

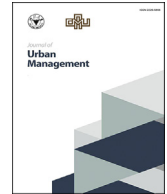
HOSTED BY



ELSEVIER

Contents lists available at ScienceDirect

Journal of Urban Management

journal homepage: www.elsevier.com/locate/jum

The impact of urban sprawl on the urban-rural fringe of post-socialist cities in Central and Eastern Europe – Case study from Hungary

Gábor László Vasárus^a, Jenő Zsolt Farkas^{a,*}, Edit Hoyk^{a,b}, András Donát Kovács^a

^aHUN-REN – Centre for Economic and Regional Studies, Institute for Regional Studies, H-1097, Tóth Kálmán u. 4., Budapest, Hungary

^bJohn von Neumann University, Faculty of Horticulture and Rural Development, H-6000, Izsáki út 10, Kecskemét, Hungary

ARTICLE INFO

Keywords:

Urban sprawl
Suburbanization
Urban-rural fringe
Built environment
Post-socialist cities
Hungary

ABSTRACT

Urban sprawl has a wide-ranging impact on the urban-rural fringe of the post-socialist cities, which are the most dynamically changing areas of the countryside in the Central and Eastern European countries. Intensive construction activity and population growth can be seen in the outskirts. Due to the lack of local spatial planning and land-use management in these areas, the environment was severely damaged during sprawl. On the fringes of the administrative area of the cities, there are huge differences in the housing conditions, character of the buildings and residential environments, and social status. To better understand the phenomenon, we investigated two Hungarian cities: Győr and Kecskemét. Both regional centers have large outskirts, and Kecskemét's catchment area has many scattered farms, even in international comparison. During our research, we conducted systematic fieldwork and in-depth interviews ($n = 30$) and implemented quantitative (GIS) and statistical analysis to gather critical features of the transformation of the urban-rural fringes. According to our results, a highly fragmented spatial structure has emerged due to the lack of local government resources and will. Urban sprawl causes complex environmental problems, such as landscape degradation and social segregation, and raises the question of the unsustainability of buildings and construction in the outskirts.

1. Introduction

Urban sprawl has been a long-standing issue in Western Europe, while in post-socialist Central and Eastern European countries, it only gained significant momentum in the early 1990s following the transition to market economies (Garcia-Ayllon, 2018; Lisowski et al., 2014; Sadowy & Lisiecki, 2019). During the past three decades, substantial areas of rural hinterlands have been converted across Europe, although the changes have differed from country to country (Gutzler et al., 2015). The urban sprawl caused many geographical changes, but it was particularly spectacular regarding land-use changes and opened out the artificial landscape forms (Bren d'Amour et al., 2017; Friis & Nielsen, 2017; Marsden & Sonnino, 2012).

Many authors have stated that the growth of built-up areas has led to the decline of ecologically valuable areas, agricultural land, and forests, which has a negative impact on landscape patterns (Tammaru, 2001; Hirt, 2008; Görgl, Helbich, Matznetter, & Fassmann, 2011; Ravetz et al., 2013). The rapid transformation poses significant challenges for urban planning and management, which may struggle to

* Corresponding author.

E-mail addresses: vasarus.gabor@krtk.hun-ren.hu (G.L. Vasárus), farkas.jenozsolt@krtk.hun-ren.hu (J.Z. Farkas), hoyk.edit@nje.hu (E. Hoyk), kovacs.andrasdonat@krtk.hun-ren.hu (A.D. Kovács).

<https://doi.org/10.1016/j.jum.2024.06.006>

Received 26 January 2024; Received in revised form 10 May 2024; Accepted 23 June 2024

2226-5856/© 2024 The Authors. Published by Elsevier B.V. on behalf of Zhejiang University and Chinese Association of Urban Management. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

govern these dynamic processes effectively (Toşa et al., 2018). The population outflow from the cities' core and the industrial investments on the fringe increased environmental problems, so managing the sprawl became a critical issue in CEE countries (Gumma et al., 2017; Lennert et al., 2020). Due to the extensive changes and the lack of financial and human resources, it was impossible to consolidate municipal management procedures and planning techniques, and the harmful effects of expansion intensified in these countries (Adamiak, 2016; Lisowski et al., 2014).

While the primary motivations for moving out of cities are the closeness to nature and the desire for a better quality of life, ultimately, this leads to adverse impacts due to the expansion of built-up areas (Antrop, 2004; Balogh & Novák, 2020; Kubeš & Nováček, 2019; Roose et al., 2013). Daily commutes also cause significant pressure, and the area-intensive suburban lifestyle requires more space and energy (Rosu & Banica, 2018). This weakens climate adaptation and mitigation efforts (Ianos et al., 2012). The unplanned expansion of suburban areas can have detrimental social and economic repercussions (Keil, 2020). We agree with authors who emphasize the need to slow down the intensive territory occupation because these changes are occurring too rapidly (Ungureanu & Volocă, 2019; Stoica et al., 2021; Zanfi et al., 2020).

In the CEE countries, urban expansion often challenges preserving historical settlement patterns, residential settings, and demographic and social dynamics (Stoica et al., 2021). During the decades of socialist state-controlled urbanization, many rural residences were annexed to the administration area of the cities. Thus, formerly independent villages, farm areas, and allotments became part of the cities but remained rural. Most of these zones are geographically isolated from the central inner built-up region of the cities and have retained their historic appearance and settlement pattern (Balogh & Csapó, 2013; Leetmaa & Tammaru, 2007; Ouředníček, 2007).

The administrative areas of the settlements in this region are divided into three territorial parts – although the terminology may differ from country to country. The first is the city core, representing the urbanized main built-up area. The second comprises the 'satellite settlements', which were annexed to cities or towns during the state-socialist urban development, especially between 1970 and 1985. These now function as districts at the edges of cities/towns, preserving their original settlement structure. The third area type is the 'outskirts,' which consists of diverse rural residences and resort areas. These areas feature scattered farmsteads and allotment-like settlement structures. In Western European cities, allotments primarily serve food production and recreational purposes, offering various environmental and social benefits (Calace & Papparuso, 2022; Teuber et al., 2019). In contrast, many allotments and resorts in the CEE countries have been transformed into permanently inhabited neighborhoods. This trend is evident in the V4 countries (Czechia, Hungary, Poland, Slovakia) and the Baltic states, and it can also be observed in Ukraine and the western part of Romania (Adamiak, 2016; Kindel & Raagmaa, 2015; Petrovič & Petrikovičová, 2021; Shkaruba et al., 2021).

Hungary's outskirts and conventional settlement structures are changing as big and mid-sized cities expand outward. They often encroach upon green spaces and farmland, displacing formerly built environments (Kovács et al., 2019; Lennert et al., 2020). The development of new housing projects and the dominance of modernized urban planning principles in suburban areas have led to the neglect and degradation of traditional patterns. The risk of the processes becomes even more substantial when considering that rural development is not sufficiently prepared. We align with authors who argue that territorial planning and spatial policy have not provided adequate solutions to constructing and regulating the fringe (Csatári et al., 2013; Iváncsics & Filepné Kovács, 2021).

Based on the starting points described above, our study focuses mainly on changes in the built environment, which we consider a crucial element of the fringe's problem. Sensing the human expansion that ignores long-term landscape needs and resulting wide-ranging land-use conflicts, a deeper understanding of the phenomenon is increasingly relevant.

Compared to our other results on the topic (Vasárus & Lennert, 2022), this paper presents new aspects regarding the rapid anthropogenic transformation of the outskirts. The study analyses the processes behind spatial and environmental changes in two Hungarian mid-sized cities, Győr and Kecskemét. These sample areas are suitable for representing the outskirts' processes of post-socialist countryside in CEE countries. Furthermore, our work contributes to the ongoing discussion on sustainable urban planning and management by exploring urban sprawl's driving factors, consequences, and the continuing transformation of the rural-urban fringe. The fact that the state mortgage-support system changed on January 1, 2024, in Hungary strengthens the actuality. Based on Decree 302/2023, families can apply for this type of residential loan for apartments only in small settlements and homes on the outskirts. For this reason, the population influx to these areas is expected to increase.

We have structured the paper as follows: Section 2 provides an overview of the examined cities and the applied methods. Section 3 presents the results of the surveys and interviews and the statistical data analysis. In Section 4 we demonstrate the main research findings and discuss the results, while in Section 5 we draw our conclusions.

2. Materials and methods

2.1. The studied cities and outskirts

After the Hungarian regime change in 1990, one-third of population growth in the suburban areas occurred in the outskirts and certain inner-city areas until 2022 (Table 1). The rural-urban fringe has become more attractive to the affected settlements' residents and domestic migrants (Bajmócy & Makra, 2016; Timár & Váradi, 2001).

To analyze the impact of urban sprawl on the built environment, we chose two Hungarian cities: Győr (130,000 people in 2023) and Kecskemét (110,000 people in 2023) (Fig. 1).

In Hungarian terms, Győr and Kecskemét are typical mid-sized cities and rural centers. Both display similar development traits, cultural heritage, and regional importance. Their size, economic, and administrative role is significantly below that of the capital, Budapest. Győr is in the Western part of Hungary, at the confluence of three rivers, and its historical role as a trading hub has shaped its urban form and economic activities. Győr is famous for its more than a hundred years of automotive components and vehicle

Table 1

The role of outskirts and satellite settlements as suburban destinations within the cities compared to independent settlements in Hungary 1990–2022. Source: Own elaboration based on census data (Hungarian Central Statistical Office).

Area	Change of city cores 1990–2022, (%)	Population growth in suburbs 1990–2022	Growth within the city (outskirts and satellite settlements)	Growth of the independent suburban settlements
Agglomerations in Hungary	−646866 (−16.4%)	487213	15.37%	84.63%
Agglomeration of Budapest	−333467 (−16.6%)	346034	0.58%	99.42%
Agglomerations of other cities	−313399 (−16.2%)	141179	51.61%	48.39%
Agglomeration of Győr	−10609 (−9.3%)	29516	30.05%	69.95%
Agglomeration of Kecskemét	−7816 (−9.3%)	18258	73.50%	26.50%

Table 2

Spatial distribution of the population growth between settlements part categories, %, 1990–2011. Areas to be examined are marked with *. Source: Own elaboration based on census data (Hungarian Central Statistical Office).

Area	Core cities		Administratively independent suburban settlements		
	Satellite settlements*	Outskirts*	Settlement cores	Satellite settlements	Outskirts
Suburbs in Hungary	1.80%	1.95%	79.63%	9.66%	6.96%
Suburbs around Budapest	0.22%	0.37%	84.51%	10.38%	4.52%
Suburbs around other cities	21.00%	30.61%	36.37%	1.80%	10.23%
Suburbs around Győr	21.37%	8.58%	65.96%	2.46%	1.63%
Suburbs around Kecskemét	35.96%	37.55%	17.09%	3.47%	5.94%

manufacturing (Rába Plc.), and this sector is continuously developing rapidly thanks to foreign capital investments like Audi Hungaria Plc (1993). Many workers moved here from the country's peripheries thanks to well-paid jobs. Otherwise, Győr is a geographically excellent example of a post-socialist city because, between 1970 and 1990, the inner settlement ring and many scattered dwellings were attached to the city's administrative area. Today, they form a dynamic inner suburban belt with many new residents, and most of the industrial investments were also established here, causing many conflicts.

In comparison, Kecskemét's location in the Great Plain influenced its agricultural economic orientation and its sprawling, vast suburbs. Kecskemét is a town that used to be an agricultural market and the county seat of Bács-Kiskun County. The city's economic profile changed significantly with the arrival of Mercedes Benz Manufacturing Hungary Ltd. in 2008. Like Győr, its administrative territory has many satellite settlements whose populations have rapidly increased in recent years. Since a large portion of suburbanization is contained inside these cities' boundaries (see Table 1 and 2, and Fig. 1), these two towns are perfect for examining the transformation of their outskirts. Despite the differences, both cities share urbanization, infrastructure, and sustainable growth challenges, reflecting general trends across CEE countries. The allotment areas formed in the socialist era show the same development pathway as the dachas of the Baltic states. On the other hand, the villages annexed to these two cities form a similar spatial structure to those in Poland and former Czechoslovakia, where this type of settlement merger was also widespread (Boentje & Blinnikov, 2007; Spórna & Krzysztofik, 2020).

2.2. Data and methods

We primarily used qualitative methods and analyses of primary empirical data, supplemented by secondary statistical data analysis. From 2016 to 2023, we conducted systematic fieldwork in the two sample areas. During this process, we classified household plots in each outskirt according to their use (hobby garden, vacation house, small industrial site, agricultural land, woodland plot) and condition (abandoned, poor, average, novel). Our exploration of the outskirts was comprehensive, navigating through streets based on maps, either on foot or by bicycle. We meticulously documented our observations in a diary and captured photographs. Subsequently, we assessed the state of infrastructure and accessibility. The primary focus of the diary was to convey the overall impression of the built environment, categorized as positive, negative, or stagnant. We closely monitored the rapid changes, documenting the experienced processes. Later, we cross-referenced our observations with the information provided by the interviewees.

Additionally, between 2019 and 2023, we conducted 30 in-depth semi-structured interviews with knowledgeable individuals in the sample cities. These included local experts such as urban planners, regional and rural developers, and architects (n = 12), local government representatives, clerks, and administrative officials (n = 12), and other professionals from NGOs, geographers, and researchers (n = 6). We explored their opinions and knowledge regarding changes in the built environment, infrastructure, spatial planning and development, and general processes in the outskirts. Respondents were selected based on their professional reputation and recommendations from others, utilizing the snowball method. All interviewees possessed extensive experience in planning or development. We adhered to the basic rules of the interview protocol, respected the rights of the interviewees, and ensured anonymity. The interviews

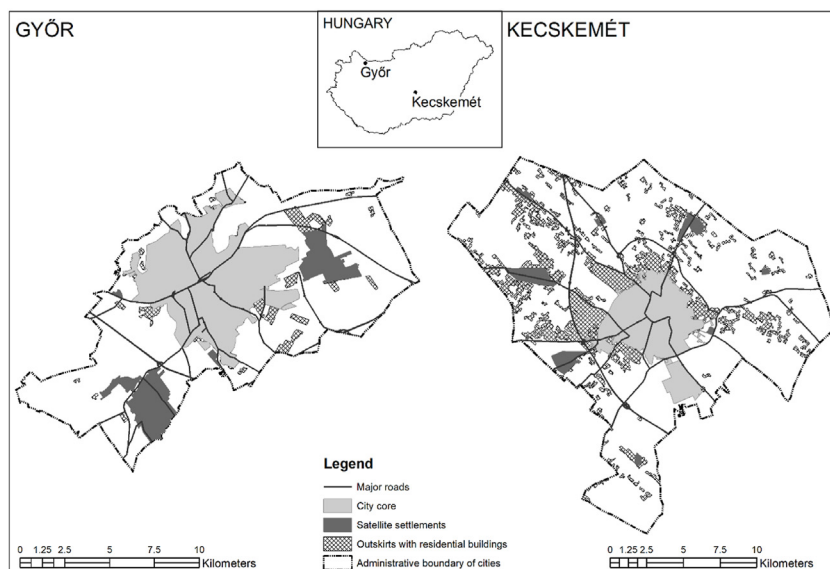


Fig. 1. Former villages (other inner areas) and scattered settlements within the administrative borders of Győr and Kecskemét, 2016. Source: ArcMagyarország by GEOX Ltd., Corine CLC50 unique national database by FÖMI.

were conducted with semi-structured questions that included:

- What characterized the suburbanization of the city area in the last three decades?
- How have the landscape and built environment changed in the rural-urban fringe?
- How did rapid and unauthorized construction affect the local settlement structure?
- At what rate did the linear infrastructure change, and what caused it?

We analyzed the answers using the coding method (Castillo-Montoya, 2016) and quantified the opinions about problems and relevant factors mentioned by respondents. In processing the questions, each group of respondents was marked separately. Experts are marked with 'E', government representatives with 'G', and the other professionals with 'P'. In those cases, the provided responses were almost similar or comparable. We positioned two acronyms following the sentences. The numerical code denotes the number of individuals who discussed the factor in question.

Besides the qualitative approach, we analyzed the Corine Land Cover database of 1990, 2000, and 2018 and the Land Cover Change database for the available periods with ArcGIS software to assess the land use changes in the selected cities. The data for the two cities was downloaded from the Copernicus Land Monitoring Service website. We also scrutinized road traffic data of Hungarian Public Roads Non-profit Co. (kira.gov.hu) with descriptive statistical methods.

Table 3

Land use changes in Győr and Kecskemét. Source: Own calculation based on Corine LC data.

Land use/land cover	Győr					Kecskemét				
	1990 (ha)	2000 (ha)	2018 (ha)	Change 1990–2018 (ha)	(%)	1990 (ha)	2000 (ha)	2018 (ha)	Change 1990–2018 (ha)	(%)
Residential zones	2623.8	2608.7	2789.7	165.9	6.3	2149.3	2279	2401.6	252.3	11.7
Industrial and commercial zones	1040	1215.7	1794.3	754.3	72.5	789.3	876.6	1324.4	535.1	67.8
Road and rail networks	66.6	73.6	64.3	-2.3	-3.5	0	31.4	31.4	31.4	100.0
Other artificial surface	415.8	506.8	524.7	108.9	26.2	818.2	834.3	1048.9	230.7	28.2
Arable land	7160.6	7049.4	6206.8	-953.8	-13.3	15007.3	14736.4	13458.8	-1548.5	-10.3
Vineyards and orchards	331.4	332.3	147.4	-184	-55.5	1916.5	1493.6	878.8	-1037.7	-54.1
Pastures	1296.1	1272.6	982.2	-313.9	-24.2	1840.2	2070.8	2048.8	208.6	11.3
Complex cultivation	1146.5	941.1	1226.8	80.3	7.0	5597	5282.4	5052.5	-544.5	-9.7
Forest	2000.3	2210.9	2072.6	72.3	3.6	3192.4	3499.4	4723	1530.6	47.9
Other semi-natural surface	1075.4	946.6	1358	282.6	26.3	909	1115.3	1251	342	37.6
Water	299.2	297.9	289	-10.2	-3.4	44.4	44.4	44.4	0	0
Total area	17455.6	17455.6	17455.6			32263.6	32263.6	32263.6		

3. Results

3.1. Changes in the built environment

Corine Land Cover data show municipalities have significant land use conversions between 1990 and 2018. In Győr, 8.4% of the administrative area and 9.7% in Kecskemét have changed, mainly in the outskirts. In three decades, the built-up area has increased more than 1000 ha in these towns. It represents a rapid growth of residential and industrial zones and other artificial areas (Table 3).

According to several respondents, the industrial and commercial areas had the most significant growth during the second half of the 1990s and the early 2000s (interviews E 9; G 10; P 4). In both cities, hypermarkets, and supermarket warehouses (Tesco, Auchan, Praktiker) were constructed on the edge of the core built-up area. Another momentous change in land use was the establishment of Audi Hungaria Plc in Győr and Mercedes-Benz Manufacturing in Kecskemét. These investments generated many new ones, resulting in a significant number of automotive suppliers establishing manufacturing capacities, further increasing the size of industrial areas (Fig. 2). Notably, these factory constructions were mainly greenfield projects involving the conversion of agricultural land.

“The construction of factories and trade logistics investments on agricultural land generated many controversies. These were the most striking changes in the outskirts.” – added an expert.

Besides the above-described constructions, our interviewees agreed that the migration to the outskirts and the new social needs brought significant changes to the built environment of the rural-urban fringe (interviews E 11; G 8; P 5). Traditional suburban residential areas have undergone substantial transformations, with classic scattered farms and homesteads nearly disappearing in many locations.

Essentially, two main changes have manifested in this process. On the one hand, hundreds of families migrated to the outskirts, constructing new houses, predominantly in districts closer to the cities. On the other hand, numerous individuals have modernized existing properties on the outskirts. These residential building investments have given rise to distinctive spatial patterns. In contrast to industrial and commercial land acquisitions predominantly occurring along main roads, private constructions were observed near these roads and in more challenging-to-reach and, consequently, more affordable areas (Fig. 3).

“As a result, irregularly built-up, overbuilt, and completely abandoned areas alternate within 100 m. The expectations of those moving here regarding the quality of life are rarely met because of the circumstances. However, it is not just the newcomers who cannot find their better lives; the local authorities also face tough challenges due to the chaotic conditions,” summarized one experienced person.

The nature of these home constructions depended primarily on the financial possibilities of the families, but other characteristics can also be observed. For instance, people who moved into less favored areas mostly made smaller properties that fit into the landscape.

“A noteworthy feature is the often-random distribution of a diverse range of housing types within individual streets, encompassing large residences for wealthy immigrants, expanded older buildings, and deteriorating properties occupied by less affluent individuals. This is because wealthier people in the late 90s and early 2000s were usually able to buy one of the few vacant properties. These buildings are very different from the traditional rural architectural forms; they do not follow architectural regulations and have significant environmental impacts,” one of the interviewees said.

The eave height and the overall mass of the newly built buildings are significantly higher and more extensive than what local regulations allow and, thus, do not fit into the landscape. Several respondents mentioned that illegal construction and expansion are typical in both cities (interviews E 7; G 9; P 6). In contrast, many new immigrants from the lower strata of society moved into old and tiny (20–30 m²) holiday homes, which do not have a bathroom toilet; thus, most of them could not be used as official permanent residences. This strong contrast at a short distance further reinforces the feeling of deprivation and segregation (Mikle, 2020; Vasárus et al., 2018).

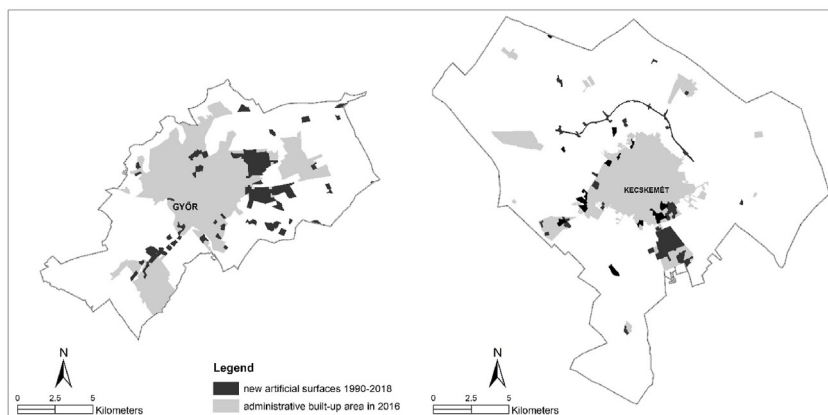


Fig. 2. New artificial surfaces in Győr and Kecskemét between 1990 and 2018. Source: Corine Land Cover Change database, ArcMagyarország by GEOX Ltd..



Fig. 3. Neglected buildings and new family houses in the same outskirts of Kecskemét (left) and Győr (right). Source: own photos.

This issue partly stems from the fact that during the socialist era, only summer houses could be built in the outskirts (floor area under 35 m²). However, people began to expand the smaller cottages into residential homes without permission in the 1980s. First, families moved out only for the summer, then for the whole year. Since the allotments and summer cottages were among the few legal forms of construction, the authorities tolerated them as a gray zone (Fig. 4). Although regulations have changed since then, some people are unaware of these changes.

The NGOs and employees of urban construction agencies estimated 10%–40% of the proportion of constructions without appropriate permits, some of which do not even comply with the building regulations for the given area. In particular, the floor area and installation height limits are typically violated, but many buildings were built illegally. In some cases, the building itself is suitable. Still, the actual usage differs from the legally registered function, so a plot classified as a “garden” is used as a business premises, or a plot with a “resort” function is used as a permanent residence. About 20% of the properties on the outskirts are problematic; these properties often do not



Fig. 4. Land use changes on the outskirts of Győr (left) and Kecskemét (right), date of the satellite images indicated by the year. Source: field survey results depicted on Google Earth images.

appear in official statistics as they are not officially residential buildings.

The interviews also indicated that the population is expected to be larger in the examined areas due to illegal construction (which means the affected population is larger than the official data in Tables 1 and 2). In local discourse, illegal land use patterns are often tolerated. In the storytelling of local governments, these activities are seen as the price of growth. We can get an insight into their subjective interpretation:

“Occasionally, we ignore anomalies and unauthorized development because we anticipate receiving additional tax from the newcomers. Due to the lack of staff, we could not check appropriately in the field. A lot of properties were built without legal standards. There were several cases where there was no similarity between the completed property and the plan submitted for approval. The building, licensed as a residential house, sometimes became a small manufacturing plant. In practice, no formal action was taken to revoke or penalize unauthorized constructions, expansions, or utilization for other purposes, as this would have placed many residents in a difficult situation.”

It is essential to highlight that in recent decades, architectural offices of cities have acted in building cases as a licensing and control body. Still, they have been unable to conduct inspections due to a lack of human resources. Furthermore, - as expressed by two municipal representatives:

“Many municipal councils have seen this as a matter of concern for the overall growth of the city. Thus, they declared the existing state of the built environment to be legal by decrees, so there was no penalty for unauthorized and irregular constructions. The county government office took over the role three years ago.” “However, there are still not enough qualified officials for the inspections, and the houses built between 1990 and 2010 are more than ten years old, so that no penalty can be imposed on them anymore. In addition, the present legislation allows for construction without a permit (up to a certain floor area), and only authorization for use needs to be applied once it has been completed.”

Some respondents agreed that these decisions are routine in municipal land use management because the goal is to promote construction for political reasons (interviews E 6; G 5; P 4). Therefore, spatial planning and local governance of the outskirts are “a nightmare”, especially in the design of streets and green space.” When someone wants to change street fronts or construct a sidewalk, they will undoubtedly run into the unregulated nature of the existing conditions - since the location of the properties is chaotic.”

Although the Hungarian Central Statistical Office publishes a detailed gazetteer every decade, it contains only the sum of the population and houses. Until the last decade, Győr operated a local office in the eastern quarter of the city, on Győrszentiván, which collected data under its authority, which shows results that correlate with our data series but differ significantly from the statistics published by the HCSO. Table 4 shows the contradictions between the local (municipal) surveys, our empirical results (Vasárus et al., 2018), and the data of the HCSO's Detailed Gazetteer, particularly the “Wittman-tag”, which is the center of an orchard with a single residential building. The population and housing stock increase was dynamic in the last two decades. In 2022, the building stock was

Table 4

The changes in population and real estate stock in case of Győrszentiván. Source: HCSO Detailed Gazetteer, Own data collection, (*) nr. 9112/60 proposal about the waste collection in Győrszentiván district, Győr municipality, 2012; Council proposal 25.163/1973 of Municipality of Győr (**), 1973.

Data collection		Kertváros	Kishegy	Nagyhegy	Szarkavár	Tibor-major	Újmajor	Külső-Vasútsor	Wittman-tag	Zsellérdűlő
Population	1970 HCSO	1	84	167	29	24	27	61	0	167
	1990, HCSO	0	24	73	0	0	22	12	1	0
	2011, HCSO	438	62	205	0	0	42	34	1	36
	2012, Local data collection (*)	~500	~70	~300	~10	~5	~30	~40	1	~50
	2022, HCSO	871	31	81	2	1	19	84	221	33
	2022, Own data collection	474	31	48	1	1	20	31	90	16
Number of flats and houses	1971, Local data collection (**)	42	10	30	1	6	8	4	1	6
	1990, HCSO	486	67	27	0	0	0	0	0	0
	2011, HCSO	240	34	89	0	0	22	13	1	16
	2014, Own data collection	487	77	135	12	2	23	16	1	38
	2022, HCSO	474	31	48	1	1	20	31	90	16
	2022, Own data collection	498	82	183	18	2	21	16	1	43
State of houses, 2022 own survey (average share in %).	New/renovated (17,2%)	89	11	29	0	0	5	3	0	12
	Average (47,5%)	259	29	79	6	1	9	9	0	18
	Poor (15,6%)	78	16	24	7	0	2	2	0	6
	Ruin or abandoned (8,2%)	32	8	27	1	0	2	0	0	1
	Used as industrial plot, workshop (2,1%)	9	1	3	0	1	2	0	0	3
	Mixed (various parts) (9,3%)	31	17	21	4	0	1	2	1	3

significantly differentiated between the individual outskirts, but a common trend is the slow renewal of the housing stock and the deficient presence of the economic function. The case of “mixed” houses is special. Typically, existing former weekend houses were expanded, but they had no financial resources to renovate the original part of the building.

This table is an exception because most local governments have not organized similar local surveys. Official statistics on the fringe are sparse and uncertain. The existing datasets are not reliable, as the interviewed experts also expressed. All this confirms the in-depth examination of individual settlements and the role of qualitative analysis.

3.2. Challenges for linear infrastructure and public services

As already described, spatial planning is significantly hampered by the lack of data and reliability problems. As mentioned, the interaction resulted in a disorganized and complicated urban fabric (Fig. 2) characterized by various land uses. The developed fragmented land use patterns significantly impact infrastructure development and public services.

The increased traffic and weight of the newcomers’ SUVs have led to a rapid deterioration of local roads, initially designed for lower volumes of traffic and lighter vehicles. In many places, the roads were made by state-owned agricultural companies, which do not meet the standards. Furthermore, many roads have never been paved, and even gravel surfaces are absent. A few of these roads are so narrow that even a fire-fighting truck cannot pass through. An unfortunate home fire case proved this, which we witnessed during the fieldwork.

Almost all respondents expressed concern about the statistics that in both cities, there is a significant increase in traffic on all access routes to the city center (interviews E 11; G 11; P 6) (Fig. 5). In some cases, we can see more than 100% road capacity utilization, which means the traffic is higher than the original planned capacity.

“The capacity of the road network around the sprawling area has been inadequate for the population growth since 2000. However, expansion is not feasible for the outskirts due to the narrow space between buildings. In other areas, such as farmsteads and smaller allotments, the roadways were initially designed with limited capacity, which is now proving insufficient. Due to unregulated construction, two vital elements of the built environment, residential structures, and linear infrastructure, essentially work against each other.” – summarized one of the interviewees.

During the fieldwork, we found that 32% of the roads were temporarily or permanently challenging to use because they were either not paved or their quality had deteriorated in winter. However, the rate of this varies greatly, there was an outskirt where there was no solid road surface at all, while elsewhere, an entire area’s road network was renovated.

Another symptom of landscape degradation is illegal landfills, which appear along both cities’ access roads (Fig. 6). It should be emphasized that the garbage collection service does not cover the entire outskirts of either city. Moreover, we found more than 139 dismantled vehicles in our sample areas. The illegal sale of parts is an income source for the destitute. This situation can become a significant problem in the future because the garbage deposited along the roads hangs over the road or damages it by blocking the stormwater drain, causing in-land water issues, and even dangerous substances can leak into the ground.

The rapidly growing population naturally significantly strains other linear infrastructural elements. Thus, the reliability of the electricity network, telephone lines (internet), and, less often, the drinking water system decreases. When local governments expand the capacity of these infrastructure systems, the expenses are typically passed on as a special tax or mandatory public contribution. While a fee of 230–400 euros per infrastructure system may not seem significant, it can pose a substantial burden for low-income and elderly residents, according to an NGO leader.

“If such an increase in costs were to become common, many people would even be displaced from the outskirts, but there are no cheaper places, so they would be displaced from the entire agglomeration” (P1).

4. Discussion

The legacy of extensive territorial expansion in larger CEE cities during the socialist era remains evident today, marked by significant land use conversion. Our experience is consistent with the literature, thus confirming that urban sprawl has fundamentally similar

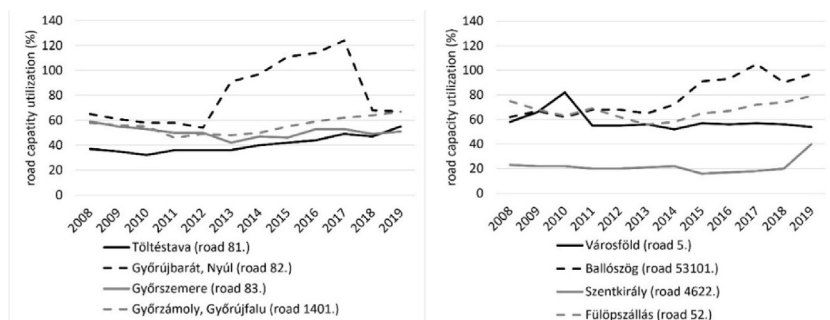


Fig. 5. Road capacity utilization leading to settlements around Győr and Kecskemét (%) (2008–2017). Source: own elaboration based on the Hungarian Public Roads Non-profit Company data.



Fig. 6. Illegal landfill of urban sprawl zone in Kecskemét (left) and Győr (right). Source: own photo.

elements across CEE cities, but, in some details, there are differences between capital cities and rural centers. Our results for the two Hungarian cities show that urban sprawl generally involves the growth of artificial surfaces, the densification of already built-up peripheral areas, the upsurge of brownfield and greenfield constructions and developments, and the population growth of peripheral regions, similar to the trends in other CEE countries (Balta & Atik, 2022; Kubeš, 2013; Shkaruba et al., 2017). The phenomenon resembles “Western sprawl” but is still different because of historical delay. In several European countries, suburbanization dominated from the 1960s, while in the CEE, it effectively started in the 1990s (Bontje & Burdack, 2011; Pourtaherian & Jaeger, 2022; Shkaruba et al., 2021) in highly intense waves and unplanned circumstances (Dahlstedt & Ekholm, 2019; Daskalova & Slaev, 2015; Lennert et al., 2020).

The Hungarian case studies show that two social groups were primarily involved in the migration: 1st, affluent individuals looking for a better living environment and seeking a rural idyll, and 2nd, vulnerable displaced individuals from the town and periphery, utilizing the inexpensive estates in the outskirts. The social composition of those who move to the fringe is partly different in capital and mid-sized cities as rural centers. Many middle and upper-class residents move out of the capital to the villages of the wider agglomeration area. On the other hand, people from rural centers mainly move to the immediate outskirts of the cities (within a 5–10 km zone), and the social composition is much more mixed. That is why people often live in poor houses in the shadow of luxury buildings (Gagyi & Vigvári, 2018; Spórna & Krzysztofik, 2020; Szmytkie, 2021; Taranu & Verbeeck, 2022).

We observed this phenomenon, especially in the case of Kecskemét. Our experiences confirm the observations of other authors: the sprawl around rural centers fragments land while contributing to social disparities, and the fringe becomes the home of entirely different social classes. Around rural centers, in contrast to the more homogeneous peripheries of large cities, there is a mosaic of land use, built-up areas, and social characteristics (Hardi, 2022). It also implies that a combination of environmental regeneration and decline characterizes the suburbanization processes in mid-size cities. The above differences could be because planning and development processes in capital and large cities are much more controlled, while, as our interviewees told us, rural centers do not have proper urban planning and management due to the lack of human capacities.

The revealed phenomena are not unique. The observed changes in the allotments in the two cities are analogous to the transformation of dachas. At the same time, the processes of the satellite settlements are very similar to the transformation of rural residences within the Polish and Czech cities. The uniqueness of the investigated areas lies in the fact that these processes appeared simultaneously in the same space and period.

In the case of the two cities we are examining, the fastest change occurs primarily within a 5–10 km fringe. Compared to the expensive suburban villages and satellite settlements, the primary reasons for choosing these locations were the lower real estate prices and the relative lack of regulations. Both affluent and precarious newcomers are starting to modify the rural-urban fringe, resulting in the construction of unauthorized buildings and improper land use practices (Fig. 5).

The buildings of affluent newcomers starkly contrast in terms of mass, eave height, layout, and design, disrupting the traditional single-row street-front building arrangement. Simultaneously, infrastructure development and road expansion have lagged behind, struggling to accommodate the increased usage. Concurrently, individuals from the opposite end of the social and economic strata have occupied existing agricultural buildings, converting them into habitable but rudimentarily equipped homes. In most cases, both groups of buildings share the common feature of being constructed with total disregard for building regulations, a common phenomenon in CEE cities (Ianos et al., 2012; Ioannidis et al., 2016; Jávör & Jancsics, 2016).

Furthermore, the expansion of commercial and industrial zones also exhibits some negative characteristics, such as neglecting the interests of those already residing there and compromising the preservation of farmland and the environment. In addition to unfavorable landscape processes and land use changes, the primary challenges involve the development of adequate urban infrastructure and public services, including road, electricity and water networks, waste collection, and public transport (Izakovičová et al., 2017; Mihai, 2018). Most services and workplaces are concentrated in the city core; thus, public transport is crucial to alleviate heavy traffic on access roads (Rosu & Banica, 2018). For primary school students, the period between November and March is challenging due to the unpaved and dimly lighted roadways.

In summary, the landscape has been degraded and fragmented due to the lack of control by the local authorities, and the current development strategies are insufficient to tackle the environmental, social, and management issues that have been developed, which is a common issue in post-socialist cities (Kubeš & Nováček, 2019; Ott, 2001). The deficiency is not only in proper schemes and measures but

also in the inability of local governments and agencies to control the situation (Lisowski et al., 2014; Sýkora & Bouzarovski, 2011; Varjú, 2020).

It is important to emphasize that this neo-liberal management approach is still prevalent 30 years after the regime change. The urban sprawl on the outskirts of post-socialist cities is often considered a “gray space” (Slaev et al., 2018). Our findings confirm this suggestion, as our observations indicated a lack of control in the development of the outskirts, in stark contrast to the suburban villages, where urban development and management were generally more regulated. As discussed in the previous paragraphs, the legal system has adapted. Furthermore, a significant lobbying force among local actors is interested in the growth of built-up areas and attracting potential investors and capital. Thus, what initially seemed like a transitional and intermittent situation (Kukulska-Koziel et al., 2019; Lennert et al., 2020) has solidified into a permanent element of urban management in Hungarian cities (Fig. 7).

Moreover, it is essential to note that this complex phenomenon in Hungary is still in an upward phase due to population policies and industrialization. In the last eight years, the Hungarian government's efforts to counter population decline by encouraging childbirth through various measures and favorable credit structures (the Family Housing Allowance Program FHAP) ensured adequate housing for young couples. The subsidies were insufficient to buy property without co-payment in cities and suburban villages but enough to purchase low-cost housing on the outskirts. The current changes in the FHAP reinforce this trend even more. Furthermore, in the future, there is a possibility that, besides the outskirts examined in this paper, the more distant outskirts of rural settlements will also become a target area for the beneficiaries. This is expected to affect “leapfrogging,” which was already occurring in some areas (Hardi et al., 2020; Kukulska-Koziel et al., 2019).

A new wave of industrialization is also led by the central government – almost completely excluding local governments from decision-making – whose current flagship investments are battery factories related to the automotive industry. Thanks to the more than 50 investments that have already been announced, Hungarian production capacity is planned to exceed 190 GWh by 2027, but all this without taking the environmental (for example, water availability) and labor requirements of production into account when selecting locations (Černá et al., 2022). Serving the automotive industry to this extent indicates a strong path dependency, in which the central government neglects the cities' decision-making autonomy, and local governments and city dwellers become increasingly vulnerable. Consequently, urban actors rationalize the tolerance of illegal and semi-illegal land use and construction in their discourse, an attitude that the historical institutionalism approach can explain.

5. Conclusion

The outskirts of post-socialist rural centers are areas where the unfavorable phenomena of urban sprawl and the general problems of (remote) rural areas appear simultaneously, reinforcing each other.

According to the international literature, urban sprawl is a delayed process in Central and Eastern Europe, including Hungary. However, we are witnessing striking changes, especially in some frequented cities within its administrative boundaries after 1990. The continuous waves of industrialization and the immigration of newcomers resulted in a nearly unmanageable situation from an urban development and management point of view. Mainly because the measures the central government took in recent years have continued to intensify these two processes.

The sprawl also strengthens those local interest groups who continue to exploit the confusion of the gray zone. At the same time, the exploitation of the resources of the outskirts and the unplanned sprawl represent a significant financial burden for the present and future city dwellers and fundamentally affect their quality of life. Thus, the impact of the expansion on urban management in Hungary and Central and Eastern Europe is much more significant than previously thought, and the legacy of the socialist economy, the practically unregulated land management, amplifies the current problems. This is also evident in the renewal of the building stock; despite numerous new and renovated properties, many houses in poor and dilapidated condition can be found in almost every area.

The identified issues exhibit similarities with the transformations observed in dachas and processes occurring in satellite settlements in Polish and Czech cities. What distinguishes these phenomena is their simultaneous occurrence within the same areas. Although the case of Kecskemét and Győr may not seem significant on a European scale, they represent a set of problems that may become common. Therefore, more emphasis should be placed on the issue of small and medium-sized urban centers. We must underline that the inaccuracy and the lack of local and official statistical data hinder the evaluation of precise conditions of the rural-urban fringe areas. Therefore, this is also a defining limiting factor of this study and why we can provide a limited amount of quantitative data. The findings suggest insufficient data masks the process, underscoring its importance more than previously thought in professional discussions.

Thus, in the framework of an ongoing research project, we will systematically survey and map some of the affected peripheral areas in Hungary and CEE through fieldwork to obtain accurate information on the built environment and the population. The sample areas will be Brno (Czechia), Gdańsk (Poland), and Bratislava (Slovakia). The planned research will give a deeper picture of the current effects of urban sprawl on the fringe in post-socialist rural centers.

Availability of data and materials

The datasets used and analyzed during the current study are available from the corresponding author upon reasonable request. The KIRA system dataset is publicly available per the INSPIRE (2007/2/EC) guidelines (<https://kira.kozut.hu/kira/>). The CORINE database is open to use from the Copernicus Land Monitoring Service website (<https://land.copernicus.eu/en/products/corine-land-cover>). The interview transcripts are not public to preserve the anonymity of the respondents.

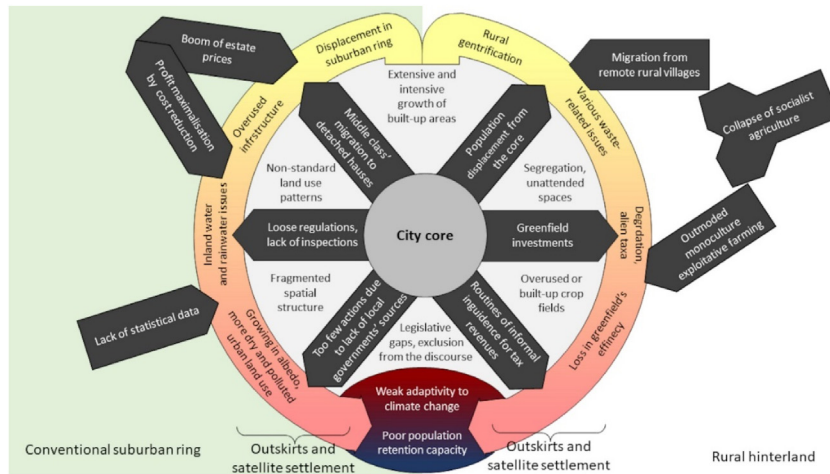


Fig. 7. The complex interactions of the urban sprawl and restructuring of the outskirts Source: own editing.

Funding

The research work of Jenő Zsolt Farkas was supported by the János Bolyai Research Scholarship of the Hungarian Academy of Sciences (BO/00353/21/10).

The research work of Gábor László Vasárus and András Donát Kovács was supported via project no. FK 146486, the project has been implemented with support from the National Research, Development and Innovation Fund of Hungary, financed under the FK_23 funding scheme.

CRedit authorship contribution statement

Gábor László Vasárus: Conceptualization, Formal analysis, Investigation, Methodology, Visualization, Writing – original draft. **Jenő Zsolt Farkas:** Conceptualization, Supervision, Visualization, Writing – original draft, Writing – review & editing. **Edit Hoyk:** Investigation, Validation, Writing – original draft, Writing – review & editing. **András Donát Kovács:** Supervision, Writing – review & editing.

Declaration of competing interest

The authors report that there are no competing interests to declare.

List of abbreviations

CEE Central and Eastern Europe
HCSO Hungarian Central Statistical Office

References

- Adamiak, C. (2016). Cottage sprawl: Spatial development of second homes in Bory Tucholskie, Poland. *Landscape and Urban Planning*, 147, 96–106. <https://doi.org/10.1016/j.landurbplan.2015.11.003>
- Antrop, M. (2004). Landscape change and the urbanization process in Europe. *Landscape and Urban Planning*, 67, 9–26. <https://doi.org/10.1016/S0169-20460300026-4>
- Bajmócy, P., & Makra, Z. (2016). Központi-, egyéb belterületek és külterületek népesedési trendjei Magyarországon 1960-2011 között. *Településtudományok*, 2, 3–21. In Hungarian with English summary.
- Balogh, A., & Csapó, T. (2013). Manors and scattered farms. special settlement forms of outskirts areas in Hungary. *Revija Za Geografijo. Journal of Geography*, 2, 81–94.
- Balogh, S., & Novák, T. J. (2020). Trends and hotspots in landscape transformation based on anthropogenic impacts on soil in Hungary, 1990–2018. *Hungarian Geographical Bulletin*, 69(4), 349–361. <https://doi.org/10.15201/hungeobull.69.4.2>
- Balta, S., & Atik, M. (2022). Rural planning guidelines for urban-rural transition zones as a tool for the protection of rural landscape characters and retaining urban sprawl: Antalya case from Mediterranean. *Land Use Policy*, 119, 106144. <https://doi.org/10.1016/j.landusepol.2022.106144>
- Boentje, J. P., & Blinnikov, M. S. (2007). Post-soviet forest fragmentation and loss in the green belt around Moscow, Russia (1991–2001): A remote sensing perspective. *Landscape and Urban Planning*, 82(4), 208–221. <https://doi.org/10.1016/j.landurbplan.2007.02.009>
- Bontje, M., & Burdack, J. (2011). Post-suburbia in continental Europe. In *International perspectives on suburbanization* (pp. 143–162). Palgrave Macmillan UK. https://doi.org/10.1057/9780230308626_8.

- Bren d'Amour, C., Reitsma, F., Baiocchi, G., Barthel, S., Güneralp, B., Erb, K. H., Haberl, H., Creutzig, F., & Seto, K. C. (2017). Future urban land expansion and implications for global croplands. *Proceedings of the National Academy of Sciences*, 114, 8939–8944. <https://doi.org/10.1073/pnas.1606036114>
- Calace, F., & Paparusso, O. G. (2022). Regional landscape planning for the innovation of urban planning. Municipal implementation of the city-country pact in Apulia. *City Territ Archit*, 9, 25. <https://doi.org/10.1186/s40410-022-00170-5>
- Castillo-Montoya, M. (2016). Preparing for interview research: The interview protocol refinement framework. *Qualitative Report*, 21(5), 811–831. <https://doi.org/10.46743/2160-3715/2016.2337>
- Černá, I., Élétető, A., Folfas, P., Kuznar, A., Krenková, E., Minárik, M., Przeździecka, E., Szalavetz, A., Túry, G., & Zábajník, S. (2022). *GVCs in central Europe: A perspective of the automotive sector after COVID-19*, 183. Bratislava: Vydavateľstvo Ekonóm.
- Csatári, B., Farkas, J. Z., & Lennert, J. (2013). Land use changes in the rural-urban fringe of Kecskemét after the economic transition. *Journal of Settlements and Spatial Planning*, 2, 153–159.
- Dahlstedt, M., & Ekholm, D. (2019). Social exclusion and multiethnic suburbs in Sweden. In B. Hanlon, & T. J. Vicino (Eds.), *The routledge companion to the suburbs* (pp. 163–173). Taylor and Francis.
- Daskalova, D., & Slaev, A. D. (2015). Diversity in the suburbs: Socio-spatial segregation and mix in post-socialist Sofia. *Habitat International*, 50, 42–50. <https://doi.org/10.1016/j.habitatint.2015.07.007>
- Friis, C., & Nielsen, J. (2017). On the System. Boundary Choices, Implications, and Solutions in Telecoupling Land Use Change Research. *Sustainability*, 9(6), 974. <https://doi.org/10.3390/su9060974>
- Gagyí, Á., & Vígvári, A. (2018). Informal practices in housing financialisation: The transformation of an allotment garden in Hungary. *Critical Housing Analysis*, 5(2), 46–55. <https://doi.org/10.13060/23362839.2018.5.2.442>
- Garcia-Ayllon, S. (2018). Urban transformations as indicators of economic change in post-communist Eastern Europe: Territorial diagnosis through five case studies. *Habitat International*, 71, 29–37. <https://doi.org/10.1016/j.habitatint.2017.11.004>
- Görgl, P., Helbich, M., Matznetter, W., & Fassmann, H. (2011). Spatial and Social Development Trends of Metropolitan Vienna: An Overview. In V. Szirmai (Ed.), *Urban sprawl in* (pp. 107–137). EuropeAula Publishing.
- Gumma, M. K., Irshad, M., Nedumaran, S., Whitbread, A., & Lagerkvist, C. J. (2017). Urban sprawl and adverse impacts on agricultural land: A case study on hyderabad, India. *Remote Sensing*, 9, 1136. <https://doi.org/10.3390/RS9111136>
- Gutzler, C., Helming, K., Balla, D., Dannowski, R., Deumlich, D., Glemnitz, M., Knierim, A., Mirschel, W., Nendel, C., & Paul, C. (2015). Agricultural land use changes - a scenario-based sustainability impact assessment for Brandenburg, Germany. *Ecological Indicators*, 48, 505–517. <https://doi.org/10.1016/j.ecolind.2014.09.004>
- Hardi, T., Repaská, G., Veselovský, J., & Vilinová, K. (2020). Environmental consequences of the urban sprawl in the suburban zone of Nitra: An analysis based on landcover data. *Geographica Pannonica*, 3, 205–220. <https://doi.org/10.5937/gp24-25543>
- Hardi, T. (2022). Differences and similarities in the expansion of suburban built-up areas around the different city regions of three Central European countries. *Tér és Társadalom*, 36(3), 165–193. <https://doi.org/10.17649/TET.36.3.3429>
- Hirt, S. A. (2008). Stuck in the suburbs? Gendered perspectives on living at the edge of the post-communist city. *Cities*, 25, 340–354. <https://doi.org/10.1016/j.cities.2008.09.002>
- Ianos, I., Sirodoev, I., & Pascariu, G. (2012). Land-use conflicts and environmental policies in two post-socialist urban agglomerations: Bucharest and Chişinău. *Carpathian Journal of Earth and Environmental Sciences*, 4, 125–136.
- Ioannidis, C., Psaltis, C., & Potsiou, C. (2016). Towards a strategy for control of suburban informal buildings through automatic change detection. *Computers, Environment and Urban Systems*, 1, 64–74. <https://doi.org/10.1016/j.compenvurbansys.2008.09.010>
- Iváncsics, V., & Filepné Kovács, K. (2021). Analyses of new artificial surfaces in the catchment area of 12 Hungarian middle-sized towns between 1990 and 2018. *Land Use Policy*, 109. <https://doi.org/10.1016/j.landusepol.2021.105644>. Article 105644.
- Izakovičová, Z., Mederly, P., & Petrovic, F. (2017). Long-term land use changes driven by urbanisation and their environmental effects example of trnava city, Slovakia. *Sustainability*, 9. <https://doi.org/10.3390/su9091553>. Article 1553.
- Jávor, I., & Jancsics, D. (2016). The role of power in organizational corruption: An empirical study. *Administration & Society*, 5, 527–558. <https://doi.org/10.1177/0095399713514845>
- Keil, R. (2020). After Suburbia: Research and action in the suburban century. *Urban Geography*, 41(1), 1–20. <https://doi.org/10.1080/02723638.2018.1548828>
- Kindel, G., & Raagmaa, G. (2015). Recreational home owners in the leadership and governance of peripheral recreational communities. *Hungarian Geographical Bulletin*, 3, 233–245. <https://doi.org/10.15201/hungebull.64.3.6>
- Kovács, Z., Farkas, J. Z., Egedy, T., Kondor, A. C., Szabó, B., Lennert, J., Baka, D., & Kohán, B. (2019). Urban sprawl and land conversion in post-socialist cities: The case of metropolitan Budapest. *Cities*, 92, 71–81. <https://doi.org/10.1016/j.cities.2019.03.018>
- Kubeš, J. (2013). European post-socialist cities and their near hinterland in intra-urban geography literature. *Bulletin of Geography. Socio-economic Series*, 19, 19–43. <https://doi.org/10.2478/bog-2013-0002>
- Kubeš, J., & Nováček, A. (2019). Suburbs around the Czech provincial city of České Budějovice – territorial arrangement and problems. *Hungarian Geographical Bulletin*, 1, 65–78. <https://doi.org/10.15201/hungebull.68.1.5>
- Kukulska-Koziel, A., Szytar, M., Cegielska, K., Noszczyk, T., Hernik, J., Gawroński, K., Dixon-Gough, R., Jombach, S., Valánszki, I., & Filepné Kovács, K. (2019). Towards three decades of spatial development transformation in two contrasting post-Soviet cities—kraków and Budapest. *Land Use Policy*, 85, 328–339. <https://doi.org/10.1016/j.landusepol.2019.03.033>
- Leetmaa, K., & Tammaru, T. (2007). Suburbanization in countries in transition: Destinations of suburbanizers in the tallinn metropolitan area. *Geografiska Annaler: Series B, Human Geography*, 2, 127–146. <https://doi.org/10.1111/j.1468-0467.2007.00244.x>
- Lennert, J., Farkas, J. Z., Kovács, A. D., Molnár, A., Módos, R., Baka, D., & Kovács, Z. (2020). Measuring and predicting long-term land cover changes in the functional urban area of budapest. *Sustainability*, 12(2020), Article 3331. <https://doi.org/10.3390/su12083331>
- Lisowski, A., Mantey, D., & Wilk, W. (2014). Lessons from Warsaw: the lack of coordinated planning and its impacts on urban sprawl. In K. Stanilov, & L. Sýkora (Eds.), *Confronting suburbanization: Urban decentralization in post-socialist central and eastern Europe* (pp. 225–255). Wiley-Blackwell. <https://doi.org/10.1186/s40984-016-0022-2>.
- Marsden, T., & Sonnino, R. (2012). Human health and wellbeing and the sustainability of urban–regional food systems. *Current Opinion in Environmental Sustainability*, 4, 427–430. <https://doi.org/10.1016/j.cust.2012.09.004>
- Mihai, F. C. (2018). Waste collection in rural communities: Challenges under eu regulations. A case study of neamt county, Romania. *Journal of Material Cycles and Waste Management*, 20, 1337–1347. <https://doi.org/10.1007/s10163-017-0637-x>
- Mikle, G. (2020). Long-term transformation of Hungarian manors: The relevance of the rural restructuring approach and the concept of the precariat. *Journal of Rural Studies*, 77, 105–112. <https://doi.org/10.1016/j.jrurstud.2020.05.003>
- Ott, T. (2001). From concentration to deconcentration. Migration patterns in the post-socialist city. *Cities*, 6, 403–412. <https://doi.org/10.1016/S0264-27510100032-4>
- Ouredníček, M. (2007). Differential suburban development in the Prague urban region. *Geografiska Annaler, B Human Geography*, 2, 111–126. <https://doi.org/10.1111/j.1468-0467.2007.00243.x>
- Petrovič, F., & Petrikovičová, L. (2021). Landscape transformation of small rural settlements with dispersed type of settlement in Slovakia. *European Countryside*, 13(2), 455–478. <https://doi.org/10.2478/euco-2021-0027>
- Pourtaherian, P., & Jaeger, J. A. G. (2022). How effective are greenbelts at mitigating urban sprawl? A comparative study of 60 European cities. *Landscape and Urban Planning*, 227, Article 104532. <https://doi.org/10.1016/j.landurbplan.2022.104532>
- Ravetz, J., Fertner, C., & Nielsen, T. S. (2013). The dynamics of peri-urbanization. In K. Nilsson, S. Pauliet, S. Bell, C. Aalbers, & T. A. Sick Nielsen (Eds.), *Peri-urban futures: Scenarios and models for land use change in Europe* (pp. 13–44). Heidelberg, Germany: Springer Verlag.
- Roose, A., Kull, A., Gauk, M., & Tali, T. (2013). Land use policy shocks in the post-communist urban fringe. A case study of Estonia. *Land Use Policy*, 30, 76–83. <https://doi.org/10.1016/j.landusepol.2012.02.008>

- Rosu, L., & Banica, A. (2018). Passenger car dependency and consequent air pollutants emissions in Iasi metropolitan area Romania. *Environmental Engineering and Management Journal*, 4, 865–875. <https://doi.org/10.30638/eemj.2018.087>
- Sadowy, K., & Lisiecki, A. (2019). Post-industrial, post-socialist or new productive city? Case study of the spatial and functional change of the chosen Warsaw industrial sites after 1989. *City Territ Archit*, 6, 4. <https://doi.org/10.1186/s40410-019-0103-2>
- Shkaruba, A., Kireyeu, V., & Likhacheva, O. (2017). Rural–urban peripheries under socioeconomic transitions: Changing planning contexts, lasting legacies, and growing pressure. *Landscape and Urban Planning*, 165, 244–255. <https://doi.org/10.1016/j.landurbplan.2016.05.006>
- Shkaruba, A., Skryhan, H., Likhacheva, O., Kireyeu, V., Katona, A., Shyrokostup, S., & Sepp, K. (2021). Environmental drivers and sustainable transition of dachas in Eastern Europe: An analytical overview. *Land Use Policy*, 100. <https://doi.org/10.1016/j.landusepol.2020.104887>. Article 104887.
- Slaev, A. D., Nedović-Budić, Z., Krunić, N., Petrić, J., & Daskalova, D. (2018). Suburbanization and sprawl in post-socialist belgrade and sofia. *European Planning Studies*, 26(7), 1389–1412. <https://doi.org/10.1080/09654313.2018.1465530>
- Spórna, T., & Krzysztofik, R. (2020). 'Inner' suburbanization. Background of the phenomenon in a polycentric, post-socialist and post-industrial region. Example from the Katowice conurbation, Poland. *Cities*, 104, Article 102789. <https://doi.org/10.1016/j.cities.2020.102789>
- Stoica, I.-V., Zamfir, D., & Virghileanu, M. (2021). Evaluating the territorial impact of built-up area expansion in the surroundings of bucharest (Romania) through a multilevel approach based on landsat satellite imagery. *Remote Sensing*, 13, 3969.
- Sýkora, L., & Bouzarovski, S. (2011). Multiple transformations. Conceptualising the post-communist urban transition. *Urban Studies*, 1, 43–60. <https://doi.org/10.1177/0042098010397402>
- Szmytkie, R. (2021). Suburbanisation processes within and outside the city: The development of intra-urban suburbs in Wrocław, Poland. *Moravian Geographical Reports*, 29(2), 149–165. <https://doi.org/10.2478/mgr-2021-0012>
- Tammaru, T. (2001). Suburban growth and suburbanisation under central planning. The case of Soviet Estonia. *Urban Studies*, 38, 1314–1357. <https://doi.org/10.1080/00420980120061061>
- Taranu, V., & Verbeeck, G. (2022). Property tax as a policy against urban sprawl. *Land Use Policy*, 122, Article 106335. <https://doi.org/10.1016/j.landusepol.2022.106335>
- Teuber, S., Schmidt, K., Kühn, P., & Scholten, T. (2019). Engaging with urban green spaces – a comparison of urban and rural allotment gardens in Southwestern Germany. *Urban Forestry and Urban Greening*, 43. <https://doi.org/10.1016/j.ufug.2019.126381>. article 126381.
- Timár, J., & Váradi, M. M. (2001). The uneven development of suburbanisation during transition in Hungary. *European Urban and Regional Studies*, 4, 349–360. <https://doi.org/10.1177/096977640100800407>
- Toşa, C., Mitrea, A., Sato, H., Miwa, T., & Morikawa, T. (2018). Economic growth and urban metamorphosis. *Journal of Transport and Land Use*, 11(1), 273–295. <https://doi.org/10.5198/JTLU.2018.1242>
- Ungureanu, T., & Voloacă, G. (2019). Mass housing neighbourhoods in Romania through the lens of healthy urbanism. In M. Benkő (Ed.), *Proceedings of the facing post-socialist urban heritage* (pp. 90–118). Budapest, Hungary: BME Department of Urban Planning and Design.
- Varjú, V. (2020). Environmental policy integration and its success on settlement level in Hungary. *DETUROPE: Central European Journal of Tourism and Regional Development*, 3, 13–36.
- Vasárus, G., Bajmócy, P., & Lennert, J. (2018). In the shadow of the City: Demographic processes and emerging conflicts in the rural-urban fringe of the Hungarian agglomerations. *Geographica Pannonica*, 22(1), 14–29. <https://doi.org/10.5937/22-16572>
- Vasárus, G. L., & Lennert, J. (2022). Suburbanization within city limits in Hungary—a challenge for environmental and social sustainability. *Sustainability*, 14(14), 8855. <https://doi.org/10.3390/su14148855>
- Zanfi, F., Merlini, C., & Giavarini, V. (2020). A portrait of Italian 'family houses': Diversified heritage in a redefined territorial and demographic context. *City Territ Archit*, 7, 20. <https://doi.org/10.1186/s40410-020-00125-8>

Other resources:

Council proposal 25.163/1973 of Municipality of Győr. (1973). *Photocopy of the manuscript*.

Nr. 9112/60 proposal about the waste collection in Győrszentiván district. (2012). *Győr municipality, photocopy of the document, property of Madarász, T.*

Detailed Gazeteer, www.ksh.hu/apps/hntr.main (4/April/2024).