, Latakia municipality and other city agencies. Comparing the main paths with the urbanisation of Latakia city and its rural areas using aerial photos and satellite images between 1934 and 2019.
- Observing the urbanisation of two towns around the city by comparing the satellite images between 1960 and 2019.

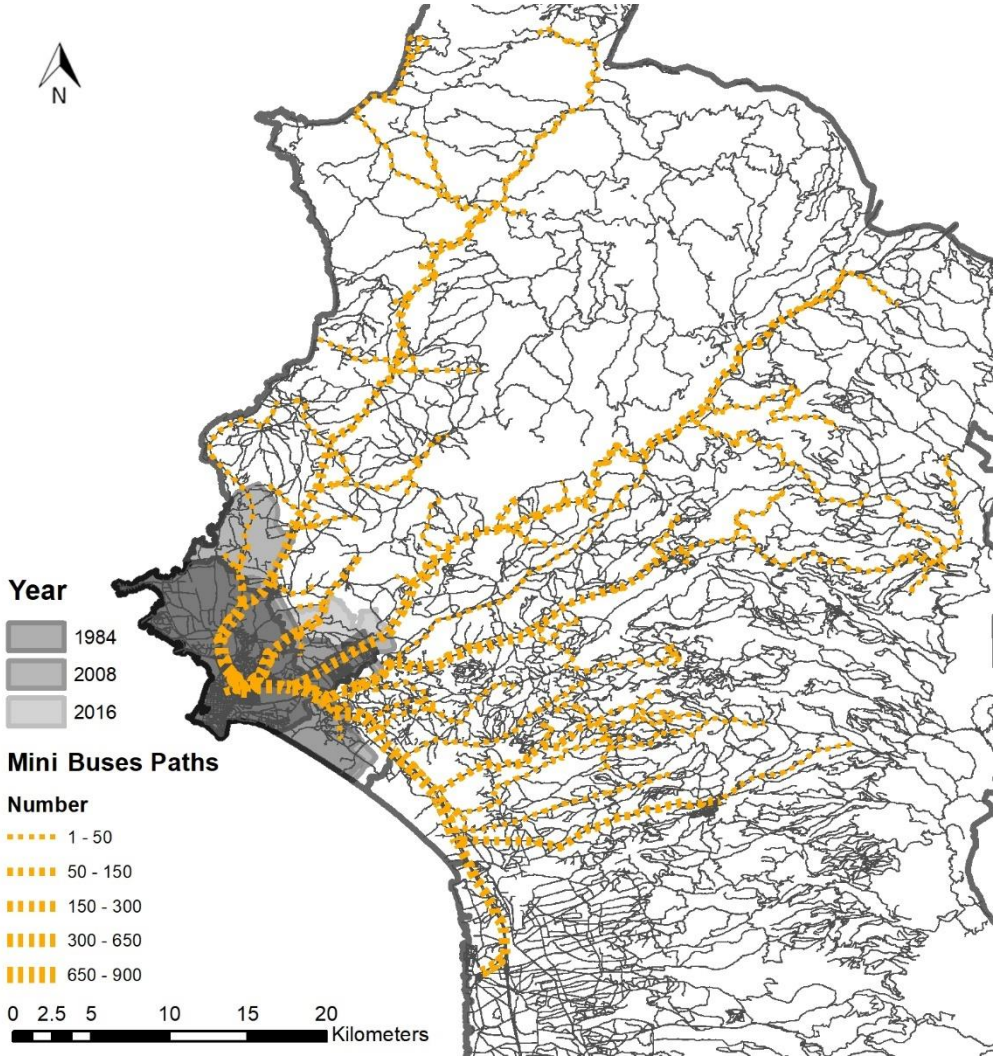
These steps were done to observe the problems of this unsystematic mode of transportation and their effect on the urbanisation problem. They were also achieved to present the needs and difficulties of applying smart mobility in Latakia Governorate. This example expresses all Syrian regions as they share the same transportation systems.

Results and discussion

Minibuses characteristics

The studied network which connects Latakia city to other rural areas contains 85 paths. Each path has a different number of minibuses (see Figure 3). The capacity of each minibus is ranged between 9 to 14 passengers. Minibuses are owned by individual drivers but formally regulated by the transportation directorates. There are three starting points inside Latakia city; Al-Shiekh Daher Square, Al-Faros Garage, and the Eastern Garage. There are no specific planned stops for the minibuses. They could stop anywhere along the path upon the request of the passenger to get in or out. New lines could be established after the request of the residents and the decision of the transportation directorate. These transportation modes or other used transportation modes in Syria are not connected to the internet via GPS, so the ability to use transportation in Syrian regions depends on the basic knowledge of the passengers or the provided information by the locals.

Figure 3. Minibuses' paths



Source: own elaboration

Urban sprawl towards rural areas in Latakia city

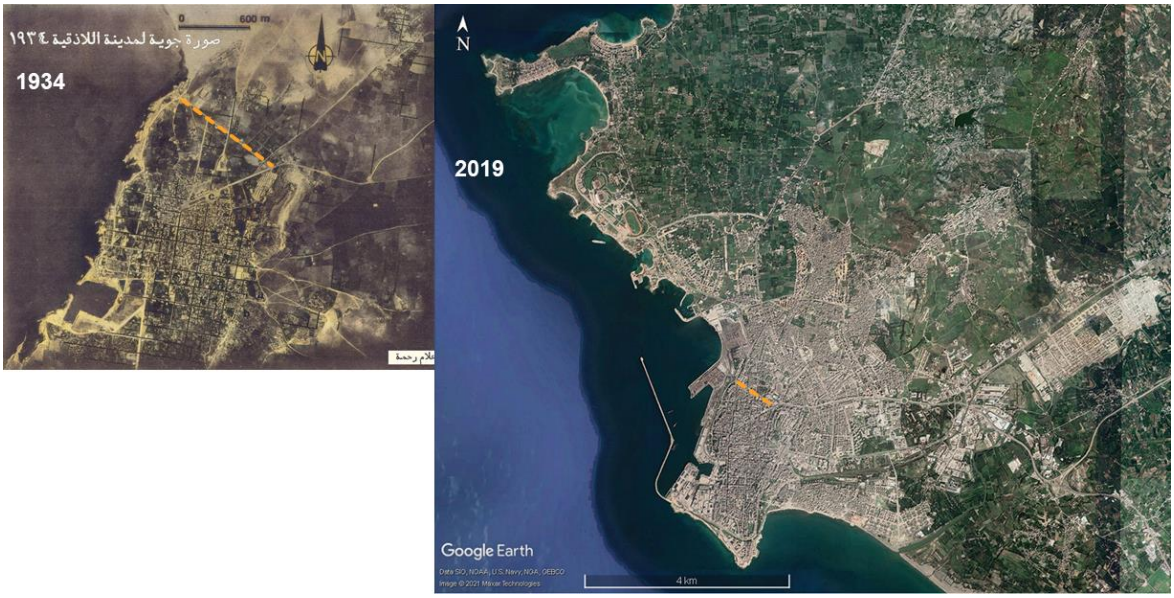
Latakia city was limited in the small eastern part until establishing some new roads in 1905 by the Ottoman ruler (Baytar 2001). In 1926, some new roads were established to connect Latakia city to other Syrian cities (Deeb 1968). Afterwards, in 1933, new surrounding areas were added to the city (Othman 1971). Several changes happened on Latakia city borders and new rural areas were added to the city between 1950 and 1967 (Baytar 2001; Deeb 1968). In 1969, rural migrations towards Latakia city have increased because of the spread of transportation systems (Balanche 2000). In 1974, the construction of Tishreen University started (Bou Snaie 2002). The major parts of the university were finished in 1982 (Baytar 2001). After that, additional rural areas were added to the city and several master plans with different city borders were developed in 1984, 2008, and 2016 (according to Latakia Municipality and the General Company for Studies and Technical Consultations in Latakia).

Urbanisation in Latakia and minibuses networks

Latakia city has witnessed urban sprawl for a long time. It is not fair to state that transportation systems and minibuses networks are the main reason for this long urbanisation process. The expansion happened due to several social and demographic changes. The spread of transportation systems plays a role in this urbanisation process. They are an essential element in controlling urban changes.

Comparing the aerial photos and satellite images of Latakia city between 1934 and 2019 shows the massive urbanisation and the urban sprawl towards rural areas (see Figure 4).

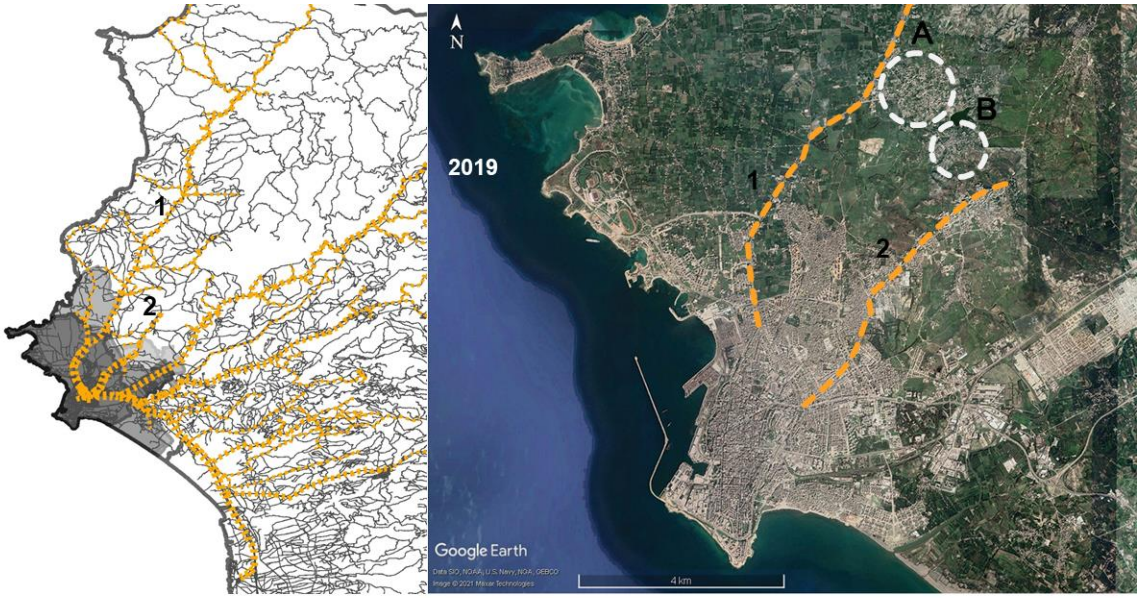
Figure 4. Urban sprawl towards rural areas



Source: the source of the old aerial images is "Latakia Photographic Museum" a Facebook group for interested people of Latakia history, the source of currents satellite image is Google Earth

Observing two of the main paths in the networks of minibuses with the recent satellite images shows the increasing urbanisation along these main paths. New settlements were established along these paths and the surrounding rural areas have expanded towards them (see Figure 5).

Figure 5. Urbanisation along the main paths



Source: own elaboration based on satellite image from Google Earth

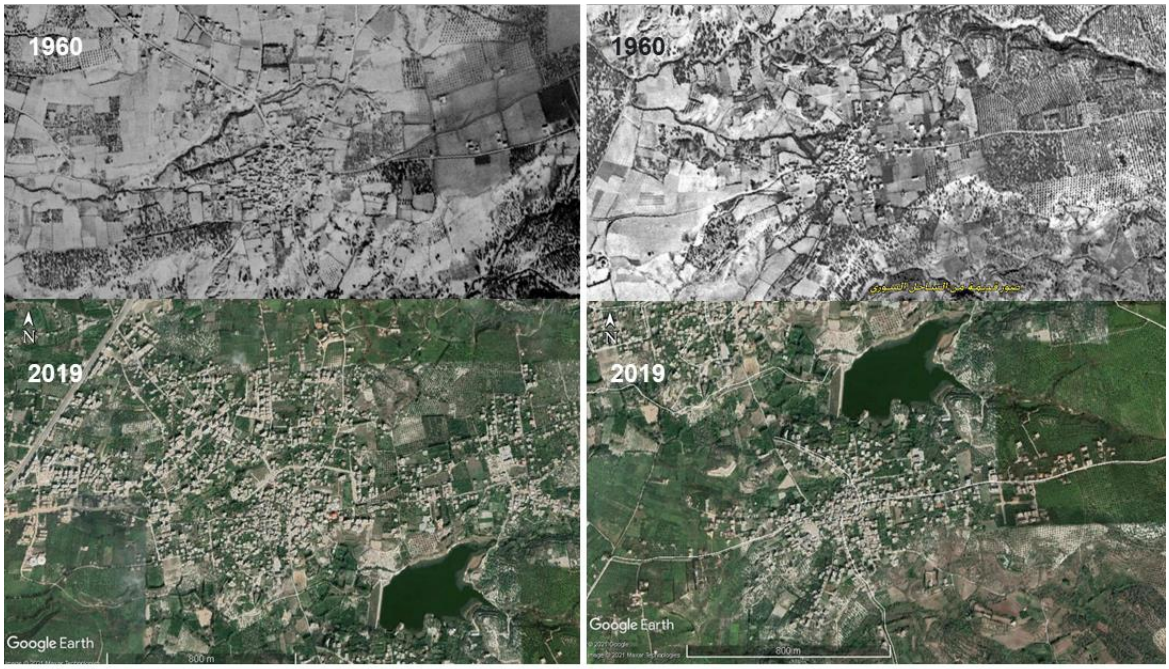
To observe the urbanisation process in the rural areas, a comparison was done between the satellite images of two towns around the city:

- Al-Qanjra town: As shown in Figure 6, there is massive urbanisation in 2019. Many settlements and residential blocks have appeared along the main road in the town which is connected to the main path of minibuses.
- Baksa town: Another example of massive urbanisation in 2019 towards the main road of the town which is also connected to the main Path of minibuses (see Figure 6).

It is important to mention that many towns have suffered from the same problem of urbanisation which was affected by the transportation networks. This overview could not present other examples because of the data shortage and the limited number of satellite images. This kind of images is not archived by a formal agency in Syria. It is mostly collected by experts and people who are interested in Latakia history.

The rural areas of Latakia Governorate need a solution for controlling this continuous urbanisation. But could smart mobility be the solution? What are the challenges and difficulties of applying smart mobility in Latakia Governorate and Syria in general?

Figure 6. The urbanisation of two rural areas around Latakia city between 1960 and 2019



Source: the source of the old satellite images is "Old photos from the Syrian coastal" a Facebook page for interested people of Latakia history, the source of currents satellite image is Google Earth

Conclusion

The used transportation modes in Latakia Governorate could be described as unreliable modes due to their capacity, working process, road networks, and the responsible agencies. It is an unorganised system that leads to an inconvenient situation for the passengers, especially during peak hours. Stopping anywhere without considering systematically planned stops causes a lot of problems and crowding issues. According to the responsible agencies and transportation directorates, new lines are established based on the demands of the residents without any previous planning or coordination with the municipality. This leads to a lot of urban problems and encourages urbanisation and urban sprawl.

Thinking of initiating smart mobility to solve the urbanisation problems may be difficult due to the inefficient infrastructure of Information and Communication Technology (ICT) and the obstacles of data sharing. The economic situation also plays a major role in these difficulties especially after the Syrian crisis and the lack of resources.

These obstacles are not limited to Latakia Governorate. They are obvious in all Syrian regions. Controlling urbanisation and solving transportation problems could not be done by applying smart mobility. Infrastructure needs to be more developed to handle smart mobility. However, it is very essential to develop the used transportation modes and convert them to systematic transportation that could control urbanisation and reduce the problems.

Acknowledgement

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References

Balanche, F. (2000): *Les Alaouites, l'espace et le pouvoir dans la region cotiere syrienne : une integration nationale ambigue*. Université François Rabelais, Tours

Baytar, G. (2001): *Latakia through history* (vol. 1). Dar al-Majd, Damascus

Bosworth, G., Price, L., Collison, M., Fox, C. (2020): Unequal futures of rural mobility: Challenges for a "Smart Countryside." *Local Economy*, 6., 586–608.

Bou Snaie, I. (2002): *Latakia in the memory of history*. Ministry of Information, Damascus

Deeb, A. (1968): The master plan of Latakia City: The stage of its developmant and its future. *Al-Omran*, 1., 82–87.

Lyons, G. (2018): Getting smart about urban mobility: Aligning the paradigms of smart and sustainable. *Transportation Research Part A: Policy and Practice*, 115., 4–14.

Munhoz, P., Dias, F., Chinelli, C., Guedes, A., Dos Santos, J., Silva, W., Soares, C. (2020): Smart mobility: The main drivers for increasing the intelligence of urban mobility. *Sustainability*, 24., 1–25.

Newman, P. (1992): The compact city : An Australian perspective. *Built Environment*, 4., 285–300.

Orlowski, A., Romanowska, P. (2019): Smart cities concept: Smart mobility indicator. *Cybernetics and Systems*, 2., 118–131.

Othman, H. (1971): *The history of Latakia*. Ministry of Culture, Damascus

Porru, S., Misso, F., Pani, F., Repetto, C. (2020): Smart mobility and public transport: Opportunities and challenges in rural and urban areas. *Journal of Traffic and Transportation Engineering (English Edition)*, 1., 88–97.

Syria: Security and socio-economic situation in the governorates of Tartous, Latakia and Quneitra (2020). The Danish Immigration Service

Syrian Arab Republic: Governate Profiles (2014). In: United Nations Office for the Coordination of Humanitarian Affairs. URL: https://reliefweb.int/sites/reliefweb.int/files/resources/Syria%20governorate%20profiles%206%20August%202014.pdf

THE ROLE OF ICT IN IRAN'S RURAL AREAS

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ABSTRACT
In recent years, the development of communication tools and the convenience of receiving messages from these media in all areas, including rural areas, has had a great impact on the quality of rural life. Therefore, with the introduction of information and communication technology in rural areas, traditional and inefficient methods of agriculture and animal husbandry are being replaced by modern and effective methods, which increases the income sources of the villagers by itself. The aim of this study is to identify the effectiveness of ICT in the enhancement of the quality of life and economic prosperity in rural communities with a focus on Shahkooh village in Golestan province. With regard to the remarkable progress and capabilities of this technology as well as the problems facing the villagers, the necessity of this research seems obvious. The research method in this study is descriptive-analytical and fieldwork. The results of the research indicate that Shahkooh village has the potential to become the first smart village in Iran, which is possible with the cooperation of the public and private sectors and the villagers. Also challenges and suggestions for further development of ICT are outlined.

KEYWORDS
ICT; rural areas; Shahkooh village; tourism

Introduction

One of the ways to make the villages smarter is to use ICT services in villages. Many experts in issues related to the development of the third world countries and rural areas believe that the quality of life and the productivity of villages increases through correct use of information and communication technologies and proper education on new methods and techniques (Bahramian 2009). As RAO shows, life quality enhancement of Indian villagers accelerated when people had sufficient access to information (Rao 2007).

It is clear that unemployment and traditional economy management in rural areas have led to excessive migration to cities. Therefore, the use of ICT, while circulating the employment and development cycle, will lead to the growth of economy in rural communities. If sufficient attention is not paid to villages, especially in areas such as

infrastructure facilities and the creation of rural employment, migration to cities will intensify. Therefore, in order to maintain the population of rural residents, facilities should be provided throughout villages as much as possible, as well as new methods of income generation and new jobs should be introduced. Moreover, it goes without saying that labour force should be trained. In fact, ICT, in addition to creating direct employment, increases productivity and sometimes increases employment in other economic sectors such as tourism. The rapid growth of information and communication technology has had a profound and far-reaching impact on the economy of all societies (Khoran, Ahmadi 2012). Research results show that ICT and its application will play an important role in the prosperity of the rural economy and the necessary individual trainings.

Of course, ICT is not a cure-all for rural development problems; but it has the potential to help the rural poor gradually eliminate some of the traditional barriers to development by increasing access to information, expanding their core markets, increasing job opportunities, and accessing better government services (Khoran, Ahmadi 2012).

The importance and necessity of information and communication technology development

ICT is one of the new fields that is used for rural employment and can cause many villagers, especially those with higher education, to stay in their village. Furthermore, it is a significant factor in the smartening of rural areas. Due to the great importance of ICT in many activities such as agriculture and its influence on the prosperity of economy, its growth and development is also pursued (Khoran, Ahmadi 2012).

Regarding the functionality of ICT in rural areas, it can be said that the functions envisaged for ICT usage in urban areas can also be used in rural areas, and it is sometimes even more necessary in them. One prominent instance is e-banking. Due to their distance from cities, the villagers usually open a bank account in the nearby cities and come to the urban branches for bank work. Therefore, more electronic banking services is needed in rural areas. Similarly, many villagers are deprived of receiving a high-quality education at their own village and have to come to cities to attend to universities. But virtual universities can be a proper replacement and a solution to their problem to some extent. Villagers also usually go to the cities for some simple administrative work, while if electronic official services are established, it is not necessary for them to spend so much time going to the cities as most of the administrative work can be done in their own villages (Khoran, Ahmadi 2012). Hence, ICT services have provided various opportunities for the empowerment of rural areas in the developing countries which should be taken seriously.

In addition, tourism is another service that can thrive in the village due to information and communication technology (ICT). The rapid growth of tourism in the world and its resulting benefits have attracted special attention of governments and planners and have

led to the formation of new policy-making methods in this field (Eftekhari, Ghaderi 2013; Sharifzadeh, Moradnezhad 2002). The developed countries of the world, before other countries, have realised the importance of tourism and have made extensive plans for its comprehensive development. Tourism can be very important in many developing countries that do not have significant economic resources. For this reason, most developing countries have started various programs in the field of tourism development. Rural tourism is a strategy that has important economic effects; in a way it can help slow down the process of evacuation of rural settlements and reduce migration. Tourism development as a strategy for rural development is a relatively new theory and local policymakers in rural communities have realised the importance of this strategy quite recently. In addition, one of the biggest benefits of tourism industry in rural areas is to generate income and wages for people working in this industry, most of whom are local and indigenous people (Sharpley 2002). Moreover, the development of tourism in rural areas can play an important role in diversifying the economy of rural communities, paving the way for sustainable rural development. On the other hand, it is a means to stimulate the growth of the national economy by overcoming the ideas of under development and improving the living standards of local people. Using information and communication technology, villagers can introduce their village to other areas, which attracts tourists to the village.

It should be noted that most of these new jobs are skill jobs that require high levels of education and expertise. Thus, employment is available for young people who have acquired high levels of ICT through education and training (Duncombe, Heeks 2001). The education and dexterity of rural youth with the Internet-related issues can deliver expert forces to the community and various organs, as well as provide different job opportunities for villagers in different networks (Shah Shojaei 2002).

The above facilities require education and culture as the underlying platform of information and communication technology which then follows by the need for a new technology. This phenomenon is certainly effective in the irregular migration of villagers and solves many of the problems mentioned. Comprehensive education in the fields of agriculture, animal husbandry and natural resources through information technology is necessary to improve the knowledge of villagers and optimise their decisions and, most importantly, their participation in developmental programs (Shah Shojaei 2002).

In the villages of Iran, due to the existence of a diversity of attitudes regarding the Internet usage, there is a need for appropriate cultural improvement. The existence of some inclinations to the traditional cultures causes some villagers not to be easily receptive of the change in their first encounter with such phenomena as electronic services via internet. Therefore, before introducing information technology to the culture of villages, it is necessary to create a suitable scientific and cultural context in these areas in various ways. In this regard, we can point to the effective role of mass media and education. The mass media can help to create a proper scientific and cultural environment in the villages

by providing advertising programs on radio and television. In addition, the Ministry of Education, by adding textbooks to provide useful information for the new generation of villagers, ought to acquaint the group with the benefits and applications of information technology and its various functions in everyday life (Maleki 2011). Some developing countries can use rural information and communication technology to decrease many social problems such as widespread urban migration, lack of educational facilities, and low levels of public knowledge and information. Since these problems are more common in rural areas, the application of communication technology in rural areas will probably be more beneficial (Maleki 2011).

With the establishment of technology parks or ICT offices near and inside the villages of Iran, the following results are obtained (Maleki 2011):

1. Many rural areas of Iran are located in pleasant climates that are historically hundred years old. These areas are suitable for attracting tourists with their rich indigenous cultures. Due to this feature, these areas can be selected as suitable environments for the establishment of technology parks. Therefore, the establishment of ICT parks near these villages can lead to the prosperity of the tourism industry.
2. Establishment of research centres in rural areas will solve the problem of villagers' access to modern science. In this way, the problems that exist in the field of the education of villagers will be solved.
3. By building technology parks and ICT offices, villagers can be introduced to agricultural science, horticulture and handicrafts in a systematic a scientific way.
4. Implementing such projects in rural areas can create jobs and reduce migration to cities. Many villagers migrate to the cities due to lack of jobs. With the establishment of ICT offices and technology parks, educated people can return to their villages and work in these parks. Also, people who do not have higher education qualifications can work in the service sector.
5. The villagers can use the facilities of technology parks to advertise their handicrafts, which will also improve the situation of handicraft production in the villages.
6. Due to the fact that technology parks will be located near the villages and each of these parks has equipped medical centres, the villagers can use the Internet to send information about their medical conditions or problems to these centres. The medical centres located in these parks, after reviewing the information received, can send a specialist doctor to the place if necessary. In case sending a doctor to the place is not necessary or possible, medical advice and necessary instructions could be share with the villagers via Internet and an appointment could be made.
7. The presence of meteorological centres in technology parks can help the villagers to receive timely forecasts of climate change in the region, because the existence of centres for analysis of information and figures sent by satellites and, more importantly, the information obtained from these sites are available. It will be very

useful for what has been discussed in the field of horticulture, agriculture and fish farming.

The main challenges of ICT in rural Iran

There are limitations to the development of information and communication technology in rural areas, the most important of which are mentioned below:

1. Lack of telecommunication infrastructure: At present, there is no suitable infrastructure for using information and communication technology services in the villages of Iran and the villagers who are interested in such services have to connect to the Internet through urban service providers, which is very costly for them (Barani, Ghodsi Rathi 2003).
2. Lack of PC at home: Despite the high import of computers, some villagers still do not have personal computers in their homes, so only the rich can use ICT services in rural areas.
3. The villagers are not familiar with computer use.
4. Existence of deficiencies and inadequacies in the rural community has reduced the proper economic use of ICT services (Sarami, Bahari 2010).
5. Lack of sufficient budget to provide financial, hardware and software support to project centres
6. Lack of local network between villages to communicate.
7. Lack of sufficient funding for hardware and software support of ICT centres.
8. Lack of e-government structures to provide administrative services, especially to villager to them through ICT.
9. Lack of support and organising centres to control and guide the ICT centre and providing information technology facilities for the use of local people.
10. Local disputes about the operation of the centre and its management.
11. Decreased motivation to use the centre over time due to lack of appropriate content
12. Improper use of the centre's facilities (Maleki 2011).

Suggestions for improving the performance of ICT centres in rural Iran

Information and communication technology has a major role in the economic and industrial development of villages. It has created new job opportunities for the villagers. In addition, villagers become acquainted with new skills and information in life. The following suggestions were collected in this field:

1. Cultural context, which is undoubtedly one of the most important pillars of information development and the need to raise awareness about the capabilities and facilities, necessitates information networks.
2. Encourage the private sector to invest in villages and ICT service centres
3. Changing the view of officials and planners on the importance of rural development in comparison with the development of the country and the belief that comprehensive development of the country without investing in rural development and improving the quality of life, which is an important and effective factor in this issue, is a key factor ICT, will not be possible. (Khajeh Shahkooh 2013, 118.).
4. Expand advanced software, hardware infrastructure and create a high-speed Internet network.
5. Extensive and efficient support for ICT users and applications in rural areas.
6. Training of specialised personnel selected among the villagers.
7. Holding training courses for villagers regarding ICT.
8. Assign ICT service offices to the villagers and administer these centres to the villagers. The government should only have a supervisory role.
9. Rural farmers use Internet services in the field of marketing of agricultural products and access to information and prices of agricultural and livestock products; moreover, other products in the national and global market through ICT service offices.
10. Expand e-commerce in rural areas.
11. Possibility of establishing relations between local village managers and government administrative institutions through ICT service offices.
12. Changes in the way of life of rural people, especially rural women, through the facilities of ICT offices.
13. Encourage farmers to use new agricultural implements such as area-appropriate tractors through ICT service offices.
14. Create digital libraries and prepare people to launch them.
15. Skills training for new jobs such as English and computer (Anabestan, Vaziri 2011).

Finally, we must not forget that all these measures are possible if the necessary training is given to the villagers at first.

Several other suggestions that help the economic growth of the rural areas and are useful for both tourist attraction and rural smartening are the following:

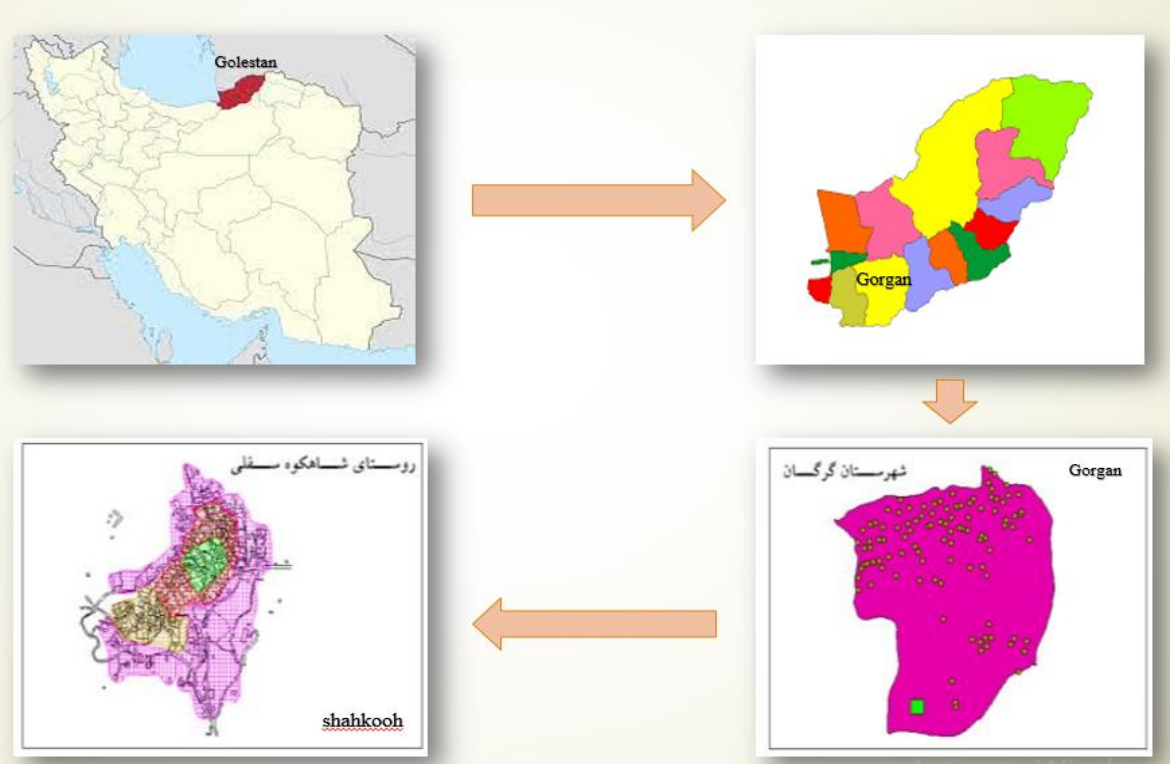
1. Using credit cards instead of cash money
2. Recycling management of water and waste resources
3. Improving transportation systems for an easier access to the village as a tourist destination
4. Improving the health system of rural areas

5. Branding the local products of each region and improving the individualisation of rural products
6. Improving rural infrastructures and housing projects in rural areas
7. Development and improvement of culture and education in rural areas according to the characteristics and needs of each region (Iran Agricultural News Agency: http://www.iana.ir)

An example of an electronic village in Iran

Shahkooh is a mountainous village located in central Alborz, which reaches Gorgan from North, Shahroud from Southeast and Damghan from Southwest, and is located in Golestan province in terms of provincial divisions. This village is located at an altitude of 2000 meters above sea level and has a land connection with the cities of Gorgan and Shahroud. Due to its mountainous climate, Shahkuh has mild summers and cold winters, and its people are engaged in agriculture and animal husbandry. In autumn and Winter, some of the local people migrate to Gorgan and Shahroud due to the cold weather and the difficulty of agricultural activities. However, in the Summer, Shahkuh has a large population and its population reaches to about five hundred families (https://irandehyar.com).

Figure 1. Geographic location of Golastan and Shahkooh



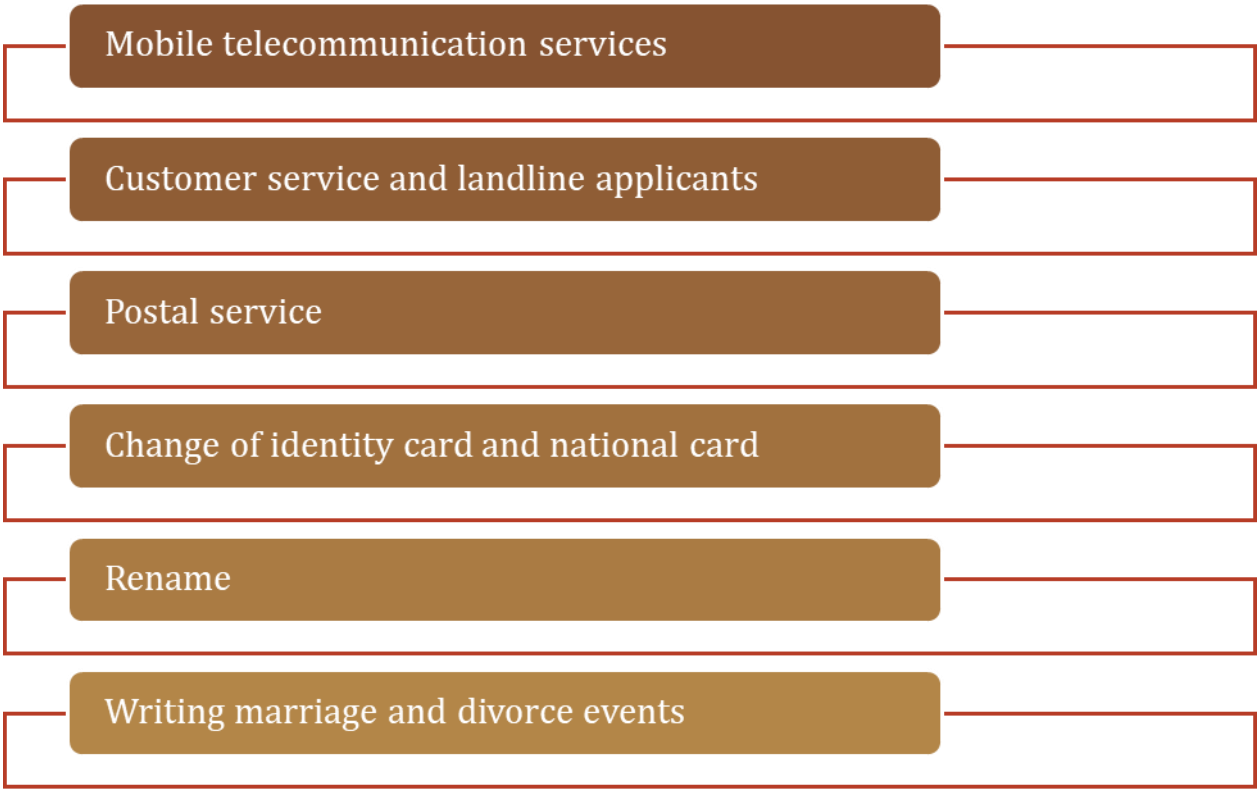
Source: Hussam et al. (2014)

Sudden changes in Shahkooh caused by ICT engineering with the establishment of an electronic village in Iran

Shahkooh village is the first electronic village in Iran and was smartened in 2000 by Dr. Ali Akbar Jalali. This village has more ICT facilities than other villages in Iran. Also, people of this village are completely familiar with ICT services. In addition, they have turned the area into a technology base, building the first comprehensive rural ICT centre instead of migrating to cities (https://irandehyar.com).

The news of the establishment of the first electronic village in Iran quickly spread to other countries and made headlines (CNN). This measure further motivated the youth of this village to study computer science specialisation fields, as nearly 2,000 local students are studying at home and abroad. It has also paved the way for the economic growth of the villagers, so that it is difficult to find a financially weak capital in the region (https://irandehyar.com).

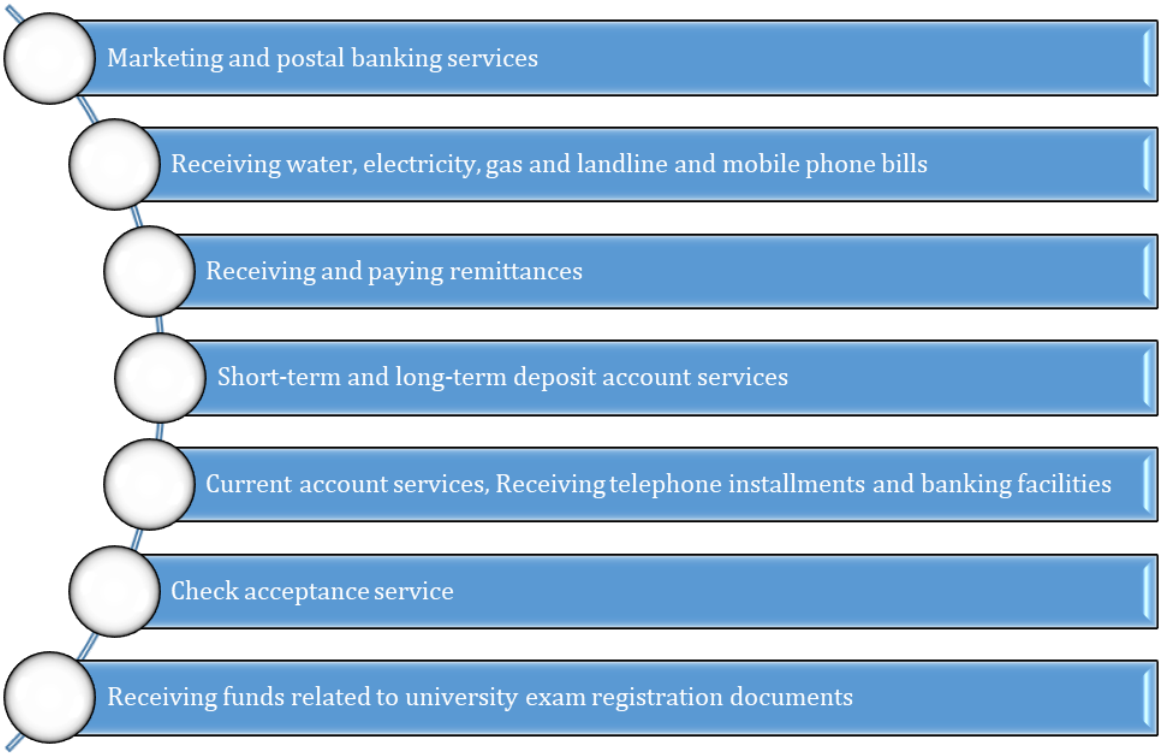
Figure 2. ICT Service in Shahkooh village



Source: own elaboration

After the successful implementation of the first internet village of Shahkooh, Dr. Jalali in collaboration with Shahkoohi villagers, Shahkooh University Association and Golestan Telecommunication Company launched another project called the first comprehensive centre of rural information and communication technology services in Qarnabad village in 2003, which was the Winter residence place of Shahkoohi villagers. A large part of the centre's equipment and building materials were donated by private sector companies and local factories. Dr. Jalali bought the land to build this centre and donated it to Iran Telecommunication Company. In addition, the first electronic banking services were established in this village with the great efforts and perseverance of Dr. Ali Akbar Jalali (https://irandehyar.com).

Figure 3. E-Banking Service in Shahkooh village



Source: own elaboration

In addition to the cases mentioned in relation to the electronic village of Shahkooh, it should be mentioned that this village is one of the historical and beautiful villages and one of the touristic sites of Golestan province. This historical and spectacular village has a very attractive texture and reminds visitors of centuries ago. The roofs of the houses are flat and covered with thatch and wood, and most of the houses have one or two floors. The main construction materials of the houses were often stone, mud, clay, and wood. The village has two large neighbourhoods called "Deh Mian" and "Deh Darreh". The villagers have been able to introduce their village to other provinces of the country by using ICT services. This has encouraged many tourists to visit this village every year (https://irandehyar.com).

Conclusion

The Smart Village and ICT project is still in the first stages also it has a long way to go in Iran, but most of the villages in Iran can become smart villages due to their capacity and potential. This requires the full efforts of the public sector, the private sector, and the villagers to be able to implement it. ICTs can be used as a tool to educate and empower women, youth and adolescents, the poor and small groups and minorities. Regarding the education and effective efficiency of communication and information technologies, it can be said that it is also a bridge between sustainable rural development and poverty reduction, because it is not possible to get out of deprivation without gaining knowledge and awareness. On the other hand, rural development is not possible without awareness of the destructive consequences of rampant economic growth and without the use of technologies (such as ICTs).

With the growth and expansion of ICT, the rural community can be raised to a level of desirable development. Otherwise, the dichotomy between urban and rural, traditional, and modern, will intensify, and an information and knowledge gap will emerge between the two, which will have devastating effects on rural communities.

Shahkooh village of Golestan province is one of the villages that has the potential to become smart. This village is located in the north of Iran in a pleasant climate and tourist area. It is the first electronic village in Iran. Shahkooh village has ICT offices and most of the educated youth of this village are employed in these offices so most of the young people in this village are studying in the field of computers and ICT. This has prevented the illegal migration of villagers to the city. This has prevented the illegal migration of villagers to the city. As it is obvious, Shahkooh village has the potential to become a smart village, but this is possible with the cooperation and perseverance of the government and the villagers.

References

Bahramian, S. (2009): *The role of information and mass media in development*. Available on the website of Islah Information Database

Duncombe, R., Heeks, R. (2001): *Enterprise development and information and communication technologies in developing countries: Supporting "ICT-Flyers"*. University of Manchester, Institute for Development Policy and Management, Manchester

Eftekhari, A., Ghaderi, I. (2013): Role of rural tourism in rural development: Review and analysis of theoretical frameworks. *Modarres*, 6., 21–32. [in Persian]

Hesam, M., Cheraghi, A., Ashour, H. (2014): *Journal of Housing and Rural Environment*, 66.
Iran Agricultural News Agency. http://www.iana.ir
Khoran, M., Ahmadi, K. (2012): The impact of ICT on employment and rural economy improvement, *National Conference on Rural Development*, 1–4.
Maleki, S. (2011): A survey and comparative study of rural ICT in Iran (Case study: Villages of Khuzestan Province). *Journal of Housing and Rural Environment*, 133., 49–68.
Rao, N. (2007): A framework for implementing information and communication technologies in agricultural development in India. *Technological Forecasting and Social Change*, 4., 491–518.
Shah Shojaei, A. (2002): A review of the situation of rural libraries and the presentation of proposals. *Book Journal*, 3., 95–72.
Sharifzadeh, A., Moradnezhad, H. (2002): Rural sustainability and development. *Jihad's Social Economic Monthly, Khordad and Tir*, 52–54. [in Persian]
Sharpley, R. (2002): Rural tourism and the challenge of tourism diversification: The case of Cyprus. *Tourism management* [in Persian]

THE USE OF INTERNET IN THE WORK OF LOCAL GOVERNMENTS

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ABSTRACT
The use of the Internet in the work of municipalities is becoming increasingly important. However, its prevalence and effectiveness vary considerably. In the case of Hungary, this is also an observable phenomenon that we experienced. For this reason, there is a need, among other things, for aids to help you navigate the world of the Internet, to show you what and how to use Internet tools. In this study, we present eight such topics: statistics, popular websites, communication, institutions, e-administration, marketing, inter-municipal partnerships, municipal fees. These will be part of a handbook for local governments in an Interreg project.

KEYWORDS
smart communities; smart database; local government; use of internet

Introduction

In the 21st century, the Internet is widespread and has become a dominant tool in our daily lives. The possibilities offered by the Internet are slowly becoming limitless, and today there are plenty of websites offering a myriad of services, making it difficult to navigate or even find. Numerous conversations, interviews and media news in recent years have shown us that this is also true in the case of local governments.

A smart database subproject will be developed within the framework of the Interreg project "SKHU / 1902 / 4.1 / 027, Smart Communities 2.0 (2020–2022)". The Smart Database (and a Helpdesk, another part of the project), as a one-stop-shop, provides all actual and relevant information in one place, thus ensuring matchmaking between villages, opportunities, and competent consultants.

The essence of the smart database is that the local governments are presented and described various Internet opportunities (as part of knowledge transfer to villages) in the form of a handbook, through which they can better connect to the information flow, and at the same time points out that villages with what tools and activities they can be 'smart' in this field. The topic is unique and practical, so the scientific page adds information to each section.

In this study, the theoretical foundations and main structural elements of this subproject are presented.

Background of the phenomenon

The use of the Internet in the work of municipalities is becoming increasingly important. However, its prevalence and effectiveness vary considerably. In the case of Hungary, this is also an observable phenomenon that we experienced from three sides.

In 2010, we conducted field surveys in Somogy county, villages (interviews with local governments), as well as examined the characteristics and presence of the settlements on the Internet and found that they are present in a modest form on the Internet, often only one settlement website (Szabó, Turcsán 2014). Then, 10 years later, in 2021, we conducted interviews with the leaders of smaller Hungarian villages, and we examined several settlements in Nógrád County in a similar way. Here, too, we found that the use of the Internet is not so widespread, but differences can already be detected in the field of individual devices: there are widespread Internet devices (used by almost all municipalities), there are devices that are used by almost no one and there are third).

It is typical that this phenomenon depends on the size of the settlement, but also on the activity of individual municipalities in this direction. In larger settlements and thus in larger municipalities, more labour capacity, time, and energy are available for this type of activity, while in the case of smaller municipalities it is often lacking or insufficient. In addition, many forms of the possibilities offered by the Internet are often unknown.

Based on these, the goal can be formulated in the case of villages, on the one hand to strengthen the labour force capacity and knowledge in this direction, and on the other hand to produce auxiliary materials. Hereinafter, the latter will be discussed. The Internet tools are important, but we cannot forget about that the tools assumes the knowledge of Internet use (residents, tourists, entrepreneurs etc.) and exclude those who do not use the Internet.

Topics of smart database

In the work of local governments, we have identified eight topics in which the possibility of using the Internet arises. These are as follows. The handbook is prepared for Hungarian and Slovak municipalities, so on the one hand the description is general and not country-specific, on the other hand the various Internet sources in the volume are partly separated into Hungarian and Slovak websites, partly international websites can be used by both parties. It is also important that a settlement is smart, part of which is that the municipality uses the opportunities provided by the internet, so we emphasise this.

The first is the communication. One of the most important issues in democratic systems is communication, namely bilateral communication between the holders of power and the population. This is particularly important for units that can be considered decentralised, such as local governments, where decision-making and the population are in the closest and most direct relationship. There has been a significant shift away from traditional forms of communication, but rather from traditional forms of information (billboards, local press). One, but still one-sided, form of this is local TV, radio broadcast communication. However, with the advent of the internet, this platform has become the simplest information interface. The settlements partly publish the news on their own websites, where the citizen can sometimes answer or ask questions in the form of comments. However, the use of already interactive interfaces and applications is even more modern. Outstanding among these is facebook, which has already become a popular information tool for local governments, mayors, and representatives. In addition to commenting on the posts, it is also possible to react with different emoji by which the reader expresses his emotional attitude to the post in a nonverbal form. But this category also includes various blogs, where you can also share both text and image content, as well as comment. In addition, there are several other, less common forms. These communication channels are presented in the manual. Here, it can be considered really smart if the municipality engages in active two-way communication via the Internet.

The second is the e-government. In the information age, the opportunities and directions of movement of all settlements and regions will develop according to the conditions set by the information society. The information society has created a new type of state, the network state, whose administration is e-government. In the network state, county and local administrations will change to create digital (e-)self-government and digital (e-) citizenship (Gergó n.d.). In Europe, in recent years, there has been, or is now, a shift to e-government at the level of governance and self-government. E-government is the adaptation of e-government to local government, or the application of network-based technologies to serve the community represented by the local government. In a narrower sense, the digital way of the work of local government bodies (and committees), in a broader sense, enabling social involvement in the process of local government, active e-participation. The task of e-government is also to provide electronic cooperation between local society and local government, local government, and state government. Finally, the continuously modernised internal operation between municipal bodies and mayoral offices (Gergó n.d.). The purpose of e-government: to connect the civil society e-gateway, the municipal-public e-gateway, the governmental and regional e-gateway, and the administrative knowledge e-gateway. There must be a significant change in the modernisation of existing local systems, e.g. in the transparency and efficiency of municipal work, in the availability of public interest and digital information, and in the IT support of civic information and administration (Gergó n.d.). On the one hand, e-business is not a paper-based or one-stop-shop e-administration, or a much faster, simpler, more professional administrative (of course electronic) administration. E-business is not just

an office administration via a computer network that allows you to download and submit both completed forms. On the other hand, there is also efficient information management, during which two-way (interactive) access to public data and information acquisition takes place. The aim is for the leaders of the municipalities to set an example for the actors of the local community in the courageous use of info-communication technologies. E-government presupposes the strengthening of the local intelligent society and the administrative application of new knowledge and technologies. A separate chapter in the manual addresses this, presenting such possibilities. Being smart here means that the municipality uses the internet tools in its work to manage administrative affairs.

The third is the use of municipal statistics. As at all levels of society and the economy, data is playing an increasingly important role in the local government sector. The settlement data that can be extracted from the databases serve several purposes in the case of a municipality. On the one hand, reports, accounts, decision-making studies, feasibility studies and settlement-level planning documents (settlement development concept, strategy, spatial planning materials) are needed, but they can also be used to prepare field documents (economic, environmental, educational etc.). programs, climate strategy etc. Based on the data, more informed decisions can be made. On the other hand, it also has an important role to play in the mandatory provision of data to various institutions. Thirdly, the statistical data collected about the settlement are also necessary for the preparation of the application materials. Fourth, by publishing the collected data, the municipality can provide information about the settlement. This is the case for local actors such as the general public, entrepreneurs or external stakeholders such as tourists, investors etc. means informing. It is a question of where the data can come from. For local governments, the internal data source is the data generated during the operation of the local government, as well as the data related to the settlement services and public services, which are available at the local government, administrative or even market participants involved in the performance. An important task is to collect and systematise them, and to manage data assets consciously (HBH n.d.). The main external source is the central statistical offices of each country. Here, censuses (every 10 years), but annual reports and microcensuses are also important sources. In addition, however, data on the settlement may be available from many other public administration institutions, organisations and even companies. Some of them are available for free, even online, others have to be paid for. The problem, however, is the fragmentation of these sources of information, their often-changing availability, format, or simply the fact that few people know about them. For this reason, it is advisable to deal with this issue separately in the handbook, ie to present the various Internet data sources and their use to local governments. Being smart means that the municipality uses a number of up-to-date statistics that it can collect through the internet.

The fourth is the presence on popular websites. Today, there are many ways to communicate information about settlements on the Internet. On the one hand, the website of the settlement itself, from which a wide range of information content, the settlement-

specific data repository and even bilateral communication can be expected. It is a gateway from which you can start and access all the information of your target audience that is important. The website of the settlement is essentially a collection of information about the settlement, as well as an extract of its situation analysis (Pap 2007). The four advantages of online advertising are: positionability, (focus), traceability, secure targeting and flexibility, interactivity. It is important that the website you create reaches as many target groups as possible; this can be helped by sending the website link to major search engines and web guides or exchanging the website link with other similar websites (such as twinned towns, nearby areas, and major tourist attractions websites) and both parties posting the link to their site (Zeff, Aronson 2000). On the other hand, there are a number of external websites where text, images, data, i.e. information about the settlement can be placed. Social media includes websites that support self-expression, the ability to share (text, image, sound, video), content generation. The best known is Wikipedia, in its own and in English. In addition, you can discover other websites describing the settlements of the given country. Two-way communication can also be important here, but this already fits into the topic of communication. It is basic that the local residents or external interested parties can find out about the location and accessibility of the settlement, its population, the main social and rich characteristics. Tourist information about the settlement (sights, accommodation, services) is important. It is also important to be on external websites because potential residents, those looking for a weekend holiday home, or even those who want to invest, look at the opportunities in such places for the first time. In addition to the textual description, it is very important to have photos as a pastime. Moreover, it is possible to make a simple video introducing the settlement, and this can also be shared on the Internet, for example on YouTube. A version of the videos is called viral video, the main features of which are short (on average 1–3 minutes), low production and media costs, their topic is an interesting or entertaining event, a typical presentation. YouTube and Facebook can help you publish these videos (Berényi 2011). Overall, the appearance of the settlement on the internet on the most visited websites is an effective, simple and cheap tool, and it also plays an important role in the marketing of the settlement. In this chapter of the handbook, we will write about appearing on popular websites. To be a smart settlement in this field means that you can find the settlement on popular websites (description, photos, videos, testimonials etc.).

The fifth is the settlement marketing. Today, many municipalities around the world are facing the consequences of demographic decline, a globalising economy, growing income needs, and the resulting competition. There is an increasing competition between the settlements for the value-creating population, tourists, investors, and businesses. From the point of view of the development and competitiveness of settlements, it is essential that they apply an appropriate marketing strategy (Marien n.d.). Despite more than two decades of history, settlement marketing is not a well-known field, and thus local governments rarely try to consciously apply it in their settlement development strategies and in their activities aimed at promoting the development of local tourism (Tózsa 2014). In settlement marketing, the target is the sale of a settlement as a product to the following

target groups: economic operators, tourists, and the population. In contrast to all three groups, the seller has the important task of, on the one hand, condemning those in the area and, on the other hand, attracting new ones to the area. Settlement marketing consists of several components (examination of the internal and external environment, selection of a possible marketing policy and determination of the goal to be achieved, market segmentation, advertising, product development) and omitting any element can jeopardise the success of the whole process (Kozma 1995). In order to successfully sell the area or to get into the public consciousness, good communication to the public is important; this requires a message that is eye-catching and creates an image of its own for the area. A key task is to get the message across to the target groups effectively. There are five general tools for communication: advertising, direct marketing, the Internet, publications / brochures, and PR (Public Relations). The benefits of Internet options include that they are inexpensive, quick to use, far-reaching, have a wealth of information, and allow two-way communication that ads, for example, do not (Kozma 2010). Various websites offer opportunities for the settlement to advertise its tourist attractions, events, accommodation, and services, on the one hand, to present the opportunities offered by the settlement, the life there, and on the other hand to try to attract investors to the settlement. In the case of smaller settlements, a special target group for all three settlements is the domestic circle, but at the same time one of the special and unique characteristics of the World Wide Web as a means of communication is that it reaches potential target groups outside the country. A separate section of the handbook deals with settlement marketing, presenting websites where this activity can be easily done. The smart nature of this topic is shown by the fact that the municipality uses internet tools in the settlement marketing.

The sixth is the registration in different institutions. Perhaps the biggest challenge in internet tools is choosing and choosing between the services of different institutions, organisations, companies. You can register at such places and access services and information either for free or for a fee. This is either a direct website visit, but it can also be an internet newsletter or an email. This can mean news about tenders, new legislation, company information, job opportunities, but it can also be media coverage. Participation in various municipal and municipal associations plays an important role, from which a local government can access a wide range of current information and can also use various services for a membership fee. In addition, it is important to highlight the technical assistance provided by the Internet. It is possible, for example, to translate to and from a foreign language, to retrieve various pictures. There will be a chapter in the handbook on the possibilities and benefits of registering with different institutions and organisations. Being a smart settlement here means that the municipality is registered in different places and thus receives selected, important information via the Internet, even in the form of newsletters.

The seventh is the partnership. Settlements can be linked by a variety of formal relationships (hierarchical and horizontal administrative, voluntary, and coercive

economic), and of course there can be a variety of informal relationships between two settlements. Twinning can be placed between the two, as long as it is usually a formal relationship based on written treaties, often even part of an international institution, but this is not necessary and it can be a "bottom-up, people's initiative" that is only slightly formalised approval and participation of local management. If the relationship-building was driven by a profit motive (for both participants, or enough if one planned to use it as capital) and investments had to be made for it, the twinning relationship is as much a relationship capital as an individual planning a migration or an entrepreneur seeking to increase market share. contacts for the intended purpose (Giczi, Sik 2003). Twinning relationships are often formed through personal ties, but an online interface can be used to find a partner. A settlement can also join international tenders and international partner networks by domestic or international consulting companies, coordinating organisations contacting the local government by joining the emerging partner network, or the settlement itself registers on such websites on the Internet. Of course, settlements sometimes locate the settlement directly through a previous cooperation or relationship. Its cooperation already covers an extremely wide area. Joint cultural and sports events can be found in the same way as joint educational projects, relations between professional and non-governmental organisations or joint economic exhibitions and fairs. Thanks to decentralisation efforts in recent decades, there has also been increasing cooperation between local government levels in tackling common problems such as regional development, the environment, support for small and medium-sized enterprises, social and employment policy, migration, and so on. Twinning relationships are long-term collaborations and provide an opportunity for participating municipalities to meet not only in connection with a protocol event, but to really get to know each other's lives and exchange experiences on current procedures for solving current problems, such as making local administration more efficient. the fight against crime, vocational training, or the struggle against unemployment (Gergó 2006). A chapter in the handbook will be about municipal partnership, introducing online forms of partner search. In this case, the municipality is smart if it is present on such international websites and may have found a sister project or project partner in this form.

The eighth is the awards of settlements. The remuneration of the outstanding activities of the settlements in one area is important from several aspects. On the one hand, it strengthens the local community, its identity, as they will be proud of their settlement. On the other hand, its reputation goes on several forums, so the image of the settlement improves. In addition, town leaders are given recognition and are better valued by the local population. There are now many types of settlement fees, there are country specifics and there are also international fees. There are some that have been advertised for a long time, year after year, and some that are unique, just occasional. In today's world, the easiest way to find out about these is on the Internet, so it's important to have this kind of collection of these awards, and it's important for city leaders to get to know them and run applications appropriate to the city. A chapter in the handbook will deal with settlement

fees, listing such options. Being smart as a town means knowing these forms thanks to the internet and even applying for it.

Conclusion

The use of the Internet is now indispensable in many areas of life, including the work of local governments. This is part of the process of turning a settlement into a smart settlement. For this reason, as many tools as possible are needed to help this process. Such is the work we started by compiling a collection of websites. By trying out the individual websites and their services, there are sure to be some that will be a useful tool for a local government, so we hope that this work will increase the efficiency of local governments and thus strengthen the use of Internet tools and their Internet presence.

References

Berényi, K. (2011): Online kommunikációs eszközök, technológiák. In: Bányai, E., Novák, P. (eds.): *Online üzlet és marketing*. Akadémiai Kiadó, Budapest, 158–177.

Gergó, A. (n.d.): *Egy községi önkormányzat az e-közigazgatás tükrében*. URL: http://www.inco.hu/inco11/ekozig/cikk1h.htm

Gergó, Zs. (2006): A transznacionális és mikroregionális hálózatok szerepe és működése. In: Kaiser, T. (ed.): *Hidak vagy sorompók? A határon átívelő együttműködések szerepe az integrációs folyamatban*. ÚMK, Budapest, 178–204.

Giczi, J., Sik, E. (2003): A települések kapcsolati tőkéjének egy típusa: A testvértelepülések. *Szociológiai Szemle*, 4., 34–54.

HBH Kft., Collective Intelligence Kft. (n.d.): *Tudatos Település Útmutató (Gyakorlati ajánlások az önkormányzatok számára a helyi versenyképesség fejlesztéséhez)*. URL: https://bm-oki.hu/News/ViewFile?fileId=1117

Kozma, G. (1995): Városmarketing mint a helyi gazdaságfejlesztés egyik lehetséges eszköze. *Tér és Társadalom*, 1–2., 37–54.

Kozma, G. (2010): A terület- és településmarketing szerepe a terület- és településfejlesztésben. In: Süli-Zakar, I. (ed.): *A terület- és településfejlesztés alapjai II*. Dialóg Campus, Budapest–Pécs, 367–408.

Marien, A. (n.d.): *A sikeres településmarketing kulcsa az elégedett lakosság*. URL: http://www.marketing-turizmus.hu/otka/n33.pdf

Pap, N. (2007): Az információs korszak kihívásai a területfejlesztésben. In: László, M., Pap N. (eds.:) *Bevezetés a terület- és településfejlesztésbe*. Lomart, Pécs, 83–90.

Szabó, P., Turcsán, Zs. (2014): Az internet használatának lehetőségei a magyarországi hátrányos helyzetű térségek marketingjében Pogányvölgye példáján. In: Lukovics, M., Zuti, B. (eds.): *A területi fejlődés dilemmái*. SZTE Gazdaságtudományi Kar, Szeged, 229–239.

Tózsa, I. (2014): A településmarketing elmélete. In: Tózsa, I. (ed.): *Turizmus és településmarketing*. Budapesti Corvinus Egyetem, Budapest, 129–157.
Zeff, R., Aronson, B. (2000): *Reklám az interneten*. Geomedia, Budapest

SMART TRANSPORTATION SOLUTIONS IN URBAN AND RURAL AREAS

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ABSTRACT
The saturation of traffic in urban spaces and the lack of transport opportunities in rural areas are causing more and more problems. The aim of the present study is to outline the possibilities that can solve these problems with the help of intelligent transport systems and demand responsive transport. In addition to the general introduction, we present some of the many possible solutions in the form of case studies.

KEYWORDS
smart transportation; rural areas; urban areas; intelligent transport

Introduction

The rapid technological development of the last decades has made it possible to meet many clever innovations in the field of everyday or scientific life, urban development, or transport. The aim of these developments is to create innovative tools and systems that significantly facilitate and optimise their use, based on modern information technologies. As a result of technological advances, it has now become a socially universal information service available to everyone, anytime, anywhere.

Newer and newer technical solutions offer an increasingly wide range of intelligent transport services, and these services are based on real-time data.[1] Intelligent transport systems are transport and traffic management developments that allow users to be informed in real time and to use transport networks more safely and intelligently.[2] While transportation is one of the key elements of the development of the world economy, our mobility is often the key to a better quality of life, but it can also cause damage to the environment, community life and sustainability. In other words, a balance needs to be formed that allows for continuous development without significant damage[3], and this is what intelligent transport systems are designed to achieve.

[1] https://www.innoteka.hu/cikk/intelligens_kozossegi_kozlekedes.283.html
[2] https://eletokosan.hu/az-okos-varos-elv-leggyakoribb-alkalmazasi-modjai-napjainkban/
[3] https://www.innoteka.hu/cikk/intelligens_kozossegi_kozlekedes.283.html

Urban transportation

The "smart city" methodology uses modern digital technology to improve the efficiency of services available in our environment, transport, environmental protection, or economic production.[4] There are many smart transport solutions in big cities that have become so ingrained in the daily lives of the population that their presence is often not even noticed. One of the main goals of intelligent transportation systems is to reduce the population's dependence on their own car while encouraging residents and visitors to use public transportation.[5] Well-functioning public transport is a particularly important urban development goal, as combined with cheap telecommunications options society can save a lot of transport time, costs and pollution for those living in and around the city (Baji 2017). Smart transport involves the use of a wide range of technologies. Such is the case with car navigation, which plans the fastest route based on current traffic conditions and also warns people of potential hazards. Automatic license plate recognition, speed measurement, or data provided by security cameras all contribute to continuous traffic monitoring. Many major cities have a mobile app developed for their own public transport that allows passengers to plan a route, calculate arrival times and manage their tickets.[6] Another type of sustainable, smart transportation is the sharing of means of transportation, so in many cities we can come across bikes and electric scooters that can be rented through apps.

Singapore

According to the IMD Smart City Index 2020, Singapore is the "smartest" city in the world, and with its many mobility developments serves as an example for other countries in terms of transport. The population of the city-state is constantly growing, so that today more than a million vehicles travel on its roads. The challenge for transport is to optimise the scarce space available and to create a more efficient, safer, and more reliable public transport system so that residents can leave car use. There is still a lot of research going on in order to achieve the goals set. One of these elements is the integration of self-driving cars into passenger and freight transport, which can provide better opportunities, especially for the elderly and those with reduced mobility. The use of self-driving vehicles is expected to lead to better compliance with traffic rules, thus greater safety and shorter journey times. In addition, with the introduction of contactless fee payment and ticket management, all this can be done online, which simplifies and speeds up the passage through the gates. On-demand shuttle services only start if passengers predict their travel

[4] https://eletokosan.hu/az-okos-varos-elv-leggyakoribb-alkalmazasi-modjai-napjainkban/
[5] https://mobility.here.com/
[6] https://enterpriseiotinsights.com/20170626/transportation/20170625transportationwhat-smart-transportation-tag23-tag99

intentions through an application, thus optimising flight utilisation and reducing traffic outside of peak hours. Online flight booking and ticketing, and thus the incorporation of information technology into public transport, provide researchers with a wealth of real-time data on transport trends and thus serve as a basis for future developments.[7]

Cluj-Napoca, Romania

After the investments made with the support of the European Union in the beginning of 2020, Cluj-Napoca became the most environmentally friendly public transport system in Romania. Of the subsidies received, 50 new trolleybuses were purchased, 25 of which were put into operation immediately, making half of the city's public transport electric, environmentally friendly. The trolleys are equipped with the most modern technologies available. Examples are the indoor and outdoor video surveillance system, the audio-video information system for informing passengers and the passenger traffic counting system. The latter allows the number of passengers to be continuously tracked and recorded at stations, routes, and vehicles. In addition to the clever improvements, all vehicles purchased are equipped with a ramp, so they can be used comfortably for restricted in their mobility and for those traveling with a stroller. Currently, two-thirds of the vehicles used in the city (bus, trolleybus, tram) are new. The city's leadership aims to transition to fully environmentally friendly public transport technologies by 2026.[8]

Esztergom, Hungary

On 31 January 2020, the Mária Valéria Bike, a joint cross-border bicycle rental system of Esztergom and Šturovo, was handed over, which was established within the framework of the Interreg V-A Slovakia-Hungary Cooperation Program. The common system also allows residents and tourists to take a rented bike out of any dock and return it to any station. This form of shared mobility is based on device sharing and promotes an environmentally friendly mode of transport. Currently, 60 conventional and 45 electric bicycles can be rented, and users can choose from a wide range of options, from day tickets to annual passes. After registration and purchase on the website created as part of the project, the bikes can be easily picked up with the user's individual PIN code and after use can be handed over at any station.[9] This method of renting a bicycle is especially popular with tourists but is also often used by locals who do not have their own bicycles to take short trips.

[7] https://www.smartnation.gov.sg/
[8] https://www.themayor.eu/en/cluj-napoca-has-the-least-polluting-public-transport-fleet-in-romania
[9] https://www.igom.hu/hir/1683-itt-szallhatsz-fel-a-maria-valeria-bike-ra

Rural transportation

The possibility of public transport in rural areas is quite different from that in cities. While public transport between major cities is most often solved by regular bus services, in sparsely populated, small-village areas there is an almost complete lack of public transport. Residents here almost completely lose their mobility in the absence of their own car (Smulian 2019). One of the main goals of developing public transport is to reduce residents' dependence on their own car. By improving transport in rural areas, urban traffic can also be reduced, as if fast and affordable opportunities open up for the rural population workers in the cities will have a high chance of opening up to public transport.[10] However it is important that not only bus services can provide a solution in the planning of transport in rural areas. While the use of state-of-the-art and very expensive technologies is typical for cities, the resources available for development in rural areas may be much lower. In these areas, the greatest emphasis is placed on shared mobility solutions so that residents can also benefit from a more cost-effective, sustainable transport.[11] Door-to-door minibuses or carpooling are flexible solutions on demand.

University of Hertfordshire, UK

Although the area is in close proximity to London, the university is in a transport-isolated location. The University of Hertfordshire set up its own bus company, UNO, in 1992, with the aim of providing faculty and students with access to campus. UNO is headquartered in Hatfield, but also operates flights to St Albans and further afield to the Universities of Northampton and Cranfield. It currently provides intelligent public transport for those living in the area with a fleet of around 100 buses (Smulian 2019). The buses use mobile technology and real-time information services. Tickets are purchased through a mobile application. With the involvement of information technology, they have a wealth of data on traffic patterns that will help them plan the route and frequency of future bus services. The basic goal in designing the transport system was to make things as simple as possible so that passengers could easily learn to use the system. In addition to modernising transport, the research group places special emphasis on drawing public attention to the importance of sustainability. The success of the project is evidenced by the fact that more than 60% of the passengers transported by the bus company set up for university purposes are not persons connected to the university, but the rural population living in the area (Smulian 2019).

[10] https://ruralsharedmobility.eu/
[11] https://enrd.ec.europa.eu/

TFI Local Link, Ireland

More than 80% of Ireland's territory is rural, and despite the fact that a large proportion of its population lives in cities, 32% of the population still remains in villages.[12] The Rural Transport Program, set up in 2002, aims to increase the mobility of people living here, a great example of top-down interventions.[13] With the support of the Irish government, the TFI Local Link rural public transport service was launched with the aim of connecting rural areas with the main public transport routes by providing affordable transport.[14] It currently offers two types of services in 15 districts of Ireland, regular bus services and door-to-door passenger transport. While bus services run regularly on weekdays and weekends (with a reduced number of connections), the intention to travel door-to-door is to be predicted and buses will depart on demand. The latter option is especially useful for those who live in scattered settlements and farms from which they have no other option to connect to public transport. More than 80% of buses can also be used with wheelchairs and prams, and passengers with reduced mobility can get help if they anticipate their travel intentions. With this development, Ireland has taken a huge step towards increasing the opportunities for the rural population, rural mobility and increasing the mobility, accessibility, and community participation of locals, especially those at risk of social exclusion.[15]

Bürgerbus, Germany

We call bottom-up transport developments those programs in which implementation begins without state support and with the help of volunteers. This group also includes the Bürgerbus in Germany. For such an initiative to be successful, four key issues need to be addressed together. These are public transport services, volunteers, local resources, and vehicles. The Bürgerbus is part of the public transport system, an option open to anyone, requiring only a reservation. In the case of a regular bus company, up to 70% of the revenue is spent on paying drivers, while in this case, with the work of volunteers, this amount is much lower. Used vehicles are all minibuses or passenger cars, as these can be driven by volunteers without a separate license. There are currently about 350 Bürgerbus routes, mainly in the provinces of North Rhine-Westphalia and Baden-Württemberg. Most routes operate between 8 a.m. and 1 p.m., and the majority of passengers are older. The main purpose of the routes is to transport people from the villages to a larger public transport hub, shopping centre, or health care facility, but more and more private vehicles booked for private use are also departing. In the case of such developments, the most

[12] https://ruralsharedmobility.eu/insight-papers/ireland/
[13] https://enrd.ec.europa.eu/
[14] https://www.nationaltransport.ie/public-transport-services/rural-transport-programme/
[15] https://www.transportforireland.ie/

important thing is for the volunteers to start with their own attachment and motivation and to participate in the project in the long run, as without them they would not be able to function.[16]

Rezo Pouce, France

Unlike before, this project does not focus on the development of public transport in the traditional sense. Rezo Pouce offers free, eco-friendly transportation while promoting hitchhiking. In some rural areas of France, hitchhiking has long been a common practice when short-term travel is required. Today, an app and website have been developed for this, so hitchhikers can even book a ride for themselves in advance, but many still opt for the traditional mode. Municipalities designate hitchhiking places where hitchhikers and drivers can meet. This mode of transport is largely trust-based, but for maximum safety, registrants must identify themselves and their vehicles. Since the release of Rezo Pouce, the number of registered members has been growing steadily. In general, three-quarters of the journeys made in this way are shorter than 10 km, while the most frequently traveling age group consists of young unlicensed adults.[17]

Summary

It is also clear from some of the examples presented that there is a huge potential for public transport in rural areas. The solutions can be very diverse, from simple on-demand bus services to extreme hitchhiking options. However, it is important to point out that the fact that a project has proven successful in one location may not be the most ideal solution in other locations. In each case the methods used must be designed with local conditions and resources in mind.[18] By examining the age composition of the population, we can already get an approximate picture of which solutions can work, as the needs of the elderly and young people are very different. Today, we can see many exemplary initiatives, especially across Europe, but the number of transport-isolated rural areas remains high. That is why it is important that more creative, smart solutions are found in the future so that the quality of life of the population can be improved in these areas through sustainable public transport.

[16] https://www.buergerbus-bw.de/info
[17] https://www.euromontana.org/en/rezo-pouce-hitch-hiking-to-improve-rural-mobility/
[18] https://ruralsharedmobility.eu/

References

Baji, P. (2017): Okos városok és alrendszereik: Kihívások a jövő városkutatói számára? [Smart cities and their subsystems: Challenges for the urban researchers of the future?] *Tér és Társadalom*, 1., 89–105.

Smulian, M. (2019): The smart solution to rural transport. *Smart Transport*, 2., 57–61.

Internet sources

- https://eletokosan.hu/az-okos-varos-elv-leggyakoribb-alkalmazasi-modjai-napjainkban/
- https://enrd.ec.europa.eu/
- https://enterpriseiotinsights.com/20170626/transportation/20170625transportationwhat-smart-transportation-tag23-tag99
- https://mobility.here.com/
- https://ruralsharedmobility.eu/
- https://ruralsharedmobility.eu/insight-papers/ireland/
- https://www.buergerbus-bw.de/info/
- https://www.euromontana.org/en/rezo-pouce-hitch-hiking-to-improve-rural-mobility/
- https://www.igom.hu/hir/1683-itt-szallhatsz-fel-a-maria-valeria-bike-ra
- https://www.innoteka.hu/cikk/intelligens_kozossegi_kozlekedes.283.html
- https://www.nationaltransport.ie/public-transport-services/rural-transport-programme/
- https://www.smartnation.gov.sg/
- https://www.themayor.eu/en/cluj-napoca-has-the-least-polluting-public-transport-fleet-in-romania
- https://www.transportforireland.ie/

SMART SOLUTIONS FOR ECOTOURISM

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ABSTRACT
A nature park is a regional cooperation of local communities on areas with considerable and distinctive natural values, landscape elements and cultural-historical significance, and their aim is to preserve, present and utilise natural heritage and cultural heritage to facilitate the development of the region. Nature parks build on the principle of integrated protection: they do not protect the landscape and nature from the people living there, they work together with them towards conservation and utilisation goals. Nature parks are model regions for the innovative and sustainable development of rural areas. My research has revealed that at the Pannontáj-Sokoró Nature Park IT tools and local knowledge required for ecotourism and for the competent virtual presentation of the region are available. The nature park development concept needs to be reviewed. First, we need a list of projects that the work organisation of the nature park could implement, and second, we also need a list of the projects the 29 settlements wish to implement, since the current support scheme does not consider complex solutions, only individual ideas and developments are subsidised. While developing the concept, it is important that compromises should be reached and priorities should be defined, as these, I believe, are necessary for growing into a smart region, into smart communities.

KEYWORDS
nature park; smart region; smart communities; rural development; rural area

Introduction

Wherever we are in the world and whatever we do, we always look at the world around us with interest. Tourism also plays an important role in this, which arouses our interest with its special tools and shapes our travel habits. In my opinion, we are only connected to the nature and living space that we know, so I consider internal tourism in a given area to be especially important, which may even mean getting to know the immediate surroundings of our own settlement, our place of residence, where we live.

In my study, after a general presentation of the international and domestic situation of nature parks, I would like to present the regional development possibilities of the Pannontáj-Sokoró Nature Park from a specific perspective. Currently, 16 nature parks have name titles, several of which I participated in before mentoring, and I manage the Pannontáj-Sokoró Nature Park and work as a vice-president in the professional work of the Hungarian Nature Park Association.

One of the tasks of the nature parks in Hungary is ecotourism, to acquaint the people living here and the visitors with the nature around us. This type of tourism is less measurable and does not generate significant economic income for the nature park in any way. However, it is important for us to promote our regions and make them attractive, while at the same time showcasing the services, attractions, tourist attractions, hiking trails and nature trails that are available in our region.

At the time of writing this essay, we are living in the era of "#stay-at-home", with the pandemic caused by the Crown virus, nature is green, and birds are chirping, but people are safest in their homes. Children are learning at home, using digital methods never tried before, while parents are lucky enough to have a home office. Nature has become especially inaccessible to the urban population, and at the same time this period will have an unpredictable effect on the tourism of Hungary and the world.

I think the topic of my paper is specifically due to the effects of the virus: what role does digital technology play in the ecotourism of an area? Is close-to-nature thinking compatible with using "gadgets" on our tours, do paper-based maps have a raison d'être? In my study, I am also looking for answers to these questions.

Nature parks in Europe

Nature parks exist in many European states. Outstanding nature with particularly rich natural and cultural heritage. Together with other protected natural areas, they cover a significant part of the territory of each state, up to 25%, and play an active role in the network of parks throughout Europe. The nature parks are mainly located in rural areas and carry out forward-looking activities in the areas of biodiversity, nature conservation, recreation and sustainable tourism, as well as environmental education and the sustainable development of rural areas (URL1).

The history of European nature parks spans more than 50 years. The Association of German Nature Parks and EUROPARC conducted a questionnaire survey in 2005 interviewing umbrella organisations in 25 European countries. According to the study, there are more than 600 nature-level collaborations in Europe similar to nature parks. The name and tasks of the "nature park" category is diverse across Europe. The concept is often confused with the concept of a "protected area", and the size, possibilities and work organisations of the parks also show great differences. Often there is a state body behind the nature parks, which even provide official tasks and related resources to the nature parks. There are a total of about 900 regional nature parks in the 20 EU Member States as well as Norway and Switzerland. Together, they cover 8% of the total area of the European Union.

Regional nature parks can make a significant contribution to the local implementation of EU nature protection directives, such as the Habitats and Birds Directives and the Water Framework Directive and support the European Union and its Member States in achieving the objectives of the Biodiversity Strategy and the Green Infrastructure Strategy. Nature parks are model regions for innovative and sustainable development of rural areas. With their work and experience, they are important partners in sustainable agriculture and therefore need to be more strongly involved in future rural development programs. Their activities are also important guidelines for schools and educational institutions in the field of training related to sustainable development.

Nature parks in Hungary

The nature park is a nature-level cooperation created by local communities in areas of the country rich in characteristic natural, cultural-historical values, with the aim of preserving and presenting the natural and cultural heritage and utilising it to promote the development of the countryside. Based on the principle of integrated protection, the nature park protects the nature and nature not from the people living in the nature, but by utilising it together with it.

In Hungary, the nature park movement started in the 1990s. However, their operation was not regulated for a long time. The concept of a nature park was introduced into the Nature Conservation Act in 2004, as well as the condition of the use of the name, according to which the consent of the Minister responsible for nature protection is required in order to obtain the title. The concept of a nature park is defined in the Nature Conservation Act (URL2), which defines a nature park as “a large area of the country rich in characteristic natural, scenic and cultural-historical values, which is intended for active recreation, relaxation, healing, sustainable tourism, nature conservation education, education and information, as well as for nature-friendly farming”.

Until 2013, the only national development document in which nature parks were named was the National Ecotourism Development Strategy. The document defining the professional and organisational and operational framework of the establishment of Hungarian nature parks was prepared in 2014 entitled The Professional Concept of Hungarian Nature Parks. “Harmony in the Nature” – The development concept of nature parks in Hungary (2015–2030) was born two years later. The aim of the document is to define the development guidelines for the existing and future nature parks, to outline the framework conditions necessary for their operation.

The main areas of activity of nature parks based on the “four-pillar model” are the following:

- *Pillar 1* – Protection of the natural and cultural heritage: care, upkeep and preservation of the natural and cultural values. Protection of worthy character elements and nature values of the natural area, application of knowledge and expertise for the survival of habitats and species.
- *Pillar 2* – Environmental education, awareness-raising: shaping the attitudes of the local population and visitors to the nature park through the presentation of local natural and cultural heritage and the efforts made to preserve it.
- *Pillar 3* – Rural development: support for developments based on natural and cultural heritage and nature features, preserving and enhancing nature values with the involvement of local communities (e.g. development of local products, markets, infrastructure supporting conservation and presentation, economic cooperation).
- *Pillar 4* – Tourism and recreation: formulating a tourism and recreation offer based on and maintaining the beauty, harmony, natural and cultural endowments and special values of the nature, product development promoting destination and recovery, destination construction, marketing, joint sales, support.

Pannontáj-Sokoró Nature Park

The Pannontáj-Sokoró Nature Park, founded in 2006, has 29 settlements (Bakonygyirót, Bakonyszentlászló, Bakonytamási, Écs, Felpéc, Fenyőfő, Gic, Győrasszonyfa, Győrság, Győrújbarát, Győrszemere, Kajárpéc, Koroncó, Lázi, Nydém, Nagydém, Pér, Ravazd, Románd, Alley, Sokorópátka, Táp, Tápszentmiklós, Tényő, Töltéstava, Veszprémvarsány), in a total area of 62.670 hectares.

"Modern nature conservation does not protect against people, but protects nature together with them," said Miklós Persányi, Minister of the Environment, in Győrújbarát on the occasion of handing over the title of Sokoró-Pannontáj Nature Park to 29 settlements in the Sokoró-Pannonhalma hills. "If we want to protect our values while making the lives of the people who live there more difficult, that is the wrong way to go", he said. He believed that values should be preserved in partnership with local society organisers, municipalities, NGOs. "This is the mission of the nature park: together we protect nature (...), the cultural heritage, together we protect the traditions that are connected to a region, he emphasised" (URL3).

Unfortunately, this partnership was not established for almost ten years, the nature park did not operate, however, the title of the nature park could not be revoked due to the lack of legal regulations in force at that time and now. In the summer of 2015, the Pannontáj-Sokoró Public Benefit Association, which I headed, took over the work organisation tasks of the Nature Park and started its work for the development of the area. Then a publication about the area was made, which can make tourists feel like visiting them, as well as a professional background study of our further work.

The Pannontáj-Sokoró Nature Park has no large-scale tourist attractions, except for Pannonhalma, so I started my work for the development of green tourism, ecotourism, and environmental education, and we are still on this path today.

Nature plays an important public role in cultural, ecological, environmental and social terms, and acts as a resource for economic activities (e.g. the trademark strength of a nature unit or tourism based on natural values, local gastronomy can also be a resource). Area protection refers to the preservation and maintenance of significant or characteristic features of the nature, its heritage value is given by the characteristic composition of the elements of the nature formed through natural features and / or human activities. The protection of a given nature can only be achieved by maintaining the forms of activity of the community living in the nature. For example, the abandonment of viticulture or the cessation of grazing can drastically change the nature of a given nature, losing its centuries-old character.

In my opinion, by preserving the nature character and presenting the natural, cultural, sacred and built environmental values found in the 29 settlements, we can draw attention to the wonderful nature of Sokoró, which already functions as a recreation area of Győr. Many families and groups of friends come here from Győr for cycling, hiking, and gastronomic experiences. We need to continue to strengthen this line. Our expert-led nature walks bring our natural assets to the attention of a significant number of participants.

One of the main pillars of our operation is tourism, which for us means mainly ecotourism and countless forms of recreational opportunities. If not in a targeted way, but incidentally, we are indirectly interested in addressing tourists and, on the other hand, tourism actors. We do not have a visitor centre, our own showroom, and we do not have enough resources and manpower, so we use the solutions of the Internet and the virtual world in several cases.

Nature park tourism

Tourism today is moving a wide crowd. Groups of friends of young people, families with small children, active retirees visit our area in search of recreation. The Hague Declaration on Tourism of the WTO (World Tourism Organization) and the Interparliamentary Union, adopted in 1989, is as follows: “On the one hand, tourism is defined as the relocation of people outside all their permanent way of life and work (housing and work), regardless of their motivations, duration and destination. Tourism, on the other hand, is a set of material, technical and organisational conditions and services created to meet people’s relocation needs”.

In his book published in 1992, Dr. Márton Lengyel defined the concept of tourism in this way: "By tourism, we mean, on the one hand, all relocations, and activities other than one's permanent way of life and work, whatever their specific motives, duration and target area. Tourism, on the other hand, is a set of material, technical and organisational conditions and services created to meet related needs. There are two forms, leisure tourism and professional tourism. Leisure tourism is a set of leisure activities and freely chosen activities outside the permanent home, motivated by one's need for diversity. Professional tourism is the totality of professional and leisure activities carried out during occupational relocations."

From the previous definitions, we can see that the definition and study of tourism is not new, yet today we mean something different than it did in the 1980s and 1990s. It is impossible to manage tourism alone, we must think of it in a given environment and system. Its central player is the person himself, who also has an impact on the economic, technological, ecological, and social environment.

The subjects of tourism in the area of the Pannontáj-Sokoró Nature Park are mainly persons participating in leisure tourism. Although a significant number of employees and entrepreneurs come here due to professional tourism, their field of interest is usually independent of the existence of the nature park (e.g. AUDI factory visitors, study-tour, sports events, business trips, Győr festivals, events).

Visitors come to our nature park for the following reasons, without claiming completeness:

- getting to know the area, recreational goal
- visit to relatives
- rural tourism (rural lifestyle, getting to know and experience the rural way of life, celebrations, events, rural slaughter of pigs, revival of folk customs)
- for the purpose of heritage tourism, an emotionally important area, a childhood memory
- religious tourism (e.g. Pannonhalma), visits to shrines, church centres
- pilgrims (Camino Hungaro and Camino Benedictus pass through the area)
- gastronomic experiences (the nature park is located in the Pannonhalma wine region)
- event and wedding venues, family reunions – for sports (running, cycling, horse riding)
- gaining experience
- hunting purpose
- ecotourism, hiking (visiting Sokoró region, forests, hills, natural rarities, nature protection areas, nature protection areas)
- nature photography and video recording
- visiting cultural destinations (country houses, stone crosses, sites of red-Friar legends)

The number of visitors and tourists arriving in nature parks cannot be measured, as the nature park is an area, not a property surrounded by a fence or gates, where it is possible to determine exactly why they came to the area, how long they stay and which category. The question is, do we need to measure how many people come to our area? In any case, although it does not bring economic income to the nature park's work organisation if there is a sudden increase in the number of people arriving to achieve each goal, it does bring indirect benefits, such as extra income from accommodation or artistic photos of the area.

In 2015, the Hungarian Nature Park Association prepared the Development Concept of the Hungarian Nature Parks in cooperation with the Ministry of Agriculture and its background institution (Ottó Herman Institute). According to the concept, the operation of nature parks is basically determined by the activities carried out along the 4 pillars (tourism and recreation, rural development, environmental education, protection of natural and cultural heritage).

In connection with the objectives set for the "Tourism and Recreation" pillar, it would be important to promote the measurability of tourism / ecotourism activities in nature parks. The sub-goal included in the concept is: "Transforming nature parks into complex tourism products". In the initial phase of developing the tourism offer of nature parks and developing a marketing communication strategy, it is essential to assess market research, the needs of potential visitors, and the awareness of people of nature parks. Taking into account the results of available research on similar topics (e.g. visits to national parks), it is definitely worthwhile to carry out primary research, even with several quantitative and qualitative methods (questionnaire surveys, focus group etc.), both on a national and regional scale.

In order to achieve the above goals, the Hungarian Nature Park Association plans to implement a project. The research carried out within the framework of the project provides an opportunity to get an idea of the tourism activities of the Hungarian nature parks and to determine the possibilities for further activities related to the tourism activities. Answers to the question of how and in what direction the tourism and recreational activities of nature parks should be developed, which will create opportunities for nature parks to further develop a sector that can be more effective in reaching young people, involving them in awareness-raising programmes and increasing the number of recreational services available locally for the population concerned.

The social need to be met within the project: the recreational opportunities of the rural population affected by the nature parks and the urban population in the catchment area of the nature parks will increase, the visibility of the tourism activities of the nature parks will increase, therefore the population can connect to them more easily. Through the results of the project, the activities of nature parks (mainly tourism) will receive more

attention from the bodies responsible for regulation and coordination, which will create opportunities for the stabilisation of the organisations, thus increasing the role of nature parks in the region, generating and maintaining cooperation and preserving rural population. (Based on the project of the Hungarian Nature Park Association.)

Tourism of the present and the future

The future is being written today, so it is already possible to predict what trends will play the biggest role in the tourism of the future. A study (URL4) has examined, among other things, the extent to which members of these generations demand and use smart technology when traveling. The path from traditional tourism to smart tourism has led through tourism that also uses online technologies. First, computers were used in offices, then airlines introduced automated booking systems, and shortly afterwards international hotel chains began to offer their guests the new technology (Pan 2014). In the 1990s, with the widespread use of the Internet, new sales channels emerged, making it possible to reach tourists in a more direct way (Buhalis, Law 2008).

The 21st century has seen the emergence of social media and the rapid development of mobile technologies. As a result, the balance between consumers and service providers has been upset: new channels of information flow have emerged and consumers are using different means to make their purchases. From 2010 onwards, the analysis of large amounts of data examined consumer habits in more depth, thus creating more personalised services, which also increased the user experience (Pan 2014).

On the one hand, smart tourism means smart destinations, which are special cases of smart cities, where developments take into account not only the needs of local residents, but also those of tourists. Lopez de Avila said the following about smart tourism: “An innovative tourist destination with the latest technology-based infrastructure guarantees the sustainable development of tourist areas, thus facilitating visitors’ communication with each other and their environment and increasing the quality of experiences and improving the living conditions of local residents” (Gretzel et al. 2014).

Another element of smart tourism is the “smart experience”, which means that they can further increase the tourist experience with continuous monitoring and personalised offerings (Neuhofer et al. 2015). According to Gretzelék (2014), the third element of smart tourism is smart business, which creates and supports tourism resources, as well as provides opportunities for collaborations, and thus for the joint creation of the experience. All this is achieved through the cooperation of the public and private sectors.

In 2014, a volume entitled “Good (well created) existence and tourism” (Michalkó, Rátz 2014) was prepared, in which renowned tourism experts examined what is the well-being of tourists, the source of well-being, what they want to see from the nature, region, where

would you go for a trip, or what do you want to experience with yourself during the tour or vacation? According to the study of Bertalan Pusztai, the basic source of tourist satisfaction is the satisfaction of the tourist when their expectations and ideas related to travel and tourist destination are fulfilled. Of course, these do not develop on their own, we have to arouse their interest in the nature, the region, the destination.

As a nature park area, it is important for us to present the nature, natural values, residential lifestyle, entertainment opportunities, traditions, gastronomic experiences, family-friendly activities, providing a real picture of life and suitable alternatives for spending free time. We need to be authentic, whatever form of presentation we choose, as we want those who come here to have fun, get it, or even more than they expected, not be disappointed. As our economic goal is minimal as opposed to promotion, it is not in our interest to scam or deceive visitors.

Beautiful nature is one of the conditions of tourism, most of the time it is a defining element. In international image research, after the hospitality of the host community, nature is the most frequently studied factor (Gallarza, Gil, Calderón 2002). In the Hungarian literature, the examination of the role of nature elements and the nature in various travel destinations appears primarily in connection with the analysis of the tourist milieu.

Pusztai (2014) drew the following conclusions in his research:

- the beauty of the nature is not primary in the tourist's decision
- Hungarians prefer to travel to coastal areas, followed by the high mountains, followed by the urban environment
- young people seek hustle and bustle, while older ones seek peace during their relaxation
- gender disagreement, women are more attracted to learning about the urban environment and cultural heritage
- nature can be continued with the available tourist services as well as on site
- together with activities and other factors, it forms the tourist experience

Although the beautiful nature is an attraction for potential tourists and visitors, it is not enough in itself to encourage anyone to travel. It is absolutely necessary to take this into account as a nature park area, we can only reach our target group by jointly promoting complex opportunities, leisure activities, cultural and traditional activities.

The digital ecotourism paradox

I often think about how smart solutions could be utilised in nature park tourism. Several implemented good examples are not or only partially relevant to us, e.g. optimisation of route planning, establishment of smart parking lots, introduction of digital payment

method when using public transport or accommodation, when buying tickets. Possibly the development of an application that recognises the sights based on their image and provides a brief information about them; hiking as part of a treasure hunt game; installation of mobile charging points on the educational path. All these solutions already exist and work in different parts of the world and in our country. Regarding the Pannontáj-Sokoró Nature Park, it may be interesting to know which features should be invested in and what kind of application is needed to achieve higher visitor numbers.

Nowadays, we do not go hiking without smart devices. These devices come with a range of useful downloadable apps that can be useful in the woods and fields. There are maps that can be used offline in the absence of the WIFI network, such as HuMap, turam.hu, but you can also find one that accompanies us along the National Blue Tour, showing the percentage of the route completed, as well as the stamp points, with photos, with GPS coordinates.

To learn about nature, you can also use the Little Plant or Animal Identifier, or the phone in your pocket and the Tree Book interactive tree identifier and the What kind of flower is this, app. If we see a bird, we can identify it using the Hungarian Ornithological Society's Bird Locator. Also in collaboration with the MME, an Amphibian and Reptile Descriptor has been produced, which lists all the amphibian and reptile species in Hungary. Geocaching is a great activity to do with your family and friends, you can record the geolocations you find in the dedicated app. The Altimeter app lets you measure altitude, and Naviki is a cycling app. We can get to know castles with the Várak.hu application, or other sights with the name Hungarian Sights.

If you are looking for accommodation, szallas.hu, Trivago or booking.com can help you, but you can also taste meals at the restaurants on Lake Balaton with the help of the Balaton Gastro Map, while we can find out about storm signals on the TAVIHAR app. The possibilities are endless, with new ideas and new apps being created every day. Which one to download? And then do we really use them more than once? We will never know, but one thing is for sure: if we are looking for something on our travels or in nature, we will reach for our phone and try to find information and help.

Nowadays, we do not leave the house without our phones, and we carry them more often than our wallets. So, the most obvious solution is to use your mobile phone to answer questions, in case of an accident or to get information. This is what we do on a hike, on a trip. Photography, capturing lovely moments and natural wonders, posting a recording of a cultural event on our social sites is now part of our lives, be we members of any age group. How does it all fit together with the environment, nature, ecotourism? In my opinion, it is very compatible. We go on a trip with the family, post on Facebook or Instagram. Acquaintances and friends will comment on what a beautiful place we have been to, and next time it is likely that this possible destination will come to mind when planning their own trip.

The community network is used to organise sack and basket communities, which promote local products, offer producers and families the opportunity to produce in a planned way, contracting their crops in advance, providing predictable quality for a predictable income. In the spirit of zero waste, you can exchange or donate your worn-out items, and get ideas for recycling. I believe that in today's world, the use of smart devices is acceptable by an undisturbed natural environment either.

The virtual world of the Pannontáj-Sokoró Nature Park

The Pannontáj-Sokoró Nature Park is located in one of the most economically favorable areas of Hungary, south of Győr. The proximity of the Slovak and Austrian borders, the development of Győr has a serious impact on the settlements of the region as well. Most people living here find jobs in Győr, with AUDI and its suppliers or the service sector accounting for the majority of the adult working population, but the service sector is also important, especially for women.

For children, nursery, kindergarten, and primary school education is available in their own settlement or in neighbouring settlements, while most of the young people go to secondary school and university in Győr. All of these conditions justify the fact that a large proportion of young people see their future locally, even if they go to university in distant cities or temporarily work abroad, they return to their own town or region as young adults.

In my opinion, we can only achieve efficiency with smart regional development, transport, and tourism solutions if we have the "smart" population and community to do so. In this case, I am not only referring to intellectual abilities, but also to the ability of the population to recognise new things, to be energy-conscious, to strive for zero waste and sustainability. These needs usually arise in a society when the basic conditions for a decent life are in place: a secure job that provides a living, childcare, housing and living conditions. I believe that these conditions are available to us in line with the national average, or even higher.

Each of the 29 settlements of the Pannontáj-Sokoró Nature Park has one or more community spaces, which have also been renovated in the last 10 years from various tender sources. Within the framework of the Integrated Community Service Area program, then as a result of the Rural Development and LEADER tenders, and nowadays the community spaces are renewed by the tender system of the Hungarian Village Program. In addition to the community centres, disused parishes and former school buildings have been given new functions, while parks and village halls have been renovated as outdoor community spaces. All this, I believe, contributes to the preservation of local identity and the functioning of local communities.

In the last 2 years, Digital Welfare Points have been established in these community spaces, the computer tools of which can be used for those who do not have it at home, and a DJP mentor provides assistance in electronic administration. As a result of these services, the region has become "smarter", its equipment has improved, so the use of electronic services will also play a greater role, the impact of which can be felt most among the middle-aged and retired age groups.

Due to the features outlined above, it was obvious in the planning and implementation of the activities of the Pannontáj-Sokoró Nature Park that we often used the features offered by the Internet. This has also proved to be cost-effective for me, as using our existing website, sending emails, and communicating on Facebook costs nothing, and we do not usually have the financial resources as an association.

Summary

In my study, by presenting the situation and activities of nature parks in Hungary, I attempted to revel the possibilities of ecotourism and digital technologies through the regional development activities of the Pannontáj-Sokoró Nature Park.

A nature, a region, a destination can, in my opinion, be successful and authentic if it remains liveable for the people who live there. Public services are available, there are job opportunities all year round, housing conditions are good, and what cannot be shown by statistics: there is also a local identity. It is important for me, as the manager of the Pannontáj-Sokoró Nature Park, to carry out activities and projects that are in the interests of the local people. This is a priority when submitting every application and organising every programme.

In the course of our operation, we like to use the possibilities provided by virtual space, as this way we can reach a wide range of people for free and quickly. These are very important qualities for us, as we almost never have the financial resources for such activities, and we do our work as social work, as volunteers. Nature parks are becoming increasingly popular in our country. Now is the time to capitalise on this enthusiasm, with a view to directing the attention of decision-makers to nature park areas and destinations.

In my opinion, the nature park is a coordinator who is at the centre of the process. It does not have to do everything, just generate cooperation, providing a basis for collaboration. I see the advantage of the nature park in this coordinating role, that there is an organisation whose job is to promote development along the four pillars of the nature park and to support exemplary initiatives. Of course, this is very difficult. If I take my own nature park as a starting point, I am aware of what should and could be done, but these are very time-consuming and labour-intensive processes that take many years to become

visible. I believe that with a good work organisation, a coordinating organisation, leaving enough time for the processes, in the medium and long term, nature park areas will have many more opportunities compared to other areas.

The research proved to me that the information technology tools and the regional knowledge are available in the Pannontáj-Sokoró Nature Park region to enable the effective implementation of ecotourism and the presentation of the region in the virtual space. To this end, it is important that there is regional cooperation, common interest and common representation of interests, so that there should not be parallel processes.

It would be important to review the concept for the development of the nature park, and to divide it into two parts. On the one hand, it is necessary to take into account the projects that could be implemented by the nature park's working organisation, the Pannontáj-Sokoró Public Benefit Association, and on the other hand, it would be important to draw up a list of projects to be implemented by the 29 municipalities, as the current tendering system does not think in terms of complex solutions, and unfortunately still supports piecemeal ideas and developments. In my opinion, the compromises formed during the creation of the concept and the setting of priorities would be an important condition for becoming a smart area, smart communities.

References

6/2020. AM rendelet a natúrparkok létrejöttéről és működéséről

A magyarországi natúrparkok fejlesztési koncepciója 2015–2030 (2015). Vidékfejlesztési Minisztérium

A magyarországi natúrparkok szakmai koncepciója (2013). Vidékfejlesztési Minisztérium

A natúrparki szakmai koordinációs hálózat 2019. évi intézkedési terve [Belső dokumentum]

A Pannontáj- Sokoró Közhasznú Egyesület EFOP-5.2.2.-17-2017-00017 számú pályázatának kutatási anyagai [Belső dokumentum]

Buhalis, D., Law, R. (2008): Progress in information technology and tourism management: 20 years on and 10 years after the Internet – The state of eTourism research. *Tourism Management*, 4., 609–623.

Lengyel, M. (2004): *A turizmus általános elmélete*. Heller Farkas Gazdasági és Turisztikai Szolgáltatások Főiskolája, Budapest

Michalkó, G., Rátz, T. (2014): *Jó(l)lét és turizmus: Utazók, termékek és desztinációk a boldogság és a boldogulás kontextusában*. Kodolányi János Főiskola–MTA CSFK Földrajztudományi Intézet, Budapest

Neuhofer, B., Buhalis, D., Ladkin, A. (2015): Smart technologies for personalized experiences: A case study in the hospitality domain. *Electron Markets*, 25., 243–254.

Pan, B. (2015): E-tourism. In: Jafari, J. Xiao, H. (eds.): *Encyclopedia of Tourism*. Springer, New York
Smartpolis (2016): *Smart city megoldások hat kulcsterületről*. BME EIT, Budapest

Internet sources

- URL1: https://www.naturparkok.hu/partnerek/europai-naturparkok-kozos-nyilatkozata
- URL2 1996. évi LIII. törvény a természet védelméről www.pannontaj.hu
- URL3: https://greenfo.hu/hir/pannontaj-sokoro-naturpark-cimet-kapott-29-telepules_1144132785/
- URL4: http://www.academia.edu/10672841/Neuhofer_B._Buhalis_D._and_
- https://trendfm.hu/cimlap/a-jovo-turizmusa-az-okos-turizmus-11233
- www.cultractive.eu
- www.digitalisturizmus.hu

TOOL TO SOLVE THE PROBLEMS IN REGIONAL BUS TRANSPORTATION – DEMAND RESPONSIVE TRANSPORT

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ABSTRACT
Owing to the low number of inhabitants and the low population density in rural areas, providing public transport for several small villages or hamlets is a challenge in the whole of Europe. Furthermore, traditional public transport is hardly sustainable financially, while ensuring only a low-level service. In order to enhance the efficiency of the system, several programs have been launched by the European Union (e.g. Lorenzini et al. 2019; SMARTA), which focus on presenting the best practices of certain European areas. One of the authors' main research field is to optimise transportation services creating generally applicable models. In this research, the structure of the public and the social as well as the demand responsive and traditional transportation services are presented by discussing the challenges and problems.

KEYWORDS
demand responsive transport; dead-end villages; performance-optimisation

Interurban public transport system in Hungary

In Hungary, domestic public transport system can be used by everyone, who pays for the fare. It means that this is a public service. It is important to mention that interurban public transport system is ordered by the Ministry of Innovation and Technology and operated by Volánbusz Ltd. countrywide.

The main task of the interurban public transport system is to make connection between towns and village. Its quantitative and qualitative parameters are regulated by law (XLI. Law of 2012). Based on the nature of the connection, different types of lines can be defined, which have different functions as well.

- National (long-distance) lines are operated between county capitals (e.g. Budapest – Szekszárd using M6 motorway) and guarantees express connection;
- Regional lines are established to connect the towns/villages within a county/region (e.g. Szigethalom – Taksony). Main function of these types of lines is to serve basic mobility needs of the inhabitants;
- Suburban lines connect the capital city/county capital and the towns/cities situated within a 100 kilometres zone (e.g. 690 Budapest, Csepel – Halásztelek – Szigethalom).

Lines can be evaluated by the main parameters, as well as frequency of vehicle journeys, variations of courses within a line and number of passengers. Based on these parameters, the main characteristic of each lines can be found in Figure 1.

Figure 1. Main characteristic of each interurban lines

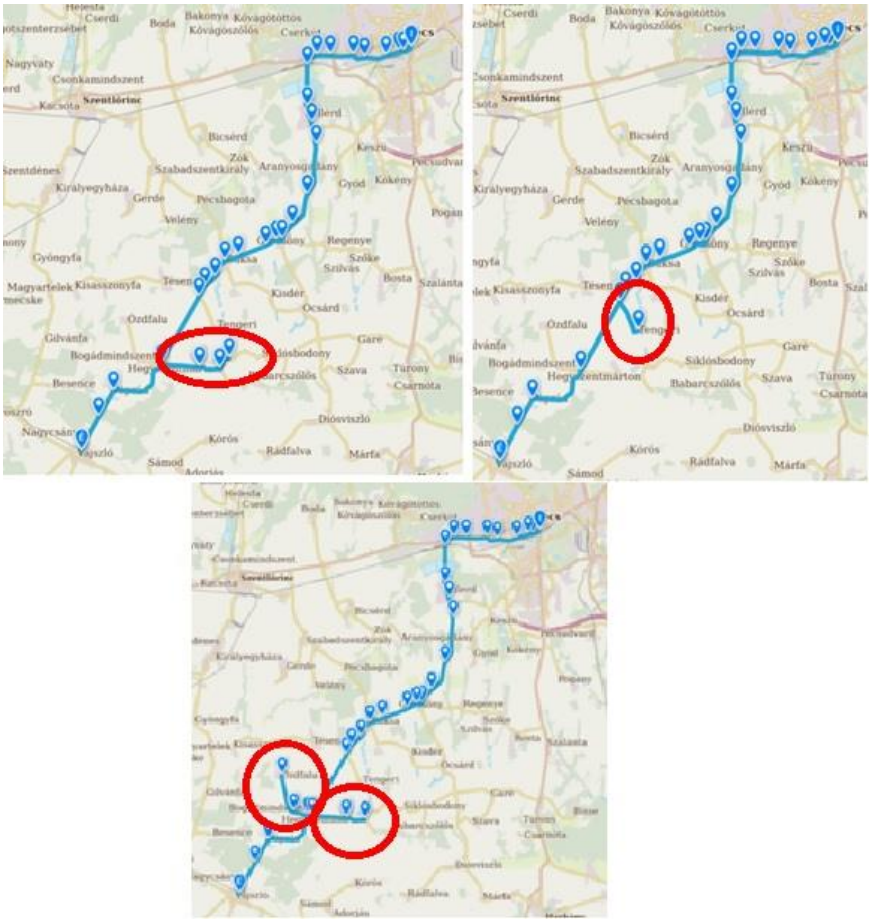
Type of line	Frequency of vehichle journeys	Variations of courses within a line	Number of passengers
Suburban	Every 5-30 minutes	Number of variations are not significant	High (no. of commuters)
Regional	Every 30-120 minutes	Different courses are conceivable	Can be high (no. of commuters)
		Courses may vary regarding to vehichle journeys (eg. detours)	In some sections (eg. detours) it is low compared to the capacity
National (long-distance)	Various (from 1 depart/day to every 30 minutes)	Number of variations are not significant	High (because of the intterregional role)

It can be seen in Figure 1 that in case of regional interurban transport lines the courses may vary regarding to vehicle journeys and in some sections, the number of passengers is quite low compared to the capacity of a non-particulated bus. These are the main problems of the regional bus service, which is presented in more details in the next chapter.

Challenges in regional bus transport service

As it was included in the 1st chapter, courses regarding regional lines can be varied from vehicle journeys to vehicle journeys. It becomes peaky in case of serving 'dead-end villages'. In Figure 2, three different vehicle journeys serve 4 'dead-end villages' – located along 1 regional line – by three different detours.

Figure 2. Different vehicle journeys in 1 regional bus line



These types of towns have the following parameters:

- can be found far from the main road;
- number of inhabitants is very low (max 1.000 persons);
- number of economically active people is low (ageing society).

Therefore, public transport service in case of 'dead-end villages' has to face the following problems and challenges:

- the level of public transport service is low (rare, occasional departs);
- detours needed;
- one regional bus line can cover more dead-end villages, which results spatial and temporal distribution and a lot of variation of detours;
- incomes from tickets/passes are much lower than (financial) addition by government
- needs high level of capacity (vehicles with 50-100 passenger-capacity)
- frequency of vehicle journeys is high (few detours per day)
- construction of timetables, reassignment of bus drivers (mobility management) can be very problematic;
- timetables are very complex, it is quite difficult to understand.

Presentation of demand responsive transport

In a sustainable urban planning process grouping of travel demands are essential. One passenger in one vehicle can only be accepted using non-motorised vehicles. Car sharing or car-pooling systems are good solutions but, the capacity of vehicles is low. The traditional public transport service (operating according to a pre-announced timetable with fixed line routes and fixed departure times) is the best solution with its higher capacity. The demand responsive transport (DRT) service is appropriate solution on that area and/or on that time period of a day where/when the travel demands are not so high, economically it is not worth providing traditional public transport service.

The application possibilities of DRT:

- In an area (it can be urban or rural) where the travel demand is low (whole day or only at weekends or some time period on a workday);
- Passengers mostly travel short distances;
- The population density is low or service for disabled persons is not available.

The main features of DRT:

- The passenger has to register the travel demand (by phone, via Internet, mobile application) previously.
- Based on the demands considering the limitation of the service (number of vehicles, drivers etc.) planning of vehicle journeys are accomplished.
- Travel demands can be combined with each other and with the possibilities of the operator.

The process of using DRT starts with a registration. Most of the DRTs require users to register. The first step is the notification of a travel demand (personal data of passenger, origin and destination point, time window, special demands). The passenger must be also flexible, because it is not at all sure that a vehicle journey is planned (after the optimisation) with exactly the same departure time the passenger wants to travel. That is why a passenger has to give a time window (± some minutes) and inside this time period has to accept the service. During the optimisation the different demands must be combined with the possibilities of operator. As a result, the route of a vehicle with exact departure times at the stop (or collecting point) is available. This is a disposition to the driver which contains the route and the name of boarding passengers. After carrying passengers, only administration tasks remain.

DRT services can be grouped based on several aspects, the system can be designed in many different ways.

Division by the connection to traditional public transport, which can be complementary. The DRT operates in those time period and/or in area when/where the traditional public transport not available.

1. The addition in space means that public transport provides areas not served by the traditional service, so it has a role to carry passengers to traditional lines. Such can be e.g. establishing a service between a small town and a railway station away from the town, if it is not practical to operate scheduled services on the basis of demand. The bus only goes out if there is a demand for it.
2. Temporal additions occur in the evening (possibly at night) or on weekends in addition to the traditional service on certain routes (e.g. the provision of a 20-minute scheduled service instead of every 10 minutes and on-demand transport at intermediate times).

The second aspect (spatial distribution of demands) is related to the origin and destination of the needs. There are services that provide on-demand transportation specifically for some purpose of travel. Such as the case with the airport minibus service, which operates on a market basis for a significantly higher amount of money than the traditional public transport fare. Passengers are transported from many places (addresses) to the airport and back (from one place to many places). There may be some targeted services (e.g. patient transport, when patients are taken to healthcare facilities from their homes or vice versa), or the "many-to-many" service, which can mean a service between collection points (quasi-stops), but even door-to-door transportation (as in the case of taxi transport).

The route can be grouped based on the route flexibility. In case of flexible route, a vehicle journey will be launched when there is a need for it (the time can be announced in advance or determined according to the needs). Semi-flexible routes can be defined as a service, when the vehicle can only go into a settlement or stop if there was a need for it. The fixed time can be problematic in case of a missed route section the vehicle will arrive earlier after the missed stop, where it may have to wait to keep the schedule. The route can be very flexible like door-to-door service.

Flexibility of time can be divided into groups too. In case fixed time departs, the route is flexible. It may have a variable departure time within certain limits (e.g. a vehicle journey is scheduled to depart at 2 p.m., but e.g. ± 15 minutes deviation can be made as required). Flexible service in time will be tailored to the travel needs.

The notification of needs can be made in one-step if the person intending to travel receives an answer immediately upon submitting the application. In this case, the request can be made even 1 hour before the scheduled departure time of the passenger. It can be perceived that optimisation (combination of trips, planning a route in detail) can only be done very minimally. During the two-step process, claims are collected, followed by

optimisation and feedback to all passengers. Specifying an interval means a time interval that the user give during notification, it is a time window that is still appropriate for the passenger. For example, the passenger wants to travel at 12 a.m., but between ¾ 12-¼ 1 is also right for the user. However, it may not be the departure but the arrival is important. In case of this the time of arrival at the desired destination during the notification and a time window should be given. In a two-step case, typically the day before the trip must be notified by a specific time (e.g. 5 p.m.), then optimisation is finished at 6 p.m., passengers are called back or the information is sent back.

The system can be used by anyone (open) or operated only for a certain group of users (closed – e.g. disabled persons). Alternatively, the system may be mixed: after planning the vehicle journeys (based on the needs of the target group) new applicants may come, who may not belong to the target group, but they can only choose from the already planned vehicle journeys where there are still free spaces available.

It is a very important question whether a DRT falls into the same category as traditional public transport in terms of funding. It is self-financing if the given service does not qualify as a community service. Under the regulation, compensation may be equal to or greater than public transport. The previous grouping criterion includes motivation (market driving force), which can be business-related (e.g. airport service) or part of public service policy.

Social service in 'dead-end villages'

Besides the 'traditional' public transport system a social service exists in these little villages, which is called village-guardian service. Main task of the village-guardian public utility is to help for the appeasement of basic needs of inhabitants. Based on this, the main parameters of this kind of social service are the following:

- operates on a social basis, but it is founded by both the municipal and state, therefore the financial structure is very difficult to overview;
- provides Demand Responsive Transport (DRT), which is not integrated into public transport, it is only for inhabitants;
- besides to transport tasks it provides:
    - catering (delivering the lunch and food for elderly people);
    - medicine delivery for elderly people;
    - etc.

Because of the social basis, most of the services are free of charge, some can be used for a fee (e.g. transport for family visits). It is important to mention, that the provided DRT-transport is operated mostly by minibuses (capacity: 8 people + driver), which can be seen in Figure 3.

Figure 3. Village-guardian minibus

Generally, it can be identified that in case of 'dead-end villages' a 'traditional' public, regional bus service (that can be used by everyone) and a village-guardian social service (only for inhabitants) exist in parallel to solve the mobility needs.

Resource problems in regional transport services

The low number of inhabitants and housing density in case of each 'dead-end villages' result for passengers regarding one detour. It means, that 'traditional' public bus transport is only can be provided by high performance for 1 passenger, because it requires high-capacity vehicles and human resource (e.g. bus drivers, mobility management team etc.) too. Besides this, a parallel DRT service exists too only for the inhabitants in a social basis, which has a main role in case of transporting children to school and the elderly to health care institution or it has other transportation service tasks (e.g. transporting the elderly people to family visits). To serve these tasks, vehicles, human resources, and performance needed as well as in case of 'traditional' public bus transport service.

In summary, to serve the mobility needs regarding 'dead-end villages' two different transportation services exist with vehicle, human resource, and performance needs, which can result a wasteful, not efficient transport system. To solve the problem, the authors of this papers developed a generally applicable optimisation model for the distribution of resources needed (Lakatos et al. 2020).

Conclusion

Providing a sustainable public transport service for areas with several small villages or hamlets is a challenge for the whole of Europe. To serve 'dead-end villages', vehicles must make a to-and-from detour to each village, which requires considerable performance from the operator, and the service must also be ordered from the responsible bodies. The number of inhabitants in rural areas is constantly decreasing, and the remaining residents are aging. This process is due to the fact that economically active people in the country tend to move into towns offering jobs and public institutions instead of commuting to work. The performance requirement of serving low transport demand areas like 'dead-end villages' is high, while the number of passengers is very low. Furthermore, passengers are economically less active, and thus their transport must largely be subsidised. The authors of this paper created a DRT-based optimisation model to make the service of rural areas with less public transport service and low demand sustainable.

References

Lakatos, A., Tóth, J., Mándoki, P. (2020): Demand responsive transport service of 'dead-end villages' in interurban traffic. *Sustainability*, 9., 3820

Lorenzini, A., Ambrosino, G., Finn, B. (2019): Smart Rural Transport Areas (SMARTA) project. In: *Proceedings of the 6th European Conference on Sustainable Urban Mobility Plans*. Groningen, The Netherlands, 17–18 June 2019. URL: https://www.eltis.org/sites/default/files/sump2019_d4_lorenzini_andrea_memex.pdf

SMACKER Project – Soft Measures & Actions for behavioural Change and Knowledge to Embrace peripheral and Rural areas. URL: https://www.keep.eu/project/22533/soft-measures-actions-for-behavioural-change-and-knowledge-to-embrace-peripheral-and-rural-areas

EXAMINATION OF SMART CITY AND SMART VILLAGE 'GOOD PRACTICES' IN HUNGARY

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ABSTRACT
Our department (Rural and Regional Development) has been focusing on the SMART City and SMART village research since 2017. We dealt with the SMART topic in the scholarship research of the New National Program of Excellence (2017/2018 semester), involving BSc and MSc students in the research activities and this topic is a part of our seminar exercises as well. A number of SMART cities have launched territorial initiatives that can provide a good basis for implementing effective Integrated Urban Development Strategies for the future in Hungary. In contrast, for SMART villages, the primary goal at the beginning in the current programming period is to create the SMART-Village reference points for which the financial resources will provided by the European Union. In this paper, we aim to find, interpret and define the SMART city and the SMART village, and to showcase Hungarian SMART initiatives through document analysis using 'good practices' in Hungary, in particular SmartRural21 project (Uppony, Remetea).

KEYWORDS
SMART city; SMART village; liveable settlement; SMART initiatives; Rural21

Introduction

With the rapid urbanisation of the world, the concept of "SMART CITY" has been gaining momentum in the international political agenda. The transformation of cities into digital cities brings along an incredible opportunity for improving citizens' welfare and fostering economic progress. While cities represent more than half of the global GDP and 70% of energy consumption and considering that over one billion people has moved to urban areas since 2000, it is clear that future urban planning and policy-making will have to focus on the role that digital technologies can play in order to transform cities and guarantee their liveability and sustainable growth on the long term. The 21st century will be the most fast-changing century in history. The fact that more data has been created in the last two years than ever before is quite revealing of this very rapid transformation. The 20th century represented a huge step forward with regards to demographics, industrialisation, scientific and technological revolution etc. The 21st century started out with the UN Millennium Development Goals (MDGs) that sought to tackle the biggest social challenges the world was facing (Dobos et al. 2015). In 2015, they were replaced by the Sustainable Development Goals (SDGs), which acknowledge that information, technology and Internet can play a significant role in achieving these ambitious goals. This is a powerful transformation: Internet is actually changing our habits, the way we communicate, how we get together, and even how we see and experience the world. It has, inextricably, changed the way citizens organise their lives. As a direct consequence, Internet will have a radical effect on cities' organisation and relationships with their citizens. Internet will change the lives of people living in cities because it will change the way productive processes are organised, how economic transactions take place and even how citizens consume culture and leisure services for instance. The challenge is still huge for many cities. As architect Vicente Guallart puts it: "Internet has changed our lives, but it has not changed our cities yet".

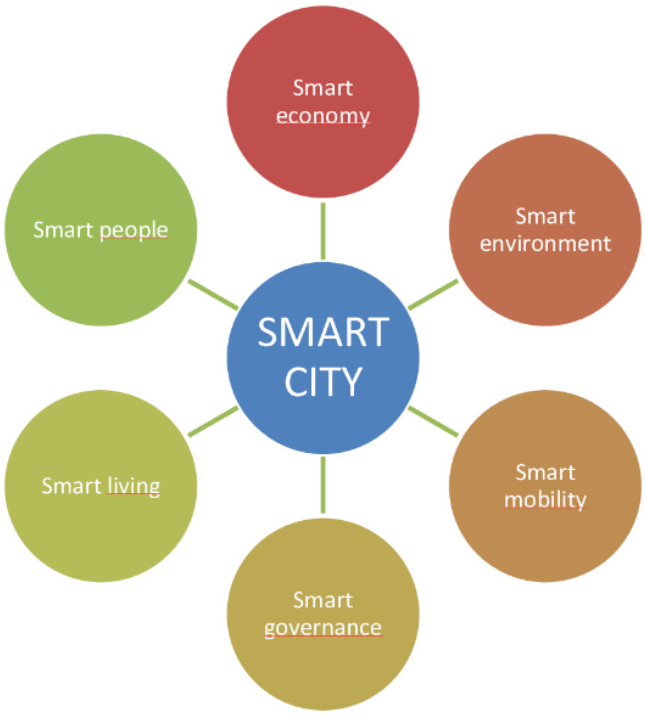
SMART City and Village concept

The SMART City concept integrates information and communication technology (ICT), and various physical devices connected to the IoT (Internet of Things) network to optimise the efficiency of city operations and services and connect to citizens. SMART city technology allows city officials to interact directly with both community and city infrastructure and to monitor what is happening in the city and how the city is evolving. ICT is used to enhance quality, performance, and interactivity of urban services, to reduces costs and resource consumption and to increase contact between citizens and government. SMART city applications are developed to manage urban flows and allow for real-time responses. A smart city may therefore be more prepared to respond to

challenges than one with a simple "transactional" relationship with its citizens (Rab et al. 2015).

A SMART city relies heavily on the deployment of technology. Different combinations of technological infrastructure interact to form the array of SMART city technologies with varying levels of interaction between human and technological systems.

Figure 1. Dimensions of SMART cities



Source: edited by Sikora-Fernandez and Stawasz (2016)

- *Digital:* A service-oriented infrastructure is required to connect individuals and devices in a SMART city. These include innovation services and communication infrastructure. Yovanof and Hazapis (2009) define a digital city as "a connected community that combines broadband communications infrastructure; a flexible, service-oriented computing infrastructure based on open industry standards; and, innovative services to meet the needs of governments and their employees, citizens and businesses."
- *Intelligent:* Cognitive technologies, such as artificial intelligence and machine learning, can be trained on the data generated by connected city devices to identify patterns. The efficacy and impact of particular policy decisions can be quantified by cognitive systems studying the continuous interactions of humans with their urban surroundings.
- *Ubiquitous:* A ubiquitous city provides access to public services through any connected device. U-city is an extension of the digital city concept because of the facility in terms of accessibility to every infrastructure.

- *Wired:* The physical components of IT systems are crucial to early-stage SMART city development. Wired infrastructure is required to support the IoT and wireless technologies central to more interconnected living. A wired city environment provides general access to continually updated digital and physical infrastructure. The latest in telecommunications, robotics, IoT, and various connected technologies can then be deployed to support human capital and productivity.
- *Hybrid:* A hybrid city is the combination of a physical conurbation and a virtual city related to the physical space. This relationship can be one of virtual design or the presence of a critical mass of virtual community participants in a physical urban space. Hybrid spaces can serve to actualise future-state projects for SMART city services and integration.
- *Information city:* The multiplicity of interactive devices in a SMART city generates a large quantity of data. How that information is interpreted and stored is critical to Smart city growth and security (Sikora-Fernandez, Stawasz 2016).

Human framework

SMART city initiatives have measurable positive impacts on the quality of life of its citizens and visitors. The human framework of a SMART city – its economy, knowledge networks, and human support systems – is an important indicator of its success (Káposzta, Honvári 2019).

- *Creativity:* Arts and culture initiatives are common focus areas in SMART city planning. Innovation is associated with intellectual curiosity and creativeness, and various projects have demonstrated that knowledge workers participate in a diverse mix of cultural and artistic activities.
- *Learning:* Since mobility is a key area of SMART city development, building a capable workforce through education initiatives is necessary. A city's learning capacity includes its education system, including available workforce training and support, and its cultural development and exchange.
- *Humanity:* Numerous SMART city programs focus on soft infrastructure development, like increasing access to voluntary organisations and designated safe zones. This focus on social and relational capital means diversity, inclusion, and ubiquitous access to public services is worked into city planning.
- *Knowledge:* The development of a knowledge economy is central to SMART city projects. SMART cities seeking to be hubs of economic activity in emerging tech and service sectors stress the value of innovation in city development.

SMART village is an innovation of sustainable planning approach at the village level that promotes knowledge-based development through the continuous learning of human resources as an integrative part of village resource development, especially in encouraging rural areas development as a part of regional system in the context of

national development planning system. This leads to the effective and efficient development of economic sectors, especially primary and secondary sectors supported by appropriate technology to high technology as a result of continuous learning which could facilitate sustainable rural urban linkages (Káposzta, Honvári 2019).

Technological impacts:

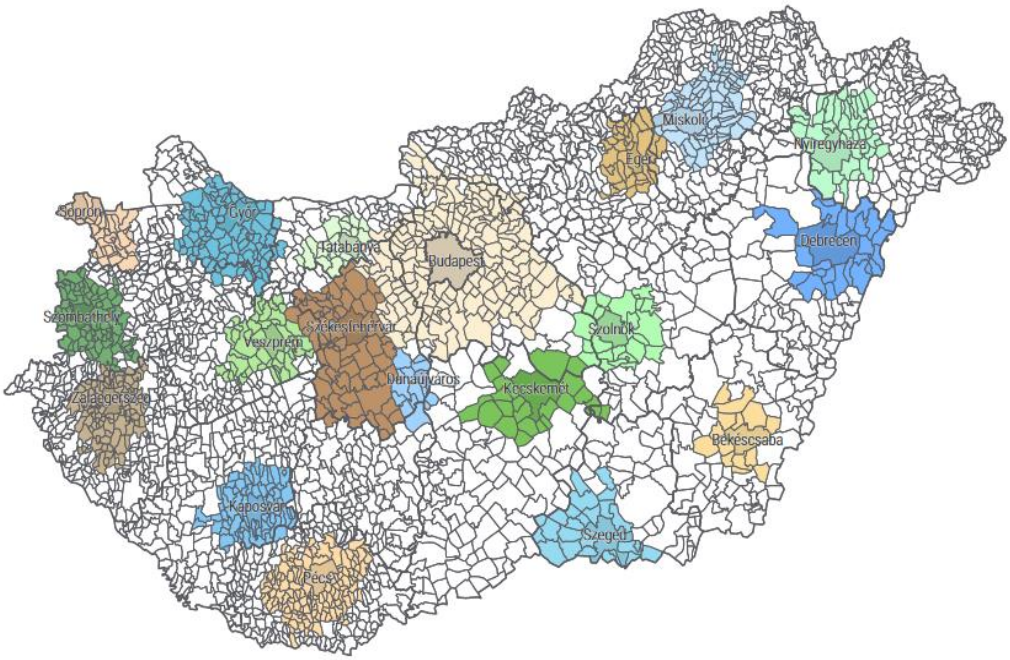
- *Physical and development synergies:* There are synergies among rural physical infrastructure and rural telecommunication system.
- *Substitution effects:* The limited rural physical flows can be substituted and facilitated by rural virtual flows.
- *Generational effects:* A rural area will be more sustainable and competitive by the synergy between physical and telecommunication infrastructures along with the growth of rural economic activities.
- *Enhancement effects:* A rural area will be more attractive, efficient, and rural physical network (road, rail, water, energy, and irrigation) will be more adequate to ensure rural-urban connectivity.
- *Technical and political processes:* As an innovative translation of rural policy into rural collective action to promote better rural condition.
- *Stakeholders:* Promoting participation and collaboration among development actors in rural context.

Settlements in the globalised world

The proportion of urban population is over 50% globally. The dominant role of cities is further emphasised by the facts, that 80% of GDP is produced there and 70% of energy is consumed by cities. According to preliminary estimates, the number of city inhabitants is expected to rise to 5 billion by 2030. However, considering the territorial differences that characterise the world, there are significant disparities between continents, countries, and regions in the case of urban populations as well. While approximately 66.4% of the population in the United States is currently living in cities, in Europe this proportion is approximately 73%. Figure 2 shows the most up-to-date situation (3 May 2020) about the functional areas of Hungary.

At present, the number of cities and towns in Hungary is 346. Of all the population, 17.4% lives in Budapest, while another 52.1% lives in other cities and towns (TeIR 2020). As mentioned above, cities are the basic engines of growth; therefore, they require continuous improvement of the technical, institutional, social, economic and environmental infrastructure. This fact makes smart and sustainable growth strategies for cities and other settlements cardinal.

Figure 2. Functional areas of Hungary



Source: https://www.ksh.hu/teruletiatlasz_urban_audit (2021)

In 2017, the European Commission, together with the European Parliament, published a document called "EU Action for SMART Villages" in order to make opportunities for villages and rural communities more visible. One of these actions is the Pilot Project on SMART Eco-Social Villages ("Smart Villages" in short). Ecorys, Origin for Sustainability and R.E.D., are implementing the Pilot Project that will run until April 2019. The potential effect of this Pilot Project is to shape the on-going discussion on the future of the "Smart Village" policy. The first dimension was governance (https://www.smartrural21.eu/). This dimension referred to Mission 1, which was to realise the effective, efficient, communicative, and innovative governance This dimension focused on developing good governance in internal and inter-village governance. Government played an important role in this dimension. Governance was related to electronic services and social media in order to increase the empowerment and involvement of citizens in public management and transparency of the decision-making process. The implementation of SMART village for village development in for example Indonesia was depend on governance models that were able to implement planned strategies. The governance dimension had three aspects, covering *public service*, *transparency*, and *policy*.

(1) Public services involved the use of ICT to provide services to the public. One of the utilisations of information technology in government was e-government, which aimed to improve the quality and quantity of public services provided to the public, so that the services provided were faster. In addition to public services, the governance dimension must be transparent.

(2) Public transparency refers to the openness of information accessed by the public. All information related to the village, resources, potential, budget, agenda, production results, tourism etc. Public transparency included openness of information and financial transparency. In village governance, an important role of the village head was needed as a decision maker. Leadership, chief of village played a role in encouraging community interaction and coordinating with various institutions. Community interaction was manifested in public participation in policy decision making at the village level. In addition to the government, technology also played an important role in the SMART village.

(3) The technology in SMART village had important roles such as investing in infrastructure, business development, human resources, potential and building communities. The existence of SMART villages was due to the awareness of ICT that could be used as instruments for local economic development efforts. In determining technology for SMART villages, the use of technology was not only for optimal utilisation of resources, but for carrying out sustainable village development. The technology dimension was divided into two aspects, namely ICT (Information and Communications Technology) and technology that was suitable for rural areas. The technology implemented in a SMART village must be in accordance with the needs and abilities of the village itself. ICT was closely related to the concept of "SMART". ICT was the core of various SMART city and SMART village concepts. While the technology used must be suitable to the needs of each village. Besides the quantity of the implementation with technology as the vehicle, status or quality of the resource was the important factor that should be considered in building SMART village (Kassai, Molnár 2016). Village formation should have potential that covers natural resources, human resources, and economic supporting resources. Resources were the village's resources consisting natural, water and energy, human, economic, as well as infrastructure resources. The quality of human resources in the city influenced the quality of the settlement. The resource dimension was divided into three aspects that were natural, human, and economic resources. The important thing that became the main focus of the village resources was the quality of sand, water, energy, and human resources. Human was the essential part of SMART village since they planned the social view in the village through personality, skill, creativity, and social relationship with others.

There should be a *community empowerment* activity in the village development. In the aspect of human resource, there were some important things that should be given attention like the education which was expected to be the encouragement of SMART village. In addition, the openness of information helped the village become more open to the outside world. The potential of the village resources could be converted into economy involving capital, economic organisation, added value, and prosperity in term of economy. Whereas the focus area in economical services should be developed under the objective to earn village income (Kassai, Molnár 2016).

Besides economic services or *local economic potential-based services*, a series of services were provided in SMART village, that were, the basic service aspect. The village basic service was the main service provided to the village community such as education and health services. SMART living was related to the quality of life such as health condition, housing quality, education facilities, social cohesion. Quality smart living supported civil community and social inclusion in the village. The dimension of living explained about the aspect of life that could be developed in SMART village. Living was related to each individual life, this dimension focused on how someone lived their daily life. In accordance with mission 4 that was actualising a decent, comfortable, and efficient neighbourhood, living dimension was divided into two aspects attempting to create safety and comfort, as well as easiness to access public facility.

Tourism is proposed as one of the dimensions discussed in the proposed SMART village model. Tourism was the development of tourism and village promotion. The development of tourism brought a new chance of job, infrastructure, and social connection. If a village had potential in tourism, SMART village should provide service in tourism object, accommodation, and supporting facilities to develop the tourist village. The dimension of tourism was divided into two aspects that were village potential and village branding. The village identity was able to be actualised through the development of the resources starting from food production or even craft (Nagy et al. 2015).

Hungarian and national SMART initiatives

Due to the limits of this paper, the following are just a few examples of the domestic and international SMART initiatives and their impacts. Considering the fact that innovative initiatives linked to SMART cities and villages do not have long traditions within urban/rural development, their effects will be formulated based on currently available information.

Budapest

In January 2017, the Municipal Assembly of Budapest accepted the vision of SMART city. The paper proposes practices that could make Budapest a SMART city, based on a Western European model. The pre-defined concept does not include specific projects to be implemented, but rather more general principles and values as to what areas are best used with SMART solutions for the future. The guidelines set out in this document are aligned with the 2013 Budapest-based Budapest 2030 Long Term Development Concept. The Hungarian Gazette of 20 March 2017 published the 56/2017. (III.20.) on the modification of certain government decrees related to the definition of the concept of “SMART city”, “SMART city methodology”. The government decree officially defines what we mean in a SMART city: The SMART city is a settlement or settlement group which

develops its natural and built environment, digital infrastructure, and the quality and economic efficiency of services available in its territory, by using sophisticated and innovative information technologies in a sustainable way.

Future development will be based on the following points:

1. establishing a regional knowledge centre
2. sustainable resources
3. environment protection
4. mobility
5. urban environment
6. social partnership
7. smart economy

Regarding to practical implementation, the next step is to create a SMART City Program based on these policy guidelines in the capital. One of Budapest's SMART initiatives is the 2014 FUTÁR (Traffic Control and Information System) system, which uses the latest technological advances to ensure that the users of the public transport network in the capital have access to as much information as possible so that they can reach their destination the fastest. The satellite-based vehicle tracking system enables the BKK (Budapest Transportation Centre) to provide real-time, continuous 24-hour supervision of the city's traffic, maintaining scheduled traffic and, in extreme situations, rapid and efficient intervention. The participants of the SMART initiative are BKK, BKV (Budapest Transportation Company) and the Budapest Municipality (Rab et al. 2015; http://www.bkk.hu/futar/). The public information system for reducing traffic and traffic in Budapest has achieved its purpose based on the information currently available, as everyday users of the system report shortening the reach of the destination, but official statistics are not yet public. In Budapest we can also find a smart bike and scooter sharing system. A *bicycle-sharing system, public bicycle scheme or public bike share* (PBS) scheme, is a shared transport service in which bicycles are made available for shared use to individuals on a short-term basis for a price or free. Many bike share systems allow people to borrow a bike from a "dock" and return it at another dock belonging to the same system.

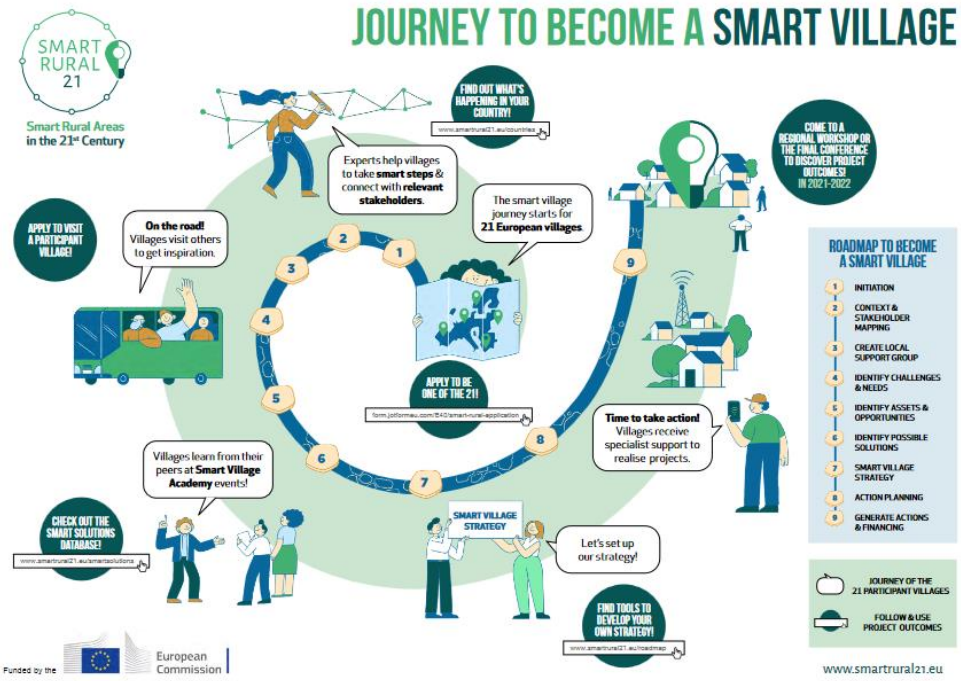
The aim of the strategic areas of the Vision is to make SMART Budapest:

1. one of the centres of international innovation, and thus the target of knowledge transfer;
2. a city able to respond to the environmental and technological changes of the 21st century;
3. its inhabitants live in an open and cooperative society;
4. continue to develop based on the development of a sustainable and local economy.

Uppony, Remetea (SmartRural21)

The 'Preparatory Action on Smart Rural Areas in the 21st Century' (Smart Rural 21) project is a two and a half-year project supported by the European Commission (DG AGRI) with the overall aim to promote and inspire villages to develop and implement SMART village approaches and strategies across Europe, and to draw conclusions and support future policy interventions on smart villages. The project started in December 2019 and will conclude in June 2022. The SmartRural 21 project is coordinated by E40 Group in cooperation with five specialist partners, IfLS and empirica (Germany), Innovatiesteunput (Belgium), Agricultural University of Athens (Greece) and eConcepts (Ireland). They are also working with 28 national experts covering all EU countries (https://www.smartrural21.eu/).

Figure 3. SMART village strategy (SmartRural21 project)



Source: https://www.smartrural21.eu (2021)

Coming from 21 different countries, the villages represent a broad spectrum of rural profiles, assets, and challenges, providing thematic and geographical balance. The project pre-selected an initial 5 villages during its preparatory phase in 2019. These villages have already developed their SMART village strategies and are turning their thoughts towards implementation. Following an open application and a systematic three-tier assessment process, which ran between March and June, the project has now confirmed the selection of an additional 16 villages – more than the 12 villages foreseen – that will now join the project. The addition of 4 extra villages was made possible with the kind support of some

of the National Rural Networks (NRNs) that agreed to support the villages jointly with the Smart Rural 21 project.

Uppony

Uppony is a small village of 280 inhabitants in Borsod-Abaúj-Zemplén, one of the most lagging behind counties of Hungary. The beautiful natural environment of the village is in sharp contrast with its current socio-economic status. The micro-region of Ózd, where Uppony is located, is situated in north-east Hungary and is one of the most disadvantaged and poorest areas in Hungary. The region is mostly characterised by small-sized villages. Population is decreasing and ageing, while the unemployment rate is high. Their main motivation to become a 'SMART village' is to demonstrate that even marginalised and disadvantaged communities like theirs have a 'way out' if the right solutions are identified and implemented. Their goal is to find innovative and inspiring solutions that can help overcoming our challenges and attract both visitors and young inhabitants to Uppony and neighbouring villages. In particular, we would like to build on our rich natural environment, archaeological sites and geological points of interest that offer a lot of potential for tourism and beyond as well as on our local entrepreneurial capacities. A positive recent development is that young people started to move into the area and some local entrepreneurship started to emerge. They would like to exploit this momentum and to build our solutions on these assets.

- It is possible, that some participatory development elements will be included into the next programme within ERDF through the CLLD tool, similar to its present form, i.e. used as an urban grants scheme coordinated by the municipalities. Furthermore, integrated approach is also covered by ITI (Integrated Territorial Investments).
- Ministry of Innovation and Technology (ITM) is the coordinating the planning on digital support and interventions. The Digital Wellbeing Non-Profit Company (Digitális Jólét Nonprofit Kft.) was established by the Hungarian Government to enhance "digital wellbeing". The company elaborated several digitally focused programmes, and the creation of a Digital Village Programme was announced in November 2020. The programme will support pilot projects through national budget.
- The Ministry of Agriculture elaborated a Digital Agricultural Strategy, supported by national funding, that concentrates on precision agriculture, data collection and computer literacy of farmers.

Remetea (Gyergyóremete)

Remetea from Harghita, Romania was selected as part of the additional 4 villages that will receive support from the project in order to develop a SMART village strategy. Located in the mountainous area of the Giurgiu Basin in Harghita county, Romania, Remetea is one of the largest villages in the region, with a population of 6.171 inhabitants. The total surface area of the village is 10.774 hectares. Remetea is a settlement of several hundred years of history, with strong traditions and eloquent cultural characteristics. One of the biggest assets of the village is the natural mineral water springs and supplies. They hope to revive the 'bath culture' of the region by opening a wellness and bath centre, while using resources efficiently.

The traditional economy is based on agriculture, forestry, and handicrafts. The community has entrepreneurial spirit, including service providers, a chocolate and sweets factory, and an office furniture enterprise. In this context, the priority is to identify and eliminate factors that limit the pursue of new business opportunities. The leadership and management of Remetea is stable, makes use of cooperative management techniques and builds up local knowledge base, besides the subordinated institutions (health centre, touristic centre, community centres, social centre, nursery) tries to respond to all the community needs. The village has been facing complex challenges and dynamic transformations that require the implementation of a new, integrated, digital management system that facilitates interaction with all the local actors of our community's everyday life. Their motivation to participate in the project is to learn and adopt an integrative development approach, including economic development, health, innovation, and education.

What is "SMART" for Remetea?
1. Infrastructure: The objective of the project is to build a natural gas distribution network located in the villages of Remetea and Sineu, with a total length of approx. 60 km, which covers all communal and county streets and roads in the village belonging to the public domain.

2. Civil constructions: Building a swimming pool of educational purpose. The swimming pool with educational and training purpose will be developed and equipped according to a standardised project plan, through the program of the National Investment Campaign CNI S.A. The pool is addressed primarily to the didactic use by schools and other educational establishments from Remetea village. The proposed investment aims to facilitate free access to the pool for children and young people to practice swimming and other water sports, and after the official school program in can be used by people interested in swimming as a leisure and health maintenance activity, the pool having a capacity of 65 persons maximum.

3. Tourism: Spa Centre, Remetea village. In Remetea, there is a mineral water source with high yield of water, certified for its healing properties, all exploitation right owned by the village. The community would like to exploit it for touristic purposes; therefore, a feasibility study has already been made. The study gave birth to a new tourism concept for this region, which takes into consideration the new tendencies in tourism worldwide. The goal is to replace the mass-tourism with the "luxury of simplicity", where sustainability becomes a main aspect, "Soft" or "Human-scale" Tourism being preferred instead of mass tourism. The main objectives are to put the least possible weight on the natural environment, enjoying nature in its "untouched" shape, requesting the visitors to know and adapt themselves to the culture of the visited place.

4. Education: Upper-secondary education in Remetea. The aim of the project is to establish a four-year upper-secondary theoretical school (high school) in the village for young people aged 14-18, where not only locals, but children from all over the country and the larger region could apply. The institution will first aim for double accreditation, i.e. it will be accredited to give both Romanian and Hungarian high school diplomas (baccalaureate), the next aim being to join an international school network and provide an internationally recognised high school diploma.

Summary

Based on the above, it can be said that the key determinants of the future of both the world and of the European Union are cities, which, taking into account regional development considerations, are the engines of growth and development. The current regional processes also underpin the fact that states and local governments cannot give responses to the urbanisation and environmental issues of globalisation. Complex management and development of the SMART cities is becoming increasingly popular with market players and maybe even more importantly, locals. In our view, successful cities in the future will need intelligent leadership, which is also reflected by the SMART initiative (cities and villages as well). However, it is important to emphasise that in order for a city/village to become a successful city/village, local needs should be taken into account in the practical application of a smart methodology. The results of these urban and rural development strategies will certainly contribute to the development of viable, smart settlement.

References

Dobos, K., Kulcsár, S., Nagy, P., Sik, A., Szemerey, S., Menyhárt, É. (2015): *Smart City Tudásplatform: Metodikai javaslat*. URL: http://lechnerkozpont.hu/doc/okos-varos/smart-city-tudasplatform-metodikai-javaslat.pdf

Gregory, S., George, N. (2019): An architectural framework and enabling wireless technologies for digital cities and intelligent urban environments. *Wireless personal communications*, 445–463.

Káposzta, J., Honvári, P. (2019): A smart falu koncepciójának főbb összefüggései és kapcsolódása a hazai vidékgazdaság fejlesztési stratégiájához. *Tér és Társadalom*, 1., 83–97.

Káposzta, J., Ritter, K., Nagy, H. (2016): Local economic development in transition economies: A tool for sustainable development of rural areas. In: Erokhin, V. (ed.): *Global perspectives on trade integration and economies in transition*. IGI Global, Hershey, 281–298.

Kassai, Zs., Molnár, M. (2016): The social success factors of local rural development. In: Ritter, K. (ed.): *Economic and local aspects of rural development*. Szent István Egyetemi Kiadó, Gödöllő, 108–117.

Nagy, A., Sain, M., Sárdi, A., Vaszócsik, V. (2015): *Településértékelés és monitoring: Módszertani javaslat*. Lechner Tudásközpont, Budapest

Rab, J., Riedel, M., Steiner, B. (2015): *SMART City példatár*. Lechner Tudásközpont, Budapest

Sikora-Fernandez, D., Stawasz, D. (2016): The concept of smart city in the theory and practice of urban development management. *Romanian Journal of Regional Science*, 1., 86–99.

Internet sources

- http://lechnerkozpont.hu/doc/okos-varos/
- http://www.bkk.hu/futar/
- https://digitalisjoletprogram.hu/hu/tartalom/okos-varos-smart-city
- https://enrd.ec.europa.eu
- https://www.ksh.hu/teruletiatlasz_urban_audit
- https://www.smartrural21.eu/

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