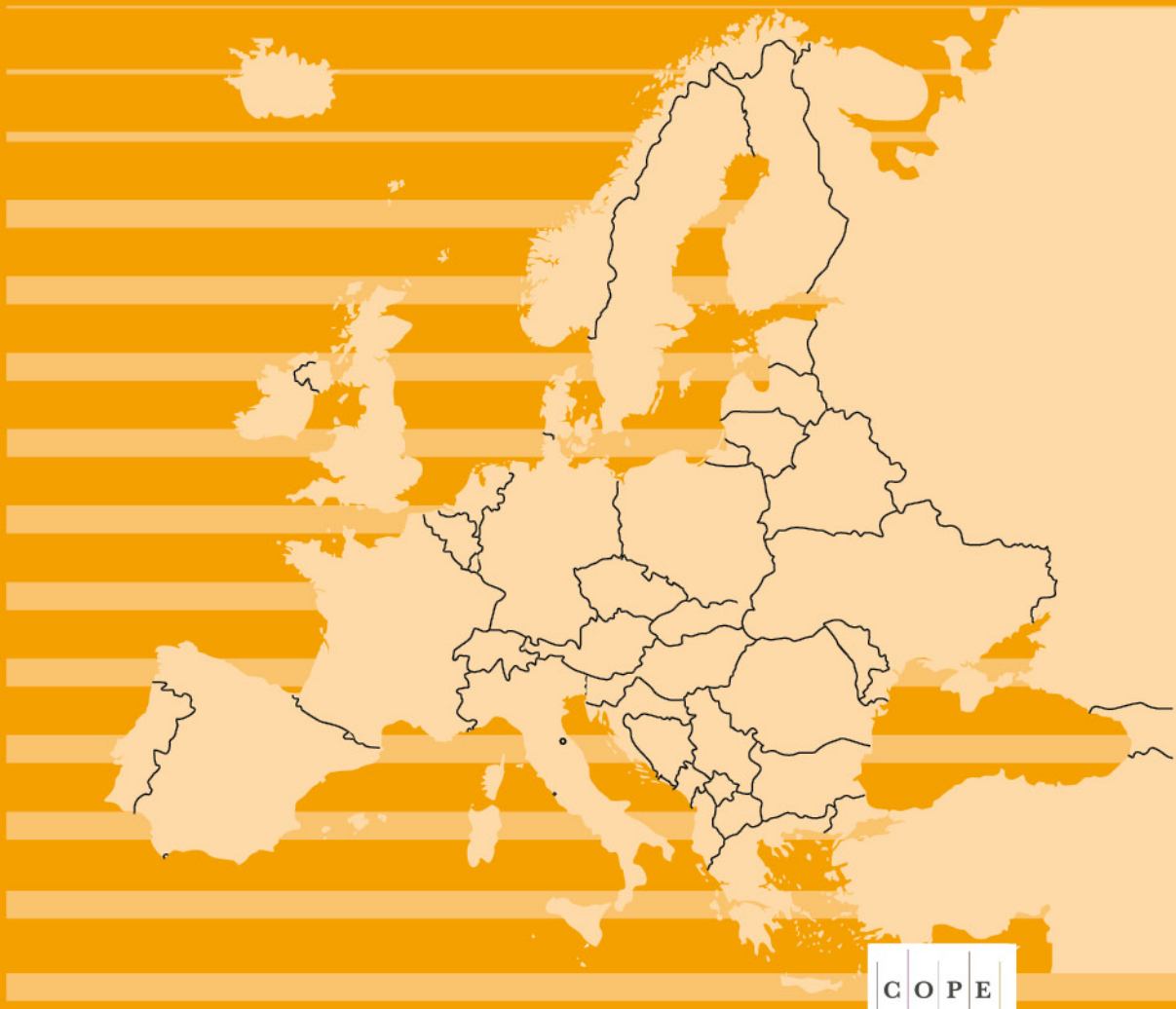
Interdisciplinary Studies on Environment, Society and Economy

Volume 33
No. 1/2026

European Spatial Research and Policy



European Spatial Research and Policy

Volume 33, No. 1
2026

Member since 2018
JM13710

EUROPEAN SPATIAL RESEARCH and POLICY

Published by Lodz University Press
Publisher's sheets 15.9; printing sheets 17.375
W.12061.26.0.C
ISSN 1231-1952
e-ISSN 1896-1525

Lodz University Press
90-237 Łódź, ul. Jana Matejki 34A
www.wydawnictwo.uni.lodz.pl
e-mail: ksiegarnia@uni.lodz.pl
tel. (42) 635 55 77

COPE
Member since 2018
JM13710

EUROPEAN SPATIAL RESEARCH AND POLICY

Volume 33 2026 Number 1

CONTENTS

ARTICLES

REVIEW ARTICLES

BOOK REVIEW

Articles

Member since 2018
JM13710

EUROPEAN SPATIAL RESEARCH AND POLICY

Volume 33 2026 Number 1

https://doi.org/10.18778/1231-1952.33.1.07

Peter LEŠKO [*], **Eva MUCHOVÁ** [**], **Radka LEŠKOVÁ** [**]

EU COHESION POLICY AND REGIONAL CLUB CLUSTERING: A COMPARATIVE ANALYSIS OF NUTS2 REGIONS IN EUROPE

Abstract. This paper assesses territorial cohesion in the EU by examining whether 242 NUTS2 regions converge to a common steady state or form distinct convergence clubs. Using regional GDP per capita data for 2000–2022 and EU Cohesion Policy payments per capita for 2000–2020, we estimate absolute and conditional β-convergence models and apply k-means clustering based on initial income, growth performance, and funding intensity. The results indicate aggregate convergence, but a strongly uneven spatial pattern: regions group into three convergence clubs with different development trajectories. While some initially poorer regions exhibit strong catching-up, other clusters show weak or very slow convergence despite substantial funding. These findings support the Club Convergence hypothesis and underline the need for more place-based cohesion interventions tailored to regional structural conditions.

Key words: EU, territorial cohesion, club clustering, EU NUTS2 region.

[*] Peter LEŠKO, Bratislava University of Economics and Business, Faculty of Economics and Finance, Department of Economics, Dolnozemská cesta 1, 852 35 Bratislava, Slovakia; Ministry of Investments, Regional Development and Informatization of the Slovak Republic, Institute of Digital and Regional Policies, Pribinova 25, 811 09 Bratislava, Slovakia; e-mail: peter.lesko@euba.sk, ORCID: https://orcid.org/0000-0002-3240-6721

[**] Eva MUCHOVÁ, Radka LEŠKOVÁ, Bratislava University of Economics and Business, Faculty of Economics and Finance, Department of Economics, Dolnozemská cesta 1, 852 35 Bratislava, Slovakia; e-mails: eva.muchova@euba.sk, radka.leskova@euba.sk, ORCIDs: https://orcid.org/0000-0001-9758-5313, https://orcid.org/0000-0002-2192-9316

Received: 11.11.2025, Revised: 26.01.2026, Accepted: 27.01.2026

Funding information: The Authors declare that the research presented in the text of the article was financed by the Scientific Grant Agency [VEGA No. 1/0679/23] and Cultural and Educational Grant Agency [KEGA No. 033EU-4/2024]. **Conflicts of interests:** None. **Ethical considerations:** The Authors assure no violations of publication ethics and take full responsibility for the content of the publication. **The percentage share of the Author in the preparation of the work is:** P.L. 33%, E.M. 33%, R.L. 33%. **Declaration regarding the use of GAI tools:** The Authors hereby declare that they used ChatGPT for minor text corrections (grammar and stylistic improvements). The tool was used only to refine language clarity without generating substantive content. The Author then carried out a thorough and critical review of the text, with particular attention to potential false, incomplete, or biased information, possible plagiarism or lack of proper/accurate authorship attribution and revised it accordingly.

1. INTRODUCTION

Territorial cohesion is a fundamental concept within the Cohesion Policy, implemented through structural and investment funds. During the 2014–2020 programming period, over 400 billion € was allocated, and a further 392 billion € is earmarked for 2021–2027. When national co-financing is included, the total financial envelope reaches nearly half a trillion euros (Cohesion Open Data Platform, 2024). Cohesion Policy accounts for roughly one-third of the total EU budget, with EU funds representing up to 13% of total public investment across the EU and more than 50% in less developed Member States (Ninth Cohesion Report, 2024). Since 2014, the European Commission introduced the Smart Specialisation (S3) concept as an ex-ante conditionality for accessing EU funds has marked a shift toward a more place-based, innovation-oriented regional development paradigm. The S3 framework rests on principles of entrepreneurial discovery, regional prioritisation, and bottom-up governance (Foray *et al.*, 2011) and has since become a cornerstone of EU innovation policy.

Despite these efforts, significant inequalities persist, particularly between core and peripheral regions, metropolitan and rural territories, and more and less developed Member States. The evidence from the Cohesion Report (2024) suggests that while Cohesion Policy has played a key role in supporting growth and investment, especially in areas aligned with the green and digital transitions, the overall process of convergence remains uneven and subject to structural and spatial heterogeneity.

Although regional convergence has been extensively examined in the empirical literature, most studies focus on national or highly aggregated regional levels, often relying on average convergence measures. As highlighted in previous research (Bartkowska and Riedl, 2009; Artelaris *et al.*, 2010; Crescenzi and Giua, 2020), such approaches may mask substantial within-country disparities and overlook heterogeneous regional development paths, particularly at the NUTS2 level, which is the primary territorial unit for the design and implementation of EU Cohesion Policy.

The objective of this study is to examine regional convergence patterns across EU NUTS2 regions by identifying potential convergence clubs and assessing how structural characteristics and spatial typologies shape heterogeneous development trajectories. By doing so, the paper aims to provide an empirically grounded interpretation of territorial cohesion and to contribute to the evaluation of EU Cohesion Policy in the context of persistent regional disparities. To achieve this objective, the study addresses the following research questions: (i) whether EU NUTS2 regions converge towards a single steady state or instead form convergence clubs; (ii) how structural characteristics influence the formation and dynamics of these regional convergence clubs; and (iii) what the observed convergence patterns imply for territorial cohesion and the effectiveness of future EU Cohesion Policy.

Methodologically, the analysis applies a club convergence framework at the NUTS2 level and compares the resulting convergence clubs with the official EU classification of regions. By confronting the outcomes of the applied cluster analysis with the existing EU regional categorisation, the study aims to assess the extent to which empirically identified convergence patterns correspond to the current policy-based regional typologies. This comparison provides an additional layer of insight into the adequacy of the official regional classification for capturing underlying development dynamics.

This perspective challenges the traditional assumption of unconditional convergence and emphasises the role of structural and spatial heterogeneity in shaping development trajectories. The advantage of this approach lies in its ability to identify groups of regions that follow similar development trajectories despite operating within the same institutional framework. By uncovering latent convergence patterns at the NUTS2 level, the analysis provides more policy-relevant insights into persistent regional disparities and allows for a more nuanced understanding of how structural conditions and spatial context influence convergence outcomes. Our findings may offer new perspectives on the regional classification for the distribution of EU resources and contribute to the understanding of the role of the post-2027 EU Cohesion Policy framework.

The paper is structured into four main sections, along with an introduction and a conclusion. Section 2 outlines the theoretical background and reviews recent literature addressing regional convergence and EU Cohesion Policy. Section 3 describes the methodology and data used in the empirical analysis. Section 4 presents the empirical findings, while Section 5 discusses patterns of convergence and regional clustering and their policy relevance. The final section offers policy recommendations and reflections on the future of EU territorial cohesion.

2. LITERATURE REVIEW

Territorial cohesion has been included for the first time in the Lisbon Treaty. Article 174 of *the Treaty on the Functioning of the EU* defines the strengthening of economic, social, and territorial cohesion as a prerequisite for harmonious development, with a particular focus on reducing disparities between regions, especially the least developed ones (European Commission, 2024). This vision is further elaborated in the Territorial Agenda 2030, which emphasizes inclusive and sustainable development, spatial justice, functional regions, and place-sensitive, multi-level governance. In this context, territorial cohesion explicitly integrates the spatial dimension into EU development policy and recognises regional diversity as a key asset.

Numerous studies have examined the impact of EU Cohesion Policy on regional development, often highlighting positive but uneven effects. The Ninth Cohesion Report (2024) estimates that GDP in several less developed regions could be 10–13% higher by 2030 due to Cohesion Policy interventions. Fiaschi *et al.* (2017) have provided evidence of a significant positive impact of EU funds on regional economic growth, particularly in poorer regions, with notable spatial spillover effects. However, as emphasised by Hager and Mohl (2011), empirical findings on growth and convergence effects remain mixed. Recent evidence suggests that short-term fiscal multipliers of EU-funded investments are generally below one (World Bank, 2024), and that funding intensity alone does not necessarily translate into stronger economic or political outcomes without appropriate timing and governance (López-Bazo, 2022).

Recent empirical research consistently shows that the impacts of EU Cohesion Policy vary significantly across territories. Crescenzi and Giua (2020) have demonstrated that the growth effects of EU funds differ substantially across Member States and tend to materialise only over time, highlighting the delayed nature of returns on structural investments. At the regional level, Bachtrögler *et al.* (2020) have emphasized the importance of local context, showing that EU support is more strongly associated with gains in employment and value added than with productivity, particularly in less developed regions with weaker territorial assets. Taken together, these findings underscore the need for a place-based and territorially sensitive approach to EU Cohesion Policy.

While territorial cohesion occupies a central place in EU policy, its conceptual ambiguity and analytical complexity continue to pose a challenge for empirical research. As noted by Medeiros (2016), there is no universally accepted definition of territorial cohesion, and interpretations vary significantly across policy, academic, and geographic contexts. Nonetheless, four key dimensions are typically emphasised in the literature: reducing socioeconomic imbalances; promoting environmental sustainability; improving the territorial cooperation/governance processes and establishing a more polycentric urban system.

In this study, territorial cohesion is understood as the extent to which regional development paths across EU territories become more balanced over time, taking structural and spatial differences into account. Territorial cohesion is examined through regional convergence patterns at the NUTS2 level, where the identification of convergence clubs reflects persistent territorial heterogeneity. By linking these convergence patterns to structural characteristics and spatial typologies, the concept is used as an analytical tool rather than only as a rhetorical framework.

Regional convergence can be assessed through various methodological approaches. In the economic literature, income convergence is typically categorized into two main concepts: unconditional (Solow, 1956) and conditional β-convergence (Barro and Sala-i-Martin, 1991). Building on the concept of conditional convergence, the club convergence hypothesis extends the analysis by allowing

for the existence of distinct groups of economies that converge towards different steady states. Regions with similar structural characteristics and initial conditions are expected to follow comparable development paths, forming the so-called convergence clubs. While the distinction between conditional and club convergence can be empirically challenging, a growing body of literature has provided evidence of club convergence among EU regions (Bartkowska and Riedl, 2009; Artelaris *et al.*, 2010; Cavallaro and Villani, 2021; Harb *et al.*, 2024; Solanes *et al.*, 2024).

Empirical studies have identified heterogeneous convergence patterns at the regional level, indicating that EU regions do not converge uniformly but rather cluster into groups with distinct growth trajectories shaped by structural and institutional factors. For instance, Bartkowska and Riedl (2009) found no evidence of overall income convergence among EU NUTS2 regions over the period 1990–2005; instead, they identified five distinct convergence clubs, each characterised by a different steady-state income path. Their results highlight the strong role of geography, as regions within the same country and capital city areas tend to cluster together. This spatial concentration is attributed to agglomeration effects and knowledge spillovers, providing empirical support for the club convergence hypothesis and underscoring the importance of initial conditions in shaping long-run income disparities in Europe.

Further empirical evidence is provided by Artelaris *et al.* (2010), who show that convergence processes in Europe tend to occur within groups of regions sharing similar structural characteristics, levels of development, and initial conditions, rather than uniformly across all regions. Their findings also point to mixed outcomes of EU Cohesion Policy: while EU funding has supported growth in some lagging regions, it has not been sufficient to eliminate persistent structural disparities. The authors, therefore, have emphasised the need for more targeted and region-specific policy interventions.

Convergence clubs have also been examined within the Eurozone, as shown by Solanes, Beyaert and Lopez-Gomez (2024), who analysed income convergence among Eurozone countries over the period 1995–2021 using Phillips–Sul club convergence tests. Their results reject overall convergence in GDP per capita across the Eurozone and instead identify three distinct convergence clubs with persistent disparities both between and within these groups, challenging the traditional core–periphery division commonly assumed in the literature. The study further shows that differences in long-run income levels across these clubs are largely driven by structural growth determinants – such as labour productivity, physical and human capital, investment and international trade – indicating that structural heterogeneity significantly shapes divergent development paths within the Eurozone.

More recent studies have examined the determinants and composition of convergence clubs in greater detail. Cavallaro and Villani (2021) have demonstrated that club membership is strongly influenced by factors such as initial income levels, human capital endowment, economic structure, and geographic proximity, using

a combination of econometric and clustering techniques. Similarly, Harb *et al.* (2024) have provided robust evidence of club convergence in total factor productivity across EU NUTS regions, revealing a clear spatial pattern in which high-performing regions are predominantly located in northern and western Europe, while low-performing regions are concentrated in southern Europe. Their results also highlight a 'productivity trap' affecting several Greek and Italian regions, in contrast to strong productivity gains observed in some regions of newer EU Member States, such as Poland, which have been narrowing the gap with the EU average.

3. DATA AND METHODOLOGY

This section provides a detailed description of the data sources, variables selected for quantitative analysis, and the statistical techniques employed to ensure reliable research results. The study uses the latest cross-sectional data at the regional NUTS2 level for the year 2022. The choice of 2022 as the reference year is based on the availability of sufficiently complete and comparable regional data at the NUTS2 level across EU Member States. Moreover, 2022 represents the most recent year with consistent reporting of key indicators and reflects a partial stabilisation of regional dynamics following the disruptions caused by the COVID-19 pandemic.

Given the pronounced volatility observed in many economic and social indicators during the 2020–2021 period, the use of 2022 data has helped to limit potential distortions associated with short-term pandemic shocks, while still capturing their medium-term territorial implications. Nevertheless, we explicitly acknowledge that some residual COVID-19 effects may persist in selected variables, and this limitation is considered when interpreting the empirical results.

The data were obtained from the European Commission, particularly the Cohesion Open Data Platform, Eurostat, and EDGAR, complemented by the authors' own calculations. Missing data at the regional level were limited and were handled using standard data-cleaning procedures to preserve the internal consistency of the dataset, ensuring that only regions with sufficient data coverage were included in the final analysis.

3.1. Territorial units and data description

In the European Union, territorial typologies are primarily defined by administrative boundaries. To reference countries' regions for statistical purposes, the EU has developed a classification known as Nomenclature of territorial units for statistics (NUTS). This methodology categorises each EU country into three levels: NUTS1, which represent major socio-economic regions; NUTS2, which are the

basic regions used for regional policies; and NUTS3, which are smaller, more localised regions (Eurostat, 2024).

According to Article 108 of Regulation (EU) 2021/1060 of the European Parliament and of the Council, EU resources shall be allocated among the following three categories of NUTS level 2 regions: *less developed regions*, whose GDP per capita is less than 75% of the average GDP per capita of the EU27; *transition regions*, whose GDP per capita is between 75% and 100% of the average GDP per capita of the EU27; and *more developed regions*, whose GDP per capita is above 100% of the average GDP per capita of the EU27.

Table 1. Distribution of NUTS2 regions in the statistical sample

Type of regions	Absolute frequency	Relative frequency [%]	GDP per capita in PPS (2022) [€]
Less developed regions	83	34.30	21,807
Transition regions	69	28.51	30,928
More developed regions	90	37.19	46,692
EU27	**242**	**100.0**	**35,400**

Note: Regulation (EU) 2021/1060 of the European Parliament and of the Council, which governs the distribution of EU resources based on the three categories of NUTS2 regions.

Sources: Eurostat and own work.

Table 1 provides an overview of the categorisation of EU regions at NUTS 2 level based on their GDP per capita, relative to the EU27 average in 2022. The dataset covers 242 regions, grouped into three categories: 83 less developed regions (34.30% of the sample) with an average GDP per capita of 21,807 €; 69 transition regions (28.51%) averaging 30,928 €; and 90 more developed regions (37.19%) with a GDP per capita of 46,692 €, approximately double that of the less developed group. For reference, the EU27 average GDP per capita was 35,400 €.

Table 2. Summary statistics

Variable	Unit of measure	Obser.	Mean	Standard deviation	Min.	Max.
GDP per capita, 2022	PPS	242	33,662.40	13,257.28	10,600	101,200
GDP per capita, 2000	PPS	242	17,701.65	7,905.04	3,400	51,400
EU Payments per capita (period 2000-2020)	EUR/capita	241	2634.28	2494.91	171.86	18,419.68

Table 2 (cont.)

Variable	Unit of measure	Obser.	Mean	Standard deviation	Min.	Max.
Real Labour Productivity per person	index, 2015=100	223	105.85	13.27	18.9	162.4
Employment Rate	%	242	69.91	8.61	32.2	84.6
Educational Level (share of higher education)	%	242	33.15	10.35	13.7	62.1
Gross Fixed Capital Formation	% of GDP	242	21.96	4.71	9.44	44.56
GHG Emissions per capita	ton/capita	237	8.527	4.825	1.435	37.432

Note: PPS – Purchasing Power Standard, GHG Emissions – Greenhouse Gas Emissions.

Sources: European Commission, Eurostat, Edgar.

Table 2 shows the summary statistics for selected economic and social indicators measured across NUTS2 regions. The variables include GDP per capita in 2022 and 2000 (measuring in PPS); EU payments per capita covering the period 2000–2020; real labour productivity per person; employment rate (of the age group 15–64); share of the population with higher education (tertiary educational attainment, age group 25–64); gross fixed capital formation and greenhouse gas (GHG) emissions per capita. The descriptive statistics underline the substantial variation across NUTS2 regions, with GDP per capita in 2022 ranging from 10,600 € to 101,200 €, and EU sources reported per capita varying between 171 € and 18,419 €. Such variation is crucial for empirical analysis, as it illustrates the heterogeneity in economic performance.

3.2. Model specification with complementary indicators

The literature on the convergence of income levels (e.g., GDP per capita) distinguishes between unconditional and conditional convergence. The long-run convergence occurs when countries with lower income levels grow faster than countries with higher income levels (Mankiw, 2022). In such cases, we refer to absolute convergence, which reflects the relationship between economic growth and the level of GDP per capita.

Unconditional (absolute) β-convergence can be tested using the following specification:

$$\Delta \ln(y_i) = \beta_0 + \beta_1 \ln(y_{i,0}) + \varepsilon_i \quad (1)$$

where $y_{i,t}$ denotes real GDP per capita of region i at time t; $y_{i,0}$ is the initial real GDP per capita of region i; β_0 represents the steady-state constant; β_1 is the convergence coefficient, which is expected to be negative if convergence is present; and ε_i is the error term.

Conditional β-convergence extends the baseline model by incorporating additional control variables that capture structural differences among regions (Barro and Sala-i-Martin, 1991).

The extended model can be specified as:

$$\Delta \ln(y_i) = \beta_0 + \beta_1 \ln(y_{i,0}) + \Sigma \gamma_k X_{ik} + \Sigma \delta_j D_{ij} + \varepsilon_i \quad (2)$$

where $\Delta ln(y_i)$ represents the growth rate of GDP per capita for region i over the selected period; X_{ik} denotes the k structural (control) variables for region i influencing growth, γ_k are their corresponding coefficients; D_{ij} are dummy variables capturing categorical effects (typology of regions according to the Commission, etc.) with δ_j as their coefficients and ε_i is the error term.

In this study, the speed of convergence and the half-life of convergence are applied as complementary indicators that quantify the process of income equalization across EU regions.

The speed of convergence (λ) is derived from the estimated regression coefficient. Following the standard formulation, the relationship is expressed as:

$$\lambda = -\frac{1}{T} \ln(1 + \beta) \quad (3)$$

where T denotes the number of years between the initial and final periods and β is the estimated coefficient from the regression of income growth on the initial income level.

The half-life of convergence ($T_{1/2}$) measures the number of years required for income disparities between regions to be reduced by one-half. It is calculated as:

$$T_{1/2} = \frac{\ln(2)}{\lambda} \quad (4)$$

where λ characterises the dynamics of the convergence process in the region.

In addition to the convergence regressions, the study applies clustering analysis to uncover potential convergence patterns among EU regions with respect to their economic performance. The clustering technique was implemented using the k-means clustering procedure, which partitions the sample into a predefined number of groups by minimizing within-cluster variance while maximising between-cluster differences. The choice of three clusters was supported both by statistical criteria (elbow method and silhouette analysis) and by economic reasoning, ensuring interpretability of the

results. K-means clustering is appropriate for this type of analysis, as it allows EU regions to be classified based on multiple dimensions simultaneously. In our case, the initial level of GDP per capita, the volume of EU payments per capita and the subsequent growth performance over the period 2000–2022. Empirical literature confirms that this approach enables a more precise assessment of regional heterogeneity.

3.3. Limitations

Several methodological limitations should be acknowledged. First, the analysis does not explicitly model spatial interdependencies among NUTS2 regions. Regional growth, labour market outcomes, and human capital formation may exhibit spatial dependence, and developments in one region can affect neighbouring territories through migration and commuting flows, trade linkages, and knowledge diffusion. As a result, part of the observed convergence dynamics may reflect spillover mechanisms that are not directly captured in the empirical specification.

Second, the study does not employ spatial econometric techniques, such as models accounting for spatial autocorrelation or spatial lag structures. Incorporating such approaches could improve the robustness of the estimates in a regional setting by explicitly modelling geographic dependence in growth processes. While the current framework identifies heterogeneous convergence patterns through β-convergence regressions and k-means clustering, future research could complement this approach with spatial econometric methods to strengthen the spatial dimension of the analysis and provide a more comprehensive assessment of EU convergence dynamics.

4. EMPIRICAL FINDINGS

4.1. The Role of EU Cohesion Policy in reducing disparities

The standard of living in the EU regions at the NUTS2 level is diverse. These inequalities are primarily related to the distribution of income and wealth, which depends on the economic and social structure of the region. Although regional disparities are a natural phenomenon, their widening can have a negative impact on the future development of the economy.

The catch-up of living standards is assessed by comparing regional GDP per capita levels to the EU27 average. Therefore, GDP per capita has been established as the primary indicator for the allocation of EU financial resources (Regulation 2021/1060 of the EP and of the Council). Figure 1 illustrates the regional inequalities among EU regions at the NUTS2 level in 2022, where individual regions are compared with the EU27 average, which is set at a value of 100.

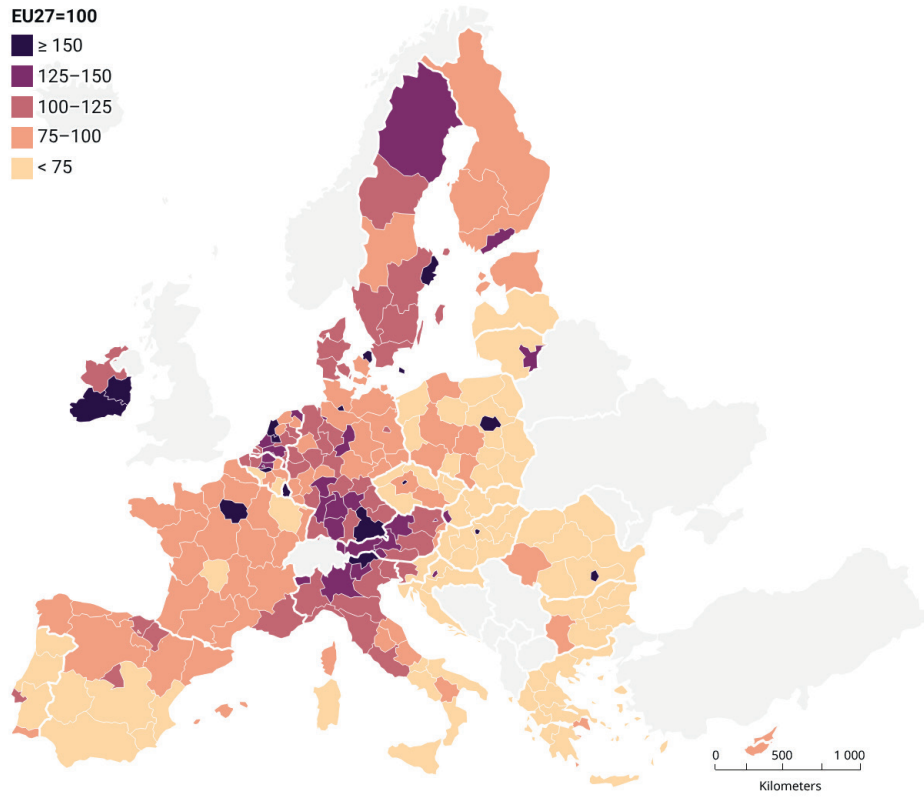


Fig. 1. Regional inequalities in EU27 (GDP per capita in PPP, NUTS2, 2022)
Source: Eurostat.

In 2022, 148 of the observed 242 regions achieved a level of GDP per capita below the EU27 average. Put differently, more than two-thirds of EU regions at the NUTS2 level (61.2%) have a significantly lower standard of living than the European average.

The least developed regions are located in Southern Europe and Central and Eastern Europe. These are mainly regions of the new Member States that are characterised by relatively low GDP per capita or slower economic growth. The mentioned regions are situated in Spain, Italy, and Greece, as well as regions in Romania, Bulgaria, and the newer EU Member States.

Our analysis further indicates that 94 regions, representing 38.8%, report a standard of living that is equal to or above the EU27 average. The most developed regions are located in the area from northern Italy through Austria to Germany. We also include several regions in the Benelux countries, southern Ireland and Scandinavia. According to 2022 data, the southern region of Ireland emerges as

the clear leader, where the standard of living reaches 186% of the EU27 average. Unsurprisingly, metropolitan regions also rank highly, reflecting the strong concentration of economic activity and income in urban centres.

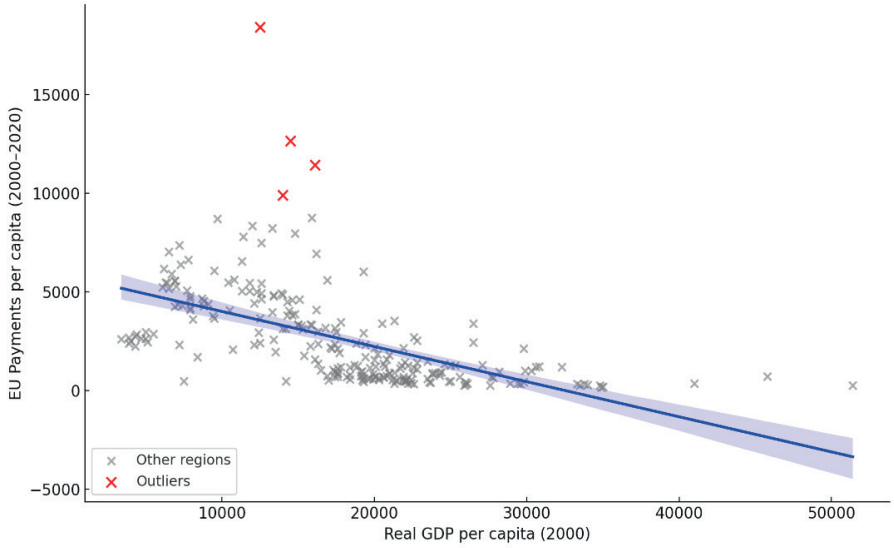


Fig. 2. EU payments and GDP per capita in NUTS2 regions
Source: European Commission, Eurostat, own calculations.

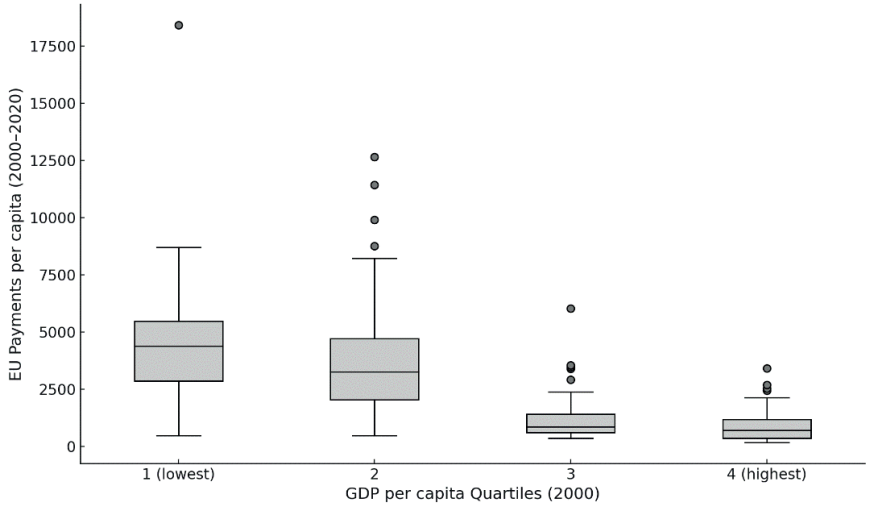


Fig. 3. EU payments per capita by GDP Quartile
Source: European Commission, Eurostat, own calculations.

Figure 2 above illustrates the relationship between real GDP per capita in 2000 and EU payments per capita from 2000 to 2020. A negative linear trend is evident – regions with lower initial GDP per capita tended to receive higher EU funding. This pattern is statistically supported by a Pearson correlation coefficient of -0.561 ($p<0.000$) and a Spearman rank correlation of -0.751 ($p<0.000$). We can see a strong inverse relationship, confirming that the EU financial support was targeted primarily at less developed regions. We also observed several extreme outlier regions: Autónoma dos Açores, Alentejo, Ciudad de Ceuta and Região Autónoma da Madeira, which significantly exceeded typical funding levels.

Furthermore, figure 3 shows the distribution of EU payments per capita from 2000 to 2020 across regions grouped by GDP per capita quartiles as of 2000. The less developed NUTS2 regions received the highest financial support, with a median payment of around 670 € per capita and several regions exceeding 900 €. These evidences underscore the strong orientation of EU cohesion policy towards promoting development in economically weaker regions.

4.2. Convergence process in the European NUTS2 regions

Territorial cohesion and economic convergence are central objectives of EU regional policy, making it essential to examine whether disparities between regions have narrowed over time. The following section presents the empirical findings concerning the convergence process across European NUTS2 regions. Table 3 summarises the estimation results for the period 2000–2022, calculated using the equations outlined above, specifically Equations (1) and (2).

Table 3. Convergence estimation for European NUTS2 regions

Variable	**Model 1 Absolute convergence (OLS method)**	**Model 2 Conditional convergence (White-robust SE)**	**Model 3 Conditional convergence (2SLS method)**
const	5.067*** (17.29)	3.366*** (5.60)	9.957*** (4.28)
$\ln(GDP_{pc,2000})$	-0.453*** (-15.07)	-0.552*** (-14.92)	-0.886*** (-6.98)
$\ln(EU\_Pay_i)$	-	-0.039** (-2.57)	-0.316*** (-3.36)
$\ln(EMPL_i)$	-	0.706*** (8.77)	0.392** (2.25)
Metropolitan (dummy)	-	0.288*** (6.67)	0.333*** (5.02)
Eurozone (dummy)	-	-0.092*** (-3.27)	-0.066 (-1.25)
R^2	0.525	0.754	0.369
Adjusted R^2	0.523	0.749	-
Obs.	242	242	242
DWH test	-	-	0.000

Table 3 (cont.)

Variable	Model 1 Absolute convergence (OLS method)	Model 2 Conditional convergence (White-robust SE)	Model 3 Conditional convergence (2SLS method)
First-stage F-stat	-	-	14.7 (p=0.000)
λ (95% CI)	0.023-0.032	0.029-0.044	0.046-0.079
$T_{1/2}$ (95% CI)	21.1-29.5	15.1-22.8	7.9-15.02

Note: ln($GDP_{pc,2000}$) - Real GDP per capita (in PPS) in 2000; ln(EU_Pay_i) - EU Payments for NUTS2 regions covering 2000-2020; ln(EMPLi) - Employment rate of the age group 15-64; Metropolitan - Dummy variable for metropolitan regions; Eurozone - Dummy variable for regions located in the eurozone; R^2 - Coefficient of determinations; Obs. - Number of observations; DWH test - Durbin-Wu-Hausman test; λ - Speed of convergence; $T_{1/2}$ - Half-life of convergence*; CI* - Confidence interval. EU Payments are treated as endogenous and instrumented using Less developed dummies (see Model 3). ***,**,* denote significance at 1%, 5% and 10% level, respectively.

Source: European Commission, Eurostat, own calculations.

We estimate the baseline absolute convergence model using ordinary least squares (OLS) method. To account for potential heteroskedasticity, we compute heteroskedasticity-robust standard errors following White (1980). This approach ensures consistent inference even when the assumption of homoscedastic residuals is violated. The regression results (Model 1) provide clear evidence of unconditional convergence among European NUTS2 regions over the last twenty years. The convergence coefficient is -0.453, statistically significant at the highest probability level. This implies that regions with lower initial GDP per capita tend to experience faster economic growth, consistent with the neoclassical convergence hypothesis. Based on the estimates, the speed of convergence is approximately 2.7% per year, with the corresponding half-life of convergence – the time required for half of the initial income gap to close – ranging between 21.1 and 29.5 years.

Model 2 reports the estimated result for conditional convergence. In this specification, additional explanatory variables were included beyond the initial GDP per capita, principally EU payments for NUTS2 regions covering 2000–2020. EU financial support is being considered because it represents a policy instrument aimed at fostering regional development, as well as reducing disparities. The convergence coefficient (-0.552) remains statistically significant and confirms the catching-up effect. In terms of structural drivers, the coefficient on EU payments is also negative and significant (-0.039), indicating that higher absorption of EU funds is correlated with weaker growth performance. The conditional convergence rate is estimated at 3.7% per year and a half-life of just under 23 years.

A closer look at the typology of regions reveals additional insights. Membership in the Eurozone is associated with slower growth (coefficient is -0.092),

which may reflect structural constraints inherent to the monetary union. Conversely, the coefficient of 0.288 (statistically significant) indicates that being classified as a metropolitan region has a strong and positive impact on development. Specifically, metropolitan regions, on average, experience a 0.29% increase the GDP per capita compared to non-metropolitan regions, assuming all other factors remain constant. According to the OECD, most European metropolitan regions achieve comparative advantage through agglomeration effects, which arise due to the concentration of economic activities and resources. The OECD underscores that these metropolitan regions will face major challenges to their success, including adverse impacts of climate change, housing affordability or public services. The need is therefore highlighted not only to reduce the differences between developed and less developed regions, but also the need for targeted territorial policies within large regions to manage their future development (OECD, 2023).

The coefficient estimate for EU payments must be interpreted with caution, as EU transfers are disproportionately directed to less developed NUTS2 regions, and the observed negative association likely reflects this endogeneity rather than a true adverse effect of cohesion policy. To address potential endogeneity of EU funds, we performed a Durbin–Wu–Hausman (DWH) test using the less developed regions dummy as an instrument for EU payments. The first-stage regression confirmed instrument relevance ($F \approx 14.7$). Based on the DWH test with a p-value below 0.001, the null hypothesis of exogeneity of EU payments is rejected, providing strong justification for preferring Model 3 (2SLS method) over the OLS estimates. The 2SLS results indicate a substantially stronger negative coefficient -0.316, consistent with the hypothesis that EU payments are disproportionately allocated to structurally weaker regions, thereby biasing OLS estimates downward. In this case, the speed of convergence is around 6.2% per year, with the corresponding half-life of convergence varying between 7.9 and 15.02 years.

4.3. Exploring Convergence Clubs across NUTS2 regions

Largely driven by the significant disparities among NUTS regions, club convergence testing has gained popularity recently. Empirical support for the existence of club-clustering in Europe has been documented in several studies already stated, including Harb *et al.* (2024), Cavallaro and Villani (2021), Artelaris *et al.* (2010), Bartkowska and Riedl (2009), and others.

This analysis aims to extend to this research by examining income convergence specifically through the Convergence Club formation. The identified convergence patterns are subsequently compared with the classification of regions established by the Article 108 of Regulation (EU) 2021/1060 of the European Parliament and of the Council, allowing for an assessment of the consistency between our empirical findings and policy-based regional groupings.

Table 4. Results for Convergence Clubs, level NUTS2

Variable	Cluster A Convergence Club 1	Cluster B Convergence Club 2	Cluster C Convergence Club 3
Number of regions	79	115	48
Initial GDP level	15,525 €	23,597 €	7,158 €
Average GDP growth by cluster	58.8%	53.8%	123.6%
EU payments	4,397 €	782 €	4,203 €
Convergence progress	weak	very slow	strong

Source: own work.

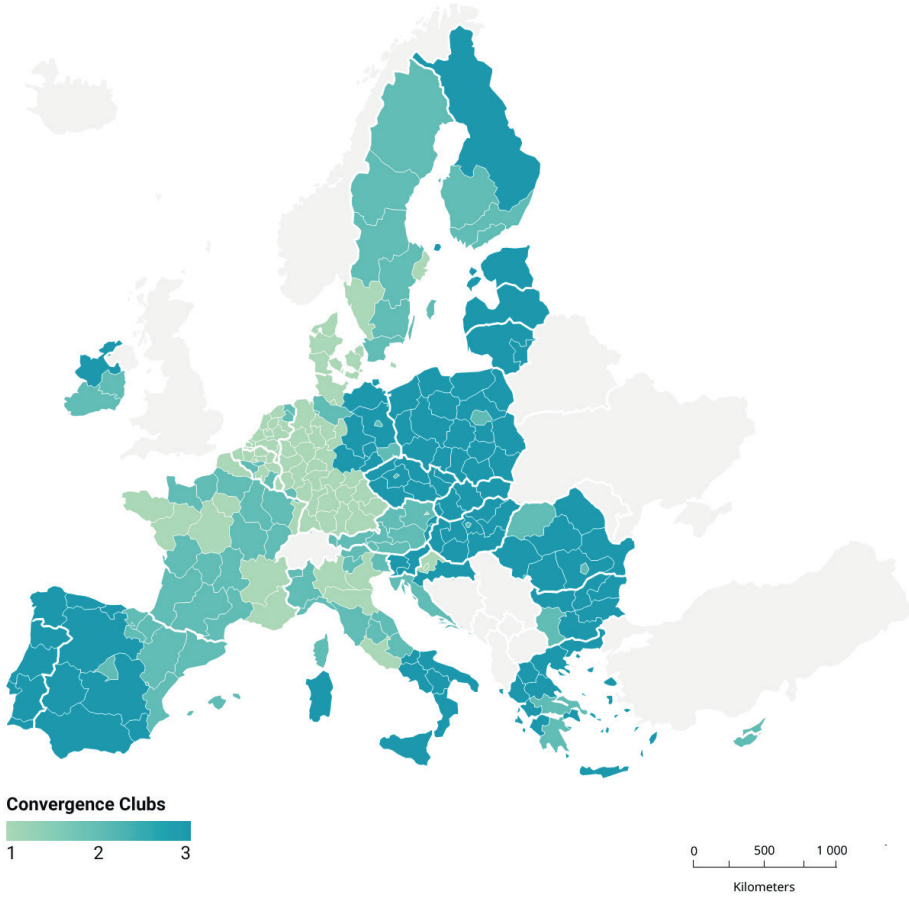


Fig. 4. Spatial distribution of convergence clubs across EU NUTS2 regions (2000–2022)
Source: own work.

Table 4 and Figure 4 present the results of the Convergence Club analysis at the NUTS2 level, dividing EU regions into three clusters based on their income convergence patterns. Cluster A, representing Convergence Club 1 with 79 regions, had a mid-range income level of 15,525 € and reached an average economic growth of 58.8%. Convergence Club 2 (Cluster B), the wealthiest group comprising 115 regions with an initial GDP of 23,597 €, exhibited the lowest growth rate (53.8%) over the observed period. By contrast, Cluster C, identified as Convergence Club 3, began from the lowest income level 7,158 €, but experienced remarkably growth (123.6%).

As shown in Table 4 and our estimations, the convergence process is heterogeneous, with notable differences observed between clusters. Cluster A shows only weak convergence, even though it benefited from the highest EU funding. Developed regions in Cluster B, which received relatively low EU support, exhibit only very slow convergence. Finally, Cluster C with 48 regions, provides strong empirical evidence of catching-up process over the observed period.

Table 5. Official classification vs Convergence clubs, level NUTS2

Type of regions	**Convergence Club 1 [%]**	**Convergence Club 2 [%]**	**Convergence Club 3 [%]**
Less developed regions	51.9 (41)	3.5 (4)	79.2 (38)
Transition regions	32.9 (26)	31.3 (36)	14.6 (7)
Developed regions	15.2 (12)	65.2 (75)	6.2 (3)
Total	100 (79)	100 (115)	100 (48)

Note: Official classification is defined in Article 108 of Regulation (EU) 2021/1060 of the European Parliament and of the Council.

Source: own work.

According to Regulation (EU) 2021/1060, as previously mentioned, the allocation of EU resources is based on three categories of NUTS level 2 regions. These include less developed regions with GDP per capita below 75% of the EU27 average, transition regions with GDP per capita between 75% and 100%, and more developed regions with GDP per capita above the EU27 average. This policy-based classification forms the starting point for further evaluation.

In Table 5, the EU official classification of NUTS2 regions is compared with the results derived from the applied cluster analysis. Our main goal is to examine to what extent the cluster analysis used corresponds to the official EU regional categorisation. The results show that less developed regions are concentrated primarily in Convergence Club 3 (79.2%) and Convergence Club 1 (51.9%). Transition

regions are more evenly distributed across the clubs, with Club 1 accounting for 32.9%, Club 2 for 31.3%, and Club 3 for 14.6%. Lastly, developed regions are predominantly clustered in Convergence Club 2 (65.2%), while smaller shares are observed in Club 1 (15.2%) and Club 3 (6.2%).

Overall, the distribution reveals a link between the official development status of regions and their placement in the convergence clubs, while also revealing some noteworthy patterns. Among less developed regions, two distinct convergence paths emerge: one group shows strong evidence of catching up, whereas the other demonstrates only very weak convergence despite receiving the highest level of EU funding. Similarly, 65.2% of NUTS2 developed regions display evidence of only very slow convergence. A comparable situation also applies to transition regions, where a substantial share demonstrates limited progress toward convergence despite considerable EU financial support.

Table 6. Estimations for Convergence Clubs

Variable	Convergence Club 1	Convergence Club 2	Convergence Club 3
const	-1.522 (-0.46)	5.892 (1.57)	-5.537*** (-3.93)
$\ln(GDP_{pc,2000})$	-0.124 (-0.53)	-0.030 (-0.57)	-0.692*** (-4.02)
$\ln(EU\_Pay_i)$	0.066 (1.08)	0.008 (0.42)	-0.058 (-0.88)
$\ln(LP_i)$	0.074 (0.09)	0.617** (2.27)	0.012 (0.03)
$\ln(EMPL_i)$	0.508* (1.69)	0.685*** (6.20)	0.512 (0.62)
$\ln(EDUC_i)$	0.064 (0.57)	0.092*** (2.59)	-0.025 (-0.11)
$\ln(GHG\_emis_i)$	0.062 (0.89)	0.084** (2.46)	-0.021 (-0.32)
Less developed (dummy)	-0.095 (-1.54)	-0.041 (-1.06)	-0.281*** (-4.30)
Metropolitan (dummy)	0.244* (1.91)	0.029 (0.69)	0.254* (1.79)
R^2	0.550	0.533	0.639
Obs.	68	108	47

Note: $\ln(GDP_{pc,2000})$ - Real GDP per capita (in PPS) in 2000; $\ln(EU\_Pay_i)$ - EU Payments for NUTS2 regions covering 2000-2020; ln(LPi) - Real labour productivity per person; ln(EMPLi) - Employment rate of the age group 15-64; $\ln(EDUC_i)$ - Share of the population with higher education (tertiary educational attainment, age 25-64); $\ln(GHG\_emis_i)$ - Greenhouse gas emissions per capita (ton/capita); Less developed - Dummy variable for EU less developed regions; Metropolitan - Dummy variable for metropolitan regions; R^2 - Coefficient of determinations; Obs. - Number of observations. ***, **, * denote significance at 1%, 5% and 10% level, respectively.

Source: European Commission, Eurostat, own calculations.

Table 6 presents the baseline condition convergence models estimated using OLS method. Our results for Convergence Club 1 reveal a weak convergence

process, as the coefficient on initial GDP per capita is negative -0.124, but not statistically significant. Employment shows a marginally significant positive impact on growth, suggesting that regions with higher employment rates performed better over the period. European metropolitan areas also grew somewhat faster, with a coefficient of 0.244 significant at the 10% level. In general, economic growth in Club 1 appears to be driven primarily by labour market dynamics and urbanisation rather than by initial income levels.

Convergence Club 2, comprising 108 developed regions, shows no evidence of convergence; initial GDP per capita does not significantly influence subsequent growth. Instead, growth is strongly linked to selected structural factors. Labor productivity, employment, and education are all significant and positively associated with economic growth, emphasising the role of human capital and productive capacity. Interestingly, greenhouse gas emissions are also positively associated with growth (0.08, significant at the 5% level). Economic activity in these EU regions remains closely tied to energy and emission-intensive processes. This cluster thus reflects a model based on efficiency and factor accumulation rather than convergence dynamics.

Convergence Club 3 (only 47 regions) provides textbook conditional convergence. The coefficient on initial GDP per capita is strongly negative and highly significant, confirming that less developed regions in this cluster experienced faster growth than their richer counterparts. The dummy for less developed regions is -0.281 (significant at the 1% level), indicating persistent disadvantages for structurally weaker regions. Metropolitan regions, by contrast, exhibit a marginally significant positive effect, which indicates that agglomeration effects are an important driver of growth in this group. To conclude, lower initial income leads to higher growth, but structural disadvantages can hold regions back.

5. DISCUSSION

The empirical results confirm that regional convergence within the EU remains highly heterogeneous, lending strong support to the club convergence hypothesis. While the aggregate convergence estimates suggest the presence of both absolute and conditional convergence among EU NUTS2 regions, the cluster analysis reveals the coexistence of distinct convergence paths. This finding is consistent with earlier studies showing that EU regions do not converge uniformly but rather form convergence clubs shaped by initial conditions, structural characteristics, and spatial context (Bartkowska and Riedl, 2009; Artelaris *et al.*, 2010). The identification of a cluster of low-income regions exhibiting strong catching-up dynamics alongside clusters characterised by weak or very

slow convergence highlights the limitations of relying solely on average convergence measures when assessing territorial cohesion.

The results also contribute to the ongoing debate on the effectiveness of EU Cohesion Policy. Although EU funding is clearly targeted toward less developed regions, as evidenced by the strong inverse relationship between initial income levels and EU payments per capita, its impact on convergence appears to be uneven. This aligns with findings by Crescenzi and Giua (2020), who have demonstrated that the growth effects of Cohesion Policy vary substantially across Member States and tend to materialise only in the long run, as well as with Bachtrögler *et al.* (2020), who emphasised the decisive role of local context in shaping policy outcomes. The presence of convergence clubs among both less developed and more developed regions suggests that EU transfers alone are insufficient to overcome deep-rooted structural disadvantages, reinforcing calls for more place-based and territorially sensitive policy interventions.

From a broader perspective, the observed convergence patterns mirror recent evidence from both regional and macro-level studies. For instance, Cavallaro and Villani (2021) have shown that club membership is closely linked to structural factors such as human capital, productivity, and economic structure, while Harb *et al.* (2024) identified persistent productivity-based convergence clubs across EU regions. Similarly, evidence from the Eurozone indicates that even highly integrated economies form distinct convergence clubs driven by structural growth determinants rather than converging toward a common steady state (Solanes *et al.*, 2024). Together, these findings underscore the central role of structural and spatial heterogeneity in shaping long-term development trajectories and challenge the notion of unconditional territorial convergence within the EU.

A limitation of this study is that it does not explicitly account for spatial spillovers between regions. Given that regional growth may be influenced by interregional linkages (e.g., commuting, migration, trade, and knowledge diffusion), future research could complement our clustering framework with spatial econometric models to capture geographic dependence more directly.

6. CONCLUSION

This paper contributes to the empirical literature on regional convergence in EU by providing a comparative analysis of NUTS2 regions. To be more precise, it examines the extent to which EU funding has reduced regional disparities, analyses how structural and spatial heterogeneity shapes the uneven convergence process, and presents empirical evidence in support of the regional club convergence hypothesis within the EU.

Our analysis reaffirms the persistence of substantial regional inequalities within the EU. At present, more than one in four EU citizens (28%) reside in NUTS2 regions where GDP per capita is below 75% of the EU average. These areas are concentrated primarily in the eastern Member States, but also include regions in Greece, Portugal, Spain, Southern Italy and outermost regions (Ninth Cohesion Report, 2024). Therefore, the EU financial resources play a crucial role in reducing regional inequalities by helping less developed regions in their efforts to catch up with more developed regions. The European Commission has allocated over 404 billion € during the 2014–2020 programming period. The total budget for implementing Cohesion Policy for the period 2021–2027 is 392 billion €. With the national co-financing, about half a trillion euros will be available to finance the programmes in the EU countries and regions.

The obtained results confirmed both absolute and conditional convergence among European NUTS2 regions over the selected period. In the case of absolute convergence, the estimated speed of convergence is approximately 2.7% per year. For conditional convergence, this rate increases, as the incorporation of structural factors enhances the explanatory power of the model. However, a more detailed examination shows that the convergence process has varied significantly across regions. EU funding has contributed to reducing regional disparities, but recent convergence trends have been strongly influenced by other determinants, including region-specific characteristics and underlying structural factors.

Evidence from the study uncovers considerable heterogeneity in income convergence among European NUTS2 regions, confirming the potential existence of three convergence clubs with different dynamics. While less developed regions in Convergence Club 3 provide strong indication of catching-up, other clusters, particularly Convergence Clubs 1 and 2, demonstrate only weak or slow convergence despite substantial EU financial support and higher initial level of GDP per capita. When set against the official EU classification framework, the findings reveal a mixture of convergence and divergence. Beyond the influence of EU funding, structural and regional factors – such as employment, productivity, education, and urbanisation – play a crucial role in shaping growth trajectories. The main policy recommendation for transition and less developed EU regions should be directed toward enhancing productivity, strengthening human capital, and fostering innovation as key drivers of sustained economic growth.

Our findings suggest that EU Cohesion Policy in the coming years will continue to be guided by the territorial principle. A place-based approach will consider the intrinsic characteristics, challenges and potential of each European region, whether less developed or more developed. By tailoring interventions to the specific needs of local regions, this approach can enhance the effectiveness of EU financial sources and foster sustainable, inclusive economic growth. The EU aims for all regions and metropolitan areas in Europe to actively contribute to sustainable development. A key component of this sustainability will be the green and digital transformation

of economies, focusing on enhanced efficiency and achieving climate neutrality. Current challenges and the EU's ambitious goals should be central to discussions on shaping the framework for Cohesion Policy beyond 2027.

REFERENCES

ARTELARIS, P., KALLIORAS, D. and PETRAKOS, G. (2010), 'Regional inequalities and convergence clubs in the European Union new member-states', *Eastern Journal of European Studies*, Centre for European Studies, Alexandru Ioan Cuza University, 1, pp. 113–133.

CAVALLARO, E. and VILLANI, I. (2021), 'Club convergence in EU countries: A sectoral perspective', *Journal of Economic Integration*, 36 (1), pp. 125–161. https://doi.org/10.11130/jei.2021.36.1.125

CRESCENZI, R. and GIUA, M. (2020), 'One or many Cohesion Policies of the European Union? On the differential economic impacts of Cohesion Policy across member states', *Regional Studies*, 54 (1), pp. 10–20. https://doi.org/10.1080/00343404.2019.1665174

BACHTRÖGLER, J., FRATESI, U. and PERUCCA, G. (2020), 'The influence of the local context on the implementation and impact of EU Cohesion Policy', *Regional Studies*, 54 (1), pp. 21–34. https://doi.org/10.1080/00343404.2018.1551615

BARRO, R. J., SALA-I-MARTIN, X., BLANCHARD, O. J. and HALL, R. E. (1991), 'Convergence across States and Regions', *Brookings Papers on Economic Activity*, 22 (1), pp. 107–182. https://doi.org/10.2307/2534639

BARTKOWSKA, M. and RIEDL, A. (2009), 'Regional convergence clubs in Europe: Identification and conditioning factors', *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.1438007

ESPINOZA, R. A. (2021), 'The Fiscal Multiplier of European Structural Investment Funds: Aggregate and Sectoral Effects with an Application to Slovenia', *IMF Working Papers 2021*, 118. https://doi.org/10.5089/9781513573762.001

EUROPEAN COMMISSION (2024), *Cohesion Open Data Platform*, https://cohesiondata.ec.europa.eu/ [accessed on: 01.10.2025].

EUROPEAN COMMISSION (2024), *History of the Policy*, https://ec.europa.eu/regional_policy/policy/what/history_en [accessed on: 12.09.2025].

EUROPEAN COMMISSION (2024), *Ninth report on economic, social and territorial cohesion*, Publications Office of the European Union, https://ec.europa.eu/regional_policy/information-sources/cohesion-report_en [accessed on: 14.09.2025].

EUROPEAN COMMISSION (2022), *EU lagging regions: State of play and future challenges*, QA-04-20-488-EN-N, Publications Office of the European Union.

EUROPEAN COMMISSION (2020), *Territorial Agenda 2030*, https://territorialagenda.eu [accessed on: 06.09.2025].

EUROSTAT (2024), *Overview - Nomenclature of territorial units for statistics*, https://ec.europa.eu/eurostat/web/nuts [accessed on: 30.08.2025].

FIASCHI, D., LAVEZZI, A. M. and PARENTI, A. (2017), 'Does EU cohesion policy work? Theory and evidence', *Journal of Regional Science*, 57 (1), pp. 1–38. https://doi.org/10.1111/jors.12364

FIURATTI, F., NIKOLOVA, D., PENNINGS, S. and SCHIFFBAUER, M. (2024), 'Are Regional Fiscal Multipliers on EU Structural and Investment Fund Spending Large? A Reassessment of the Evidence', *Policy Research Working Paper No. 10658.* Washington, DC: World Bank. https://doi.org/10.1596/1813-9450-10658

FORAY, D., DAVID, P. A. and HALL, B. H. (2011), 'Smart specialisation from academic idea to political instrument, the surprising career of a concept and the difficulties involved in its implementation', MTEI Working Paper.

HAGEN, T. and MOHL, P. (2011), '16 Econometric evaluation of EU Cohesion Policy: a survey', *International Handbook on the Economics of Integration: Factor Mobility, Agriculture, Environment and Quantitative Studies*, 3, 343. https://doi.org/10.4337/9781849806152.00030

HARB, G., BASSIL, C. and EL SAHLI, Z. (2024), 'Club convergence in productivity among European regions: Recent evidence and policy implications', *Journal of Economic Integration*, 39 (3), pp. 525–556. https://doi.org/10.11130/jei.2024026

LÓPEZ-BAZO, E. (2022), 'The Impact of Cohesion Policy on Regional Differences in Support for the European Union', *JCMS: Journal of Common Market Studies*, 60, pp. 1219-1236. https://doi.org/10.1111/jcms.13153

MANKIW, G. N. (2022), *Macroeconomics*, eleventh edition, New York: MacMillan Publishers.

MEDEIROS, E. (2016), 'Territorial cohesion: An EU concept', *European Journal of Spatial Development*, 14 (1), 1–30. https://doi.org/10.5281/zenodo.5141339

OECD (2023), 'OECD Regional Outlook 2023: The Longstanding Geography of Inequalities', *OECD Publishing*, Paris. https://doi.org/10.1787/92cd40a0-en

REGULATION (EU) 2021/1060 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32021R1060 [accessed on: 03.09.2025].

SOLANES, G. J., BEYAERT, A. and LOPEZ-GOMEZ, L. (2024). 'Income convergence clubs in the Eurozone: a tale beyond the core/periphery divide', *Applied Economic Analysis*, 33 (97), pp. 1–18. https://doi.org/10.1108/AEA-02-2024-0085

SOLOW, R. M. (1956), 'A Contribution to the Theory of Economic Growth', *The Quarterly Journal of Economics*, 70 (1), pp. 65–94. https://doi.org/10.2307/1884513

WHITE, H. (1980), 'A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity', *Econometrica*, 48 (4), pp. 817–838. https://doi.org/10.2307/1912934

APPENDIX A

Table 7. List of the EU regions at NUTS2 level

Country	Regions at NUTS2 level
Belgium	Région de Bruxelles-Capitale/Brussels Hoofdstedelijk Gewest; Prov. Antwerpen; Prov. Limburg; Prov. Oost-Vlaanderen; Prov. Vlaams-Brabant; Prov. West-Vlaanderen; Prov. Brabant wallon; Prov. Hainaut; Prov. Liège; Prov. Luxembourg; Prov. Namur
Bulgaria	Severozapaden; Severen tsentralen; Severoiztochen; Yugoiztochen; Yugozapaden; Yuzhen tsentralen
Czechia	Praha; Střední Čechy; Jihozápad; Severozápad; Severovýchod; Jihovýchod; Střední Morava; Moravskoslezsko
Denmark	Hovedstaden; Sjælland; Syddanmark; Midtjylland; Nordjylland
Germany	Stuttgart; Karlsruhe; Freiburg; Tübingen; Oberbayern; Niederbayern; Oberpfalz; Oberfranken; Mittelfranken; Unterfranken; Schwaben; Berlin; Brandenburg; Bremen; Hamburg; Darmstadt; Gießen; Kassel; Mecklenburg-Vorpommern; Braunschweig; Hannover; Lüneburg; Weser-Ems; Düsseldorf; Köln; Münster; Detmold; Arnsberg; Koblenz; Trier; Rheinhessen-Pfalz; Saarland; Dresden; Chemnitz; Leipzig; Sachsen-Anhalt; Schleswig-Holstein; Thüringen
Estonia	Eesti
Ireland	Northern and Western; Southern; Eastern and Midland
Greece	Attiki; Voreio Aigaio; Notio Aigaio; Kriti; Anatoliki Makedonia, Thraki; Kentriki Makedonia; Dytiki Makedonia; Ipeiros; Thessalia; Ionia Nisia; Dytiki Ellada; Sterea Ellada; Peloponnisos
Spain	Galicia; Principado de Asturias; Cantabria; País Vasco; Comunidad Foral de Navarra; La Rioja; Aragón; Comunidad de Madrid; Castilla y León; Castilla-La Mancha; Extremadura; Cataluña; Comunitat Valenciana; Illes Balears; Andalucía; Región de Murcia; Ciudad de Ceuta; Ciudad de Melilla; Canarias
France	Ile-de-France; Centre — Val de Loire; Bourgogne; Franche-Comté; Basse-Normandie; Haute-Normandie; Nord-Pas de Calais; Picardie; Alsace; Champagne-Ardenne; Lorraine; Pays de la Loire; Bretagne; Aquitaine; Limousin; Poitou-Charentes; Languedoc-Roussillon; Midi-Pyrénées; Auvergne; Rhône-Alpes; Provence-Alpes-Côte d'Azur; Corse; Guadeloupe; Martinique; Guyane; La Réunion; Mayotte
Croatia	Panonska Hrvatska; Jadranska Hrvatska; Grad Zagreb; Sjeverna Hrvatska
Italia	Piemonte; Valle d'Aosta/Vallée d'Aoste; Liguria; Lombardia; Abruzzo; Molise; Campania; Puglia; Basilicata; Calabria; Sicilia; Sardegna; Provincia Autonoma di Bolzano/Bozen; Provincia Autonoma di Trento; Veneto; Friuli-Venezia Giulia; Emilia-Romagna; Toscana; Umbria; Marche; Lazio
Cyprus	Kypros
Latvia	Latvija
Lithuania	Sostinės regionas; Vidurio ir vakarų Lietuvos regionas

Country	Regions at NUTS2 level
Luxembourg	Luxembourg
Hungary	Budapest; Pest; Közép-Dunántúl; Nyugat-Dunántúl; Dél-Dunántúl; Észak-Magyarország; Észak-Alföld; Dél-Alföld
Malta	Malta
Netherlands	Groningen; Friesland; Drenthe; Overijssel; Gelderland; Flevoland; Noord-Holland; Zeeland; Utrecht; Zuid-Holland; Noord-Brabant; Limburg
Austria	Burgenland; Niederösterreich; Wien; Kärnten; Steiermark; Oberösterreich; Salzburg; Tirol; Vorarlberg
Poland	Małopolskie; Śląskie; Wielkopolskie; Zachodniopomorskie; Lubuskie; Dolnośląskie; Opolskie; Kujawsko-pomorskie; Warmińsko-mazurskie; Pomorskie; Łódzkie; Świętokrzyskie; Lubelskie; Podkarpackie; Podlaskie; Warszawski stołeczny; Mazowiecki regionalny
Portugal	Norte; Algarve; Centro (PT); Área Metropolitana de Lisboa; Alentejo; Região Autónoma dos Açores; Região Autónoma da Madeira
Romania	Nord-Vest; Centru; Nord-Est; Sud-Est; Sud-Muntenia; Bucureşti-Ilfov; Sud-Vest Oltenia; Vest
Slovenia	Vzhodna Slovenija; Zahodna Slovenija
Slovakia	Bratislavský kraj; Západné Slovensko; Stredné Slovensko; Východné Slovensko
Finland	Länsi-Suomi; Helsinki-Uusimaa; Etelä-Suomi; Pohjois- ja Itä-Suomi; Åland
Sweden	Stockholm; Östra Mellansverige; Småland med öarna; Sydsverige; Västsverige; Norra Mellansverige; Mellersta Norrland; Övre Norrland

Source: European Commission.

APPENDIX B

Table 8. Allocation of financial resources for the programming period 2014-2020

Country	Total allocation [bn. €]	EU sources		Country's own resources	
		[bn. €]	[%]	[bn. €]	[%]
Luxembourg	0.53	0.32	60.2	0.21	39.8
Malta	1.21	1.01	83.1	0.20	16.9
Cyprus	1.39	1.11	80.0	0.28	20.0
Denmark	2.90	2.10	72.5	0.80	27.5
Netherlands	4.97	2.85	57.4	2.12	42.6
Slovenia	5.62	4.51	80.3	1.11	19.7
Belgium	6.29	3.26	51.8	3.03	48.2
Estonia	6.33	4.88	77.2	1.45	22.8
Ireland	7.22	4.39	60.8	2.83	39.2
Latvia	7.61	6.23	81.8	1.38	18.2
Sweden	7.98	4.62	57.9	3.36	42.1
Finland	10.83	4.93	45.6	5.90	54.4
Lithuania	10.99	9.33	84.9	1.66	15.1
Bulgaria	13.02	11.13	85.5	1.89	14.5
Austria	14.07	6.69	47.6	7.38	52.4
Croatia	14.20	12.19	85.9	2.01	14.1
Slovakia	20.52	16.57	80.7	3.95	19.3
Greece	30.12	25.16	83.5	4.96	16.5
Hungary	32.09	27.16	84.6	4.93	15.4
Czechia	34.90	25.78	73.9	9.12	26.1
Portugal	36.96	29.38	79.5	7.58	20.5
Romania	41.58	35.21	84.7	6.37	15.3
Germany	52.09	34.07	65.4	18.02	34.6
France	56.56	36.56	64.6	20.00	35.4
Spain	74.99	57.32	76.4	17.67	23.6
Italy	93.26	62.76	67.3	30.50	32.7
Poland	111.44	91.27	81.9	20.17	18.1
EU27 average	25.91	19.29	74.4	6.62	25.6

Source: European Commission (Cohesion Open Data Platform), own calculations.

Member since 2018
JM13710

EUROPEAN SPATIAL RESEARCH AND POLICY

Volume 33 2026 Number 1

https://doi.org/10.18778/1231-1952.33.1.01

Csaba DEAK [*], **Baibhaw KUMAR** [**], **Csaba DEBRECZENY** [***], **Balazs DEAK** [****]

UNVEILING THE DYNAMICS OF HUNGARY'S INNOVATION PERFORMANCE

Abstract. This article investigates Hungary's growing status as a moderate innovator in the European Union, examining why it lags behind leaders like Denmark and emerging performers like Estonia. While previous research has focused on composite scores such as the European Innovation Scoreboard (EIS), this study combines these indicators with a Data Envelopment Analysis (DEA) approach to evaluate innovation efficiency. The study covers the period from 2016 to 2023 providing a temporal analysis of Hungary's innovation deficit relative to the EU average, as well as a comparative assessment with chosen EU equivalents. The paper identifies systemic slackness in Hungary's innovation ecosystem, notably in terms of converting R&D inputs and human capital into concrete innovation outputs.

Key words: European Innovation Scoreboard, Global Innovation Index, innovation performance.

[*] Csaba DEAK, Faculty of Materials and Chemical Engineering, University of Miskolc, Egyetem 1, 3515 Miskolc-Egyetemváros, Hungary; e-mail: deak.csaba@uni-miskolc.hu, ORCID: https://orcid.org/0000-0002-2160-7472

[**] Baibhaw KUMAR, Faculty of Mechanical Engineering and Informatics, University of Miskolc, Egyetem 1, 3515 Miskolc-Egyetemváros, Hungary; e-mail: baibhaw.kumar@uni-miskolc.hu, ORCID: https://orcid.org/0000-0003-0466-0711

[***] Csaba DEBRECZENY, Hungarian University of Agriculture and Life Sciences, Páter Károly 1, 2100 Gödöllő, Hungary; e-mail: csaba.debreczeny@gmail.com, ORCID: https://orcid.org/0009-0004-9597-9406

[****] Balazs DEAK, Innovation management Doctoral school, Óbuda University, Bécsi 96/B, H-1034 Budapest, Hungary; e-mail: balazsdeakwup@gmail.com, ORCID: https://orcid.org/0009-0001-8826-2595

Received: 23.10.2024, Revised: 16.08.2025, Accepted: 04.11.2025

Funding information: University of Miskolc, Hungarian University of Agriculture and Life Sciences, Óbuda University. **Conflicts of interests:** None. **Ethical considerations:** The Authors assure no violations of publication ethics and take full responsibility for the content of the publication. **The percentage share of the Author in the preparation of the work is:** C.D. 25%, B.K. 25%, C.D. 25%, B.D. 25%. **Declaration regarding the use of GAI tools:** Not used

1. INTRODUCTION

Innovation in a country is mostly about coming up with new ideas, making products and services, and getting them to the market effectively. This ability depends on a country's research base, skilled workers, and technical infrastructure, all of which work together to make the economy more competitive and solve problems in society (Roukanas, 2021). In the late 20th century, people started trying to measure innovation on a national or regional level. In the beginning, researchers traditionally examined a few restricted indicators, such as how much money was spent on research and development (R&D) and how many patents were filed. D. B. Audretsch and Belitski (2020) have mentioned that R&D spending and patent counts were good initial steps in evaluating innovation, but they only showed a small part of the picture, mostly focusing on formal scientific and technological improvements. These measurements did not include social innovation, non-technological innovation or process-related gains that are common in many areas of the economy. This criticism made people realise that innovation is a complex thing that needs more comprehensive ways to be measured.

Single-dimensional measurements usually do not offer a complete picture, composite indices like the Global Innovation Index (GII) or the National Innovation Capacity Index (NICI) were created to give a more complete view. The Organisation for Economic Co-operation and Development (OECD) and Eurostat produced the Oslo Manual in the 1990s. It was built on the efforts of the OECD and Eurostat to create standardised ways to assess innovation that go beyond only patents and R&D spending (Ciaffi *et al.*, 2024). These indices and recommendations include things like human capital, business sophistication, knowledge absorption capacity, and institutional frameworks. They provide a big picture view of innovation (Brás, 2023). For example, the NICI was designed to compare the innovation capacity of EU Member States by looking at both, how many new ideas they arrived at and how well they were able to use and apply them (Szopik-Depczyńska *et al.*, 2020). More recent studies have even linked the circular material use rate to improvements in innovation-led industrial infrastructure. This shows that innovation indicators now cover environmental, industrial, and social aspects (Skare *et al*., 2024). Although they form the basis of innovation assessment, traditional measures such as R&D investment and sector classifications have limitations when it comes to capturing the entire range of innovative activities. The larger processes and behaviors that drive innovation inside organizations and industries are overlooked when we focus simply on the 'object' of innovation, such as patents or specific technology. In a similar argument, the OECD (2010) found that sector classifications based on research and development were often oversimplified; the boundaries between technology producers and users are becoming increasingly blurry in many industries, and firms often operate in both

the manufacturing and service sectors, rendering static classifications less useful. Also, only looking at industries with a lot of or very little technology based on static R&D intensity levels does not consider how industries are always changing, especially those that work with digital platforms and services, where new ideas can come up outside of official R&D processes. We need measurement frameworks that are more complete and flexible since R&D measurements only give us useful baseline information and do not consider the variety, complexity, and process-oriented nature of modern innovation ecosystems.

However, even if measurement has gotten better, there is still a divide in the EU innovation landscape between the North and the South. Kowalski (2021) and Kowalski and Rybacki (2021) have both shown that countries in Northern and Western Europe are better at coming up with new ideas than countries in Southern and some Eastern Europe. This disparity is not just a result of differing levels of innovation; it is also due to structural problems in innovation ecosystems, such as the South's inability to absorb new technology, weaker institutional frameworks, and poorer investment capacity. For instance, Denmark and Finland are great at making and selling high-end tech advances, but several Southern EU countries have a hard time using and adapting current technologies in a way that works. Over the years, these structural differences have grown. If strategic interventions do not focus on the capacity-building and absorption-side problems in regions that are falling behind, the gap in innovation potential across Europe is likely to remain the same. The starting knowledge resource and system-institution conditions determine the course of innovation development processes and their management. Therefore, it makes sense that areas with high levels of invention at the outset would develop more quickly than areas with lower levels of innovation capabilities (Kijek and Matras-Bolibok, 2018).

The National Innovation Efficiency Index and the National Innovation Strength Index are the two points of view from which this innovative method, called the National Information and Communication Infrastructure NICI, evaluates the effectiveness of a country's capability for innovation. According to Cohen and Levinthal (1990), absorptive capacity explains why nations can use external information and modern technologies differently. Absorptive capacity is a country's ability to perceive and use fresh foreign information productively in its economy. Investing in education, R&D, and institutional learning enhances this capacity. Knowledgeable human capital, technological infrastructure, and competent institutions help nations grasp and incorporate complicated foreign technologies. Strategic frameworks like the NICI in Africa show how nations align technological goals with socio-economic development to build (Information and Communication Technologies) ICT absorptive capacity. Countries may struggle to turn ICT policy into economic results without a base of human capital and prior experience with similar technology. Thus, absorptive capacity explains why some nations overtake others technologically despite similar access to global information

flows. Compared to earlier indices, this dual approach offers a more thorough assessment of a nation's capacity for innovation. Similar to global indices, the European Commission (EC) offers a comparative evaluation of the research and innovation performance of EU Member States, other European nations, and their neighbouring regions through the European Innovation Scoreboard (EIS) (European Commission, 2023b). It provides a descriptive assessment of EU countries by evaluating the relative merits and demerits of their national innovation systems and pinpointing issues that require attention.

The European Commission uses a composite measure called the Summary Innovation Index (SII) to create its annual innovation rankings through EIS. There is an average of 25 indicators that make the components of SII. Accordingly, it can be concluded that innovation performance is better the higher the average value of the 25 indicators. Given the limits of composite metrics like the Summary Innovation Index, innovation studies must critically evaluate measurement diversity. Edquist *et al*. (2018) have suggested that the SII, despite its popularity in EU policy circles, simply averages inputs, outputs, and contextual factors without separating them. This aggregate may oversimplify innovation system dynamics and produce deceptive rankings that do not reflect innovation performance. The authors called for efficiency or productivity-based measures that would link innovative outputs to inputs utilising index numbers and Data Envelopment Analysis. These methods show how well governments turn resources into innovation, improving system performance assessment. Such complex assessment methods help drive targeted innovation programs by showing how much governments invest in innovation and how effectively it produces returns. This discussion emphasizes the necessity for innovation measurement systems that account for national circumstances and innovative routes rather than composite scores. Similarly, the Global Innovation Index (GII) has employed a comparable efficiency approach. The ratio of the output sub-index score over the input sub-index score is known as the „Innovation Efficiency Ratio," and it is supplied by the GII. There is a correlation between the competitiveness of the EU-28 nations and the measures of innovation and business sophistication, but there is only a modest correlation between their competitiveness and the sub-indices of the other two pillar groupings (basic necessities and efficiency enhancers) (Marčeta and Bojnec, 2020). It displays the amount of innovation output that a nation receives in relation to its inputs.

The EU wants to boost the innovative economy in every Member State because innovations are the main engine of sustainable economic growth and development, as well as a major factor in raising competitiveness and societal well-being (EU report, 2020). This means that in order to accomplish overall advancement, it is necessary to ensure their convergence and bridge the so-called innovation gap. This is based on the identification of key factors that contribute to the innovation gap (FIG) (Polyakov *et al*., 2023). This further enables each member state to strengthen its National Innovation System (NIS) by giving pri-

ority to the development of those indicators (e.g., FIG) that influence their standing within the EU the most. For those who value innovation, open innovation has a detrimental impact on the development of new products in medium and high-tech businesses. Open innovation has a stronger impact on process, organisational, and eco-innovation for moderate innovators (Leitão *et al*., 2024).The performance gaps throughout the Member States have shrunk between 2016 and 2023, notably within the categories of 'Strong Innovators' and 'Moderate Innovators,' according to the EC's most recent report of 2023 for EIS. The bulk of moderate and emerging innovators reside in Southern and Eastern Europe, while Innovation Leaders and Strong Innovators are found in Northern and Western Europe. One of the primary factors that can cause nations to enter the middle-income trap is a lack of capacity for innovation (Lebdioui *et al*., 2021). The Hungarian pharmaceutical industry, the Czech automobile industry, and the recently established MNE-related university units and private universities are a few instances of how these businesses impact innovation systems in transition economies (Lengyel and Cadil, 2009). In addition to making investments in information and communication technology and intellectual property rights, Hungary and the other Visegrad nations should think about establishing extra-local connections in order to enhance and maintain territorial inventions (Amponsah Odei *et al*., 2024). In the context of the European Innovation Scoreboard's 2023 report, which highlights the shrinking performance gaps among Member States, particularly between Strong Innovators and Moderate Innovators, Hungary stands out as a case warranting closer examination. As a Moderate Innovator with a performance at 70.4% of the EU average in the period of 2016–2023 as per GII, the country ranking fluctuated between 33 to 39 as highlighted in Fig. 1. Hungary's position is both intriguing and indicative of the underlying challenges within its innovation ecosystem. This paper aims to dissect the factors contributing to Hungary's performance gap in innovation, particularly its slower pace of improvement relative to the EU average and proposes a novel assessment framework that incorporates sustainability and renewable energy indicators into innovation measurement. The boundaries of open innovation vary throughout knowledge-intensive industries and across various geographic contexts; in national and international marketplaces, the creative industries face the most restrictions on knowledge exchange (B. D. Audretsch and Belitski, 2023).

This research work endeavors to rigorously analyze Hungary's status as a moderate innovator within the European context by dissecting the contributory factors to its performance. The study is framed within a comparative temporal assessment from 2016 to 2022, keeping side by side Hungary's innovation metrics against those of Estonia, the leading moderate innovator, and Denmark, recognised as the frontrunner in EU innovation. The purpose of this parallel is to elucidate the gaps and to identify actionable insights that could elevate Hungary's innovation standing.

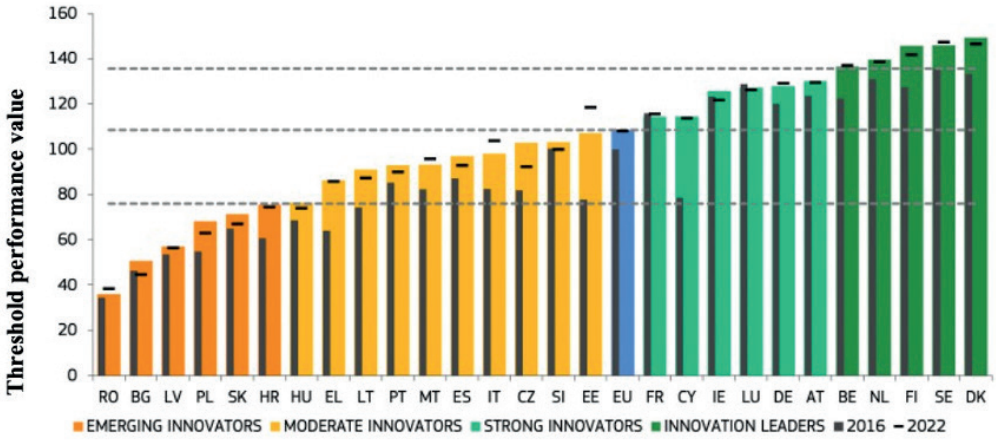


Fig. 1 (a). Performance of EU nations in the EIS
Source: EIS (European Commission, 2023).

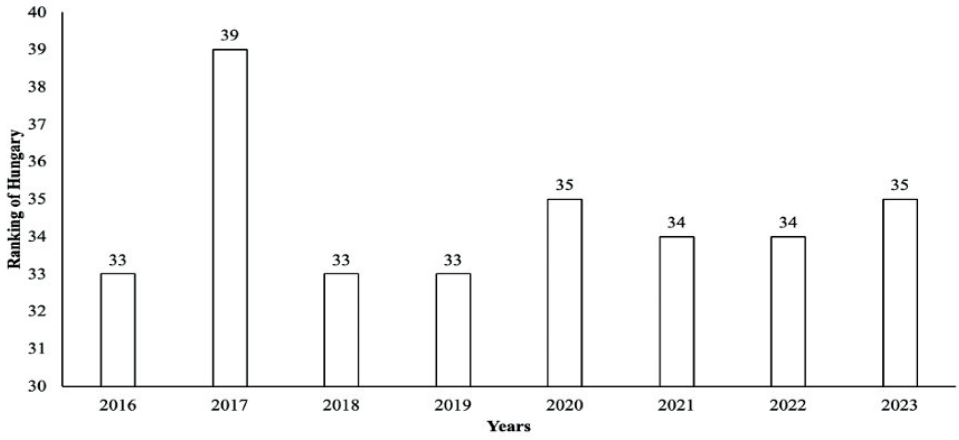


Fig. 1 (b). Performance of Hungary in the Global Innovation Index
Source: own work based on data from Dutta *et al.*, 2023.

2. METHODOLOGY

The methodology of our study is based on the analytical framework outlined by the European Innovation Scoreboard (EIS) 2023, which classifies innovation into four fundamental categories, i.e., Framework Conditions, Investments, Innovation Activities, and Impacts. A country's innovation performance is depicted in a nuanced manner through the Summary Innovation Index (SII) (Katarina and Pavol, 2019), which is a collection of indicators that surround each of these categories. The study evaluates the fundamental components that support innovation, emphasizing lifelong learning, digital infrastructure, and human resources. These metrics assess the likelihood of innovation-driven growth by considering the amount and caliber of human capital in STEM disciplines, the popularity of postsecondary education, and the use of digital technology. Our analysis examines financial expenditures that support innovation, from both, public and private sectors. This includes venture capital and government funding directed towards R&D, critical drivers for innovative output Innovation has no appreciable effect on foreign direct investments (FDI) but has a beneficial influence on human resources, research, and creative outputs (Dempere *et al*., 2023). This dimension of innovation activities addresses the behaviors indicative of innovation within the economy, such as SMEs' product and process innovations, collaborations, intellectual property creation, and job mobility among human resources (Bajkó *et al.*, 2022). The vitality of these activities provides insight into the practical implementation of innovative ideas. Impacts are the tangible outcomes of innovation efforts that are reflected in this category. We analyse the direct effects on employment within knowledge-intensive sectors, the economic influence via sales impacts, and the broader societal contributions, including environmental sustainability metrics. To synthesize this data, we employed a two-analytical assessment approach as shown in the Fig. 2.

Temporal analysis: We conducted a longitudinal study spanning the period from 2016 to 2023 to identify trends, progress, and patterns in Hungary's innovation journey. By examining the trajectory of these indicators, we can pinpoint areas of improvement and persistent challenges.

Comparative analysis: Our research contrasts Hungary's current innovation performance with that of Estonia, the leading moderate innovator, and Denmark, an acknowledged innovation leader within the EU. This comparison not only benchmarks Hungary against its peers but also against the highest standard of innovation within the EU.

Data envelopment analysis (DEA): DEA is a non-parametric frontier analysis method, which benchmarks various decision-making units (DMUs) in this study to compare countries' outputs from inputs. Our investigation used a BCC-based output-oriented DEA model with variable returns to scale (VRS) (Banker *et al*., 1984). The analysis ensures that the output orientation maximizes innovation outputs given its input capacity.

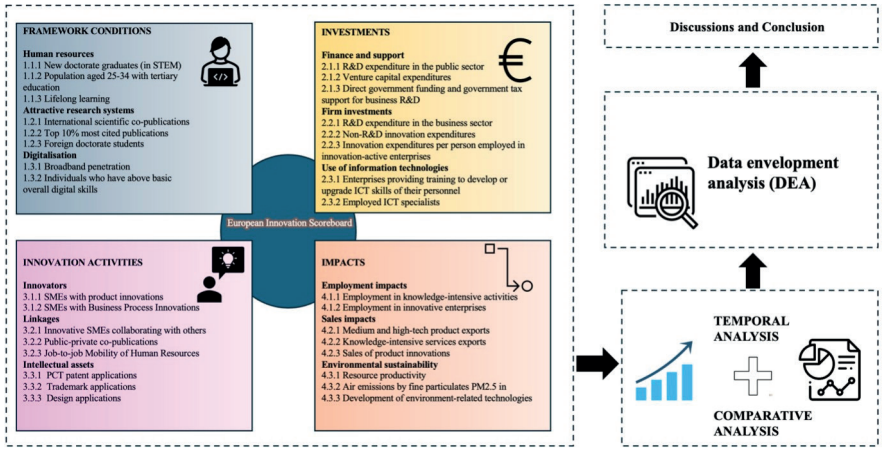


Fig. 2. Methodology adopted for the study

Source: own work.

Furthermore, we introduce an innovative approach to quantifying the innovation gap of Hungary relative to the European Union average, utilising the Summary Innovation Index (SII). We aim to elucidate the discrepancy in innovation performance by comparing Hungary's SII to that of the EU. This comparison serves as a barometer for assessing Hungary's relative progress or regression in innovation. Equation (1) (Dworak, 2020), defines the innovation gap index for Hungary as the ratio of Hungary's SII to the average SII for the EU in a year. This ratio provides a snapshot of Hungary's innovation performance relative to the EU benchmark, enabling a direct comparison within the context of a specific year.

$$G_{HU} = \frac{SII_{HU}}{SII_{EU}} \tag{1}$$

where,

G_{HU} is the innovation gap index for Hungary in relation to the EU average in year t,

SII_{HU} is the Summary Innovation Index for Hungary in year t,

SII_{EU} is the average Summary Innovation Index for the EU in year t.

$$D_{HUt1} = \left[\frac{SII_{HUt1}}{SII_{EUt1}}\right] - \left[\frac{SII_{HU}}{SII_{EU}}\right] \tag{2}$$

where,

D_{HUt1} is the index of changes in the level of the innovation gap between Hungary and the EU average in a particular year t_1 as compared to year t,

SII_{EUt1} is the average Summary Innovation Index for the EU in year t_1,

SII_{HUt1} is the Summary Innovation Index for Hungary in year t_1.

Equation (2) calculates the index of changes in the level of the innovation gap between Hungary and the EU average for a particular year t1 as compared to year t. Here, D_{HUt1} encapsulates the directional shift in Hungary's innovation gap, with negative values signalling a widening of the gap, and positive values indicating its narrowing. It is imperative to understand that while D_{HUt1} indicates the direction of the gap's movement, it does not quantify the absolute change in Hungary's innovation performance.

The complexity lies in the interpretation of D_{HUt1}. A negative D_{HUt1} could imply that Hungary's innovation performance is declining relative to the EU average or that other EU countries are advancing at a faster pace. Conversely, a positive D_{HUt1} would suggest improvement in Hungary's innovation activities or a deceleration in the EU's average innovation growth. It is, therefore, crucial to contextualise the index of changes D_{HUt1} concerning the index of innovation gap G_{HU}, to discern whether Hungary is closing the innovation gap by advancing its own performance or simply benefiting from a relative slowdown in the EU's innovation growth.

The additional DEA was performed to assess innovation system efficiency in Hungary, Estonia, Denmark, and other EU nations to supplement our temporal and comparative research. Our historical gap analysis and Summary Innovation Index (SII) provide significant insights into absolute and relative innovation performance, but they do not show how well each country converts its innovation resources (inputs) into quantitative innovation outcomes. Therefore, the DEA assesses whether lower-performing countries like Hungary underperform owing to limited resources or inefficient use of existing capabilities. The choice of DEA inputs and outputs was guided by two considerations: (1) relevance to innovation ecosystem performance, and (2) alignment with available EIS indicators. After critical review, the following variables were selected:

Inputs:

– Public sector R&D expenditure (% of GDP) (capturing government innovation funding);

– Business sector R&D expenditure (% of GDP) (reflecting private sector innovation investment);

– Venture capital investment (% of GDP) (representing financial support for innovation startups);

– Human resources in science and technology (% of total employment) (as a proxy for skilled workforce);

– Broadband penetration (%) (capturing digital infrastructure that enables innovation activities).

Outputs:

– Patent applications per million population (innovation outcome in technological domains);

– Sales share of new-to-market products (%) (reflecting commercialisation of innovation);

– Employment in knowledge-intensive activities (% of total employment) (human capital utilisation);

– International scientific co-publications per million population (indicative of research collaboration and openness);

– Resource productivity (EUR/kg) (as a proxy for eco-innovation and efficiency).

The DEA efficiency score (θ) for each country is calculated by solving the following linear programming model (output-oriented, VRS):

$$Maximize\ \mathrm{q} = \sum_{r=1}^{s} u_r Y_{rj}$$

Subject to,

$$\sum_{i=1}^{m} v_i X_{ij} = 1$$

$$\sum_{r=1}^{s} u_r Y_{rj} - \sum_{i=1}^{m} v_i X_{ij} \leq 0 \forall k$$

$$u_r, v_i \geq \xi \text{ and } \forall r, i$$

where,

Y_{rj} = amount of r produced by country j

X_{ij} = amount of i produced by country j

u_r, v_i = weights assigned to output r and input i

x = small positive number to avoid zero weights

Through gap calculation, our study meticulously dissects the multi-layered nature of innovation performance in Hungary. By adopting a holistic view that encompasses inputs, processes, and outputs of innovation, our approach provides a balanced and comprehensive understanding of Hungary's innovation ecosystem. Our added comparison with Estonia and Denmark offers a lens to identify best practices and strategise on potential areas for enhancement to elevate Hungary from its current position as the least moderate innovator to a more competitive stance within the European Union.

3. RESULTS

3.1. Temporal analysis for Hungary

The temporal analysis provides a time-tested testament of the performance of a nation over a period. The graph depicted in Fig. 3 from the European Innovation Scoreboard presents a multifaceted view of Hungary's innovation performance, offering both a comparative perspective against the EU average and a temporal analysis of performance changes over two intervals, 2016–2023 and 2022–2023.

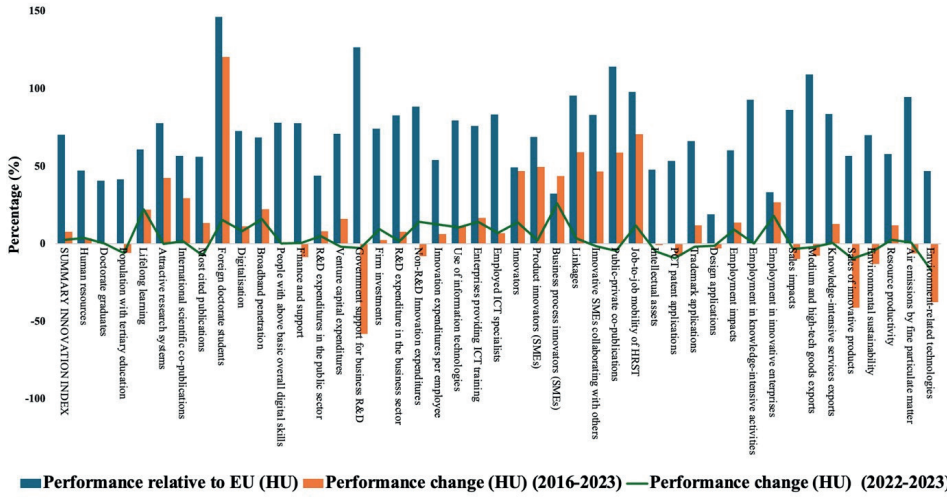


Fig. 3. Temporal analysis of parameters of EIS (Hungary)

Source: own work based on the EIS scoreboard (European Commission, 2023).

The performance of Hungary, when assessed relative to the EU average, indicates a mixed innovation landscape. Hungary performs above the EU average in „International scientific co-publications" and „Sales impacts," which suggests a commendable level of international research collaboration and an ability to translate innovations into marketable products with positive sales outcomes. Also, by contrast, in crucial sectors like „Venture capital expenditures" and „R&D expenditures in the business sector," Hungary falls well short of the EU average, suggesting possible underinvestment in these vital innovation drivers.

Hungary has clearly seen significant oscillations in terms of the temporal shift in innovation performance from 2016 to 2023. A positive increase has been observed throughout the nation in „Innovative SMEs collaborating with others," suggesting that the environment is becoming more favorable for small and medium-sized businesses to participate in cooperative innovation initiatives. A significant set

down in „Design applications" and „R&D expenditures in the public sector," for example, raises concerns about potential financing limits for research and development by the government and a potential loss in design innovation.

The performance change over the most recent period, 2022–2023, has revealed more about Hungary's current innovation trajectory. The downward trends in „Non-R&D innovation expenditures" and „Renewable energy technologies," albeit slight, may point to a short-term strategic de-prioritisation or fiscal realignment in these areas. Conversely, modest improvements in „Employment in knowledge-intensive activities" and „Resource productivity" hint at ongoing efforts to enhance the knowledge-based economy and efficient resource utilisation. From this EIS data, it is evident that Hungary has shown remarkable performance in several areas of innovation, such as marketable innovations and international co-publications; yet, there exist notable areas that necessitate attention in order to enhance the nation's total potential for innovation.

3.2. Temporal analysis for Estonia

According to a study by Ferraro *et al.* (2023) over the 2014–2018 estimation period, Estonia's Cohesion Policy funding for R&D and innovation had a positive short-term impact on employment and labour productivity. The impact was highest and most substantial for labour productivity. The graph in Fig. 4 presents delineates the innovation performance of Estonia (EE) against the backdrop of the European Innovation Scoreboard metrics. Estonia is recognised as the best-performing country within the „moderate innovator countries" category, and the analysis will focus on this distinction.

Estonia's performance relative to the EU average indicates innovation prowess in specific areas. Notably, Estonia exceeds the EU average significantly in 'Digitalisation' and 'Sales impacts,' suggesting that the country has effectively harnessed digital technologies to boost its market presence and that these technologies have had a tangible impact on sales. Additionally, Estonia shows robust performance in 'Human resources' and 'Attractive research systems,' which implies a well-developed talent pool and a conducive environment for research and development.

Considering the timeframe from 2016 to 2023, Estonia's innovation profile has seen substantial growth, particularly in 'Job-to-job mobility' and 'Lifelong learning.' These metrics suggest an agile and continuously improving workforce, key elements for sustaining innovation. There has also been notable advancement in 'Broadband penetration,' reflecting Estonia's emphasis on high-speed internet as a foundation for digital innovation.

In the most recent term, i.e., 2022–2023, Estonia displayed a remarkable upward trajectory in 'Non-R&D innovation expenditures,' indicating an increased commitment to innovation beyond traditional research and development. This

broad approach to innovation was essential for countries like Estonia that have aimed to carve out a niche in the competitive global market. However, it is important to recognise a decline in 'Patent applications,' which could signal a potential area for policy intervention to bolster intellectual property outputs.

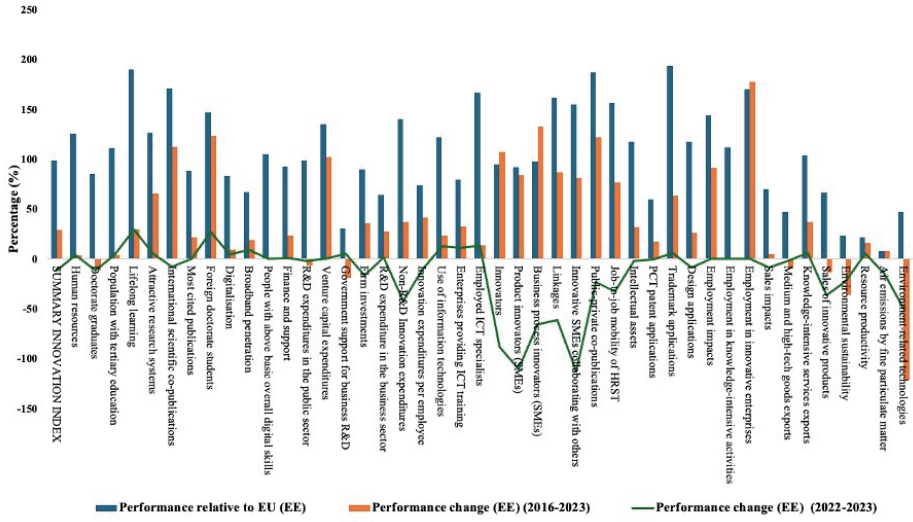


Fig. 4. Temporal analysis of parameters of EIS (Estonia)

Source: own work based on the EIS score board (European Commission, 2023).

Estonia's position as the best performer among the moderate innovators is underpinned by its strategic investments in digitalisation and human capital. The country's substantial performance in 'Sales impacts' underscores the success of its innovation outputs in meeting market demands and driving economic growth. However, the decline in 'Patent applications' points to a potential vulnerability in maintaining a competitive edge in technological innovation. This calls for targeted strategies to stimulate intellectual property creation and to ensure that R&D investments translate into tangible outputs (Ciaffi *et al*., 2024). Moreover, Estonia's commitment to 'Non-R&D innovation expenditures' suggests an acknowledgment of the diverse nature of innovation, extending beyond conventional R&D.

3.3. Comparative analysis with Denmark

As per the EIS 2023 report, Denmark, with a performance of 137.6% above the EU average, is a leader in innovation performance. Performance surpasses the Innovation Leaders' mean. The rate of performance growth is more than the EU's (8.5%-point) pace. The nation's performance advantage over the EU is growing. In this section,

we discuss a trendline assessment with the EU average, innovation leader, i.e., Denmark, and compare it with Hungary. The EUROSTAT database (European Commission, 2024a) was selected for its comprehensive and authoritative compilation of statistical information across the European Union, ensuring reliable and comparable data critical for assessing innovation performance trends. An analysis of these trend lines provides valuable insights into the development of human capital and innovation outputs within the region. By analysing the Eurostat data depicted in Fig. 5, we observed two distinct but interrelated trends regarding R&D expenditure and R&D personnel as percentages of GDP and the active population, respectively, across Denmark (DK), Estonia (EE), Hungary (HU), and the European Union (EU) averages.

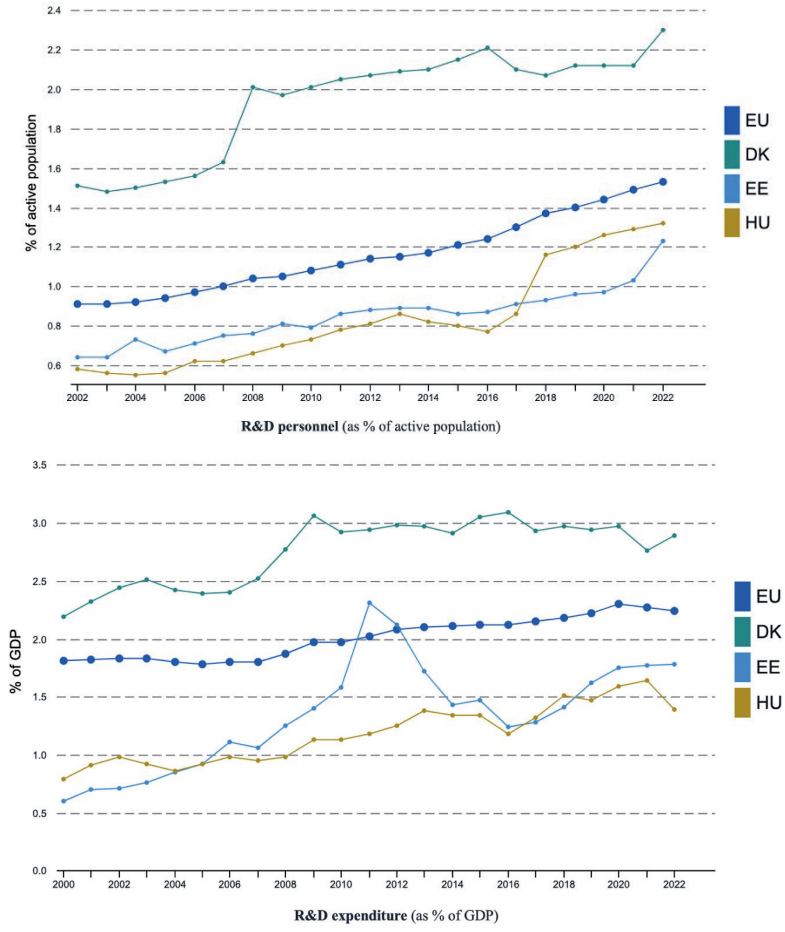


Fig. 5. Trendline assessment of R&D personnel (a) and expenditure (b) for Denmark, Estonia, Hungary, and the European Union over the last two decades

Source: own work based on data from EUROSTAT (2023).

The graph a) illustrates the proportion of R&D personnel in the active population. Denmark consistently exceeds the EU average, indicating a strong commitment to cultivating a knowledge-intensive labor force, a key component of an innovative economy. Estonia, while starting from a lower baseline, shows an impressive and steady rise, suggesting robust policies in education and workforce development, which may drive its status as a top performer among moderate innovators. Hungary, however, displays a relatively flat trend with a slight uptick in recent years, signifying a potential area for policy intervention to expand its R&D workforce.

The graph b), the R&D expenditure as a percentage of GDP also presents noteworthy insights. Denmark showcases high and relatively stable investment levels, indicating a mature and sustained innovation policy. Estonia, mirroring its R&D workforce trend, displays notable expansion, indicating a rise in innovation investment as a key focus for the nation. Although Hungary's trend fluctuates, it has consistently fallen behind the EU average, indicating the necessity for increased investment in research and development to bolster innovation.

Denmark's significant investment in both sectors aligns with its position as a leader in innovation, indicating that continued investment in research and development is likely playing a role in strong innovation results and a vibrant, knowledge-based economy. Estonia's developments, specifically in the number of R&D workers, show an increasing capacity for creativity, especially if the growth in R&D spending persists. Some reasons include developing geographically cross-border innovation clusters that have been established, such as the Öresund region between Denmark and Sweden. These clusters focus on specific tactics to enhance their competitiveness and foster continued development towards their goal of becoming a worldwide innovative cluster (Park, 2014). This may result in Estonia emerging as a key player in the EU innovation scene.

A country's tendency for innovation can be deduced from its investment in R&D and size of its workforce. Denmark has made significant investments in both fields, aligning with its position as a pioneer in innovation. This indicates that continued funding in research and development probably aids strong results in innovation and a dynamic, knowledge-focused economy. Estonia is experiencing positive advancements, especially in the amount of R&D workers, indicating a rising possibility for innovation as long as R&D investment continues to increase. As a consequence of this, Estonia could emerge as a key player in the innovation sector of the EU.

Further, the graph a) of Fig. 6 displays the proportion of total employment that can be attributed to high-technology manufacturing and knowledge-intensive services. The EU's positive trend indicates a move towards a knowledge-focused economy, with Denmark at the forefront due to its advanced workforce and focus on technology sectors. Estonia's growth is showing potential, aligning with its growing recognition as a digital and technology-driven economy. Hungary is experiencing growth, but it is happening at a slower rate, pointing to a delayed uptake of knowledge-intensive tasks in its overall workforce.

The graph b) shows patent applications to the European Patent Office per million people, indicating significant variations in innovation levels. Denmark's strong and consistent rate indicates a healthy climate for innovation and the development of intellectual property. Estonia's increasing trend, while not as high as Denmark's, indicates a growing ability for innovation and creating intellectual property. By contrast, Hungary's lack of growth indicates a leveling off in innovation, as its patent application rates are much lower than the EU average, highlighting a potential need to enhance its innovation policy.

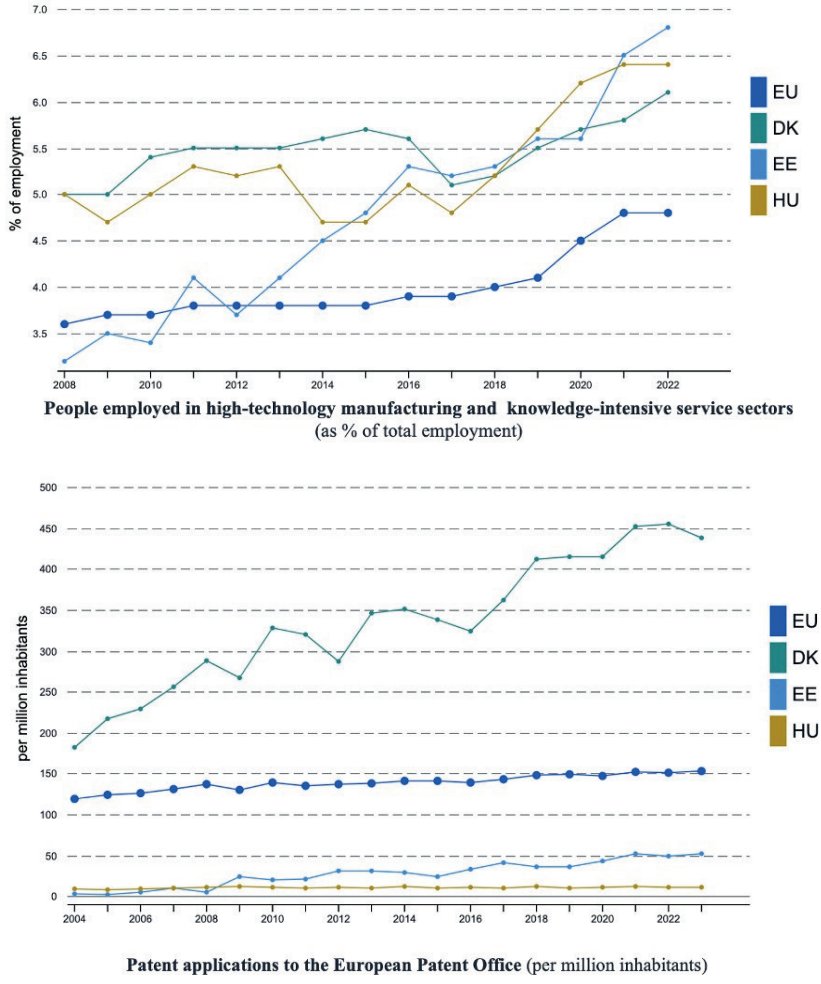


Fig. 6. Trendline assessment of employment in knowledge-intensive sectors (a) and patents (b) in the European Patent Office for Denmark, Estonia, Hungary, and the EU over the last two decades

Source: own work based on data from EUROSTAT (2023).

Denmark's results point to a developed ecosystem that fosters creativity and the creation of intellectual property. Estonia's increasing trend shows how well its policies fostering innovation work and how much room it has for growth. In Hungary, the stagnation of patent applications points to a need for policy action, including improving the funding of research and development (R&D) endeavors, strengthening the linkages between academia and business, and offering financial incentives for the patenting and commercialisation of research findings. All of these tendencies point to the necessity of having the capacity to produce and apply high-tech knowledge in order to sustain a competitive advantage in the contemporary economy.

3.4. Summary Innovation Index analysis with the EU

In this section, the assessment of the comparative innovation gap between the Hungarian SII and the EU average SII over the recent years is presented. Table 1 illustrates a quantitative assessment of Hungary's innovation performance relative to the EU average over the period 2016–2022, employing the Summary Innovation Index (SII) as a comparative metric. Through this period, the innovation gap index for Hungary G_{HU} and the index of changes in the level of the innovation gap $D_{HU/1}$ have been calculated to offer insights into Hungary's trajectory in innovation development.

Table 1. The Summary Innovation Index for Hungary and the average value for EU countries, keeping 2016 as the reference year

Year	SII_{HU}	SII_{EU}	G_{HU}	$D_{HU/1}$
2016	100.000	68.568	0.68568	0
2017	100.448	68.482	0.6817657	-0.0039143
2018	100.844	68.519	0.6794554	-0.0062246
2019	102.983	66.924	0.6498548	-0.0358252
2020	104.136	67.96	0.6526081	-0.0330719
2021	106.296	70.419	0.6624802	-0.0231998
2022	107.915	73.867	0.6844924	-0.0011876

Source: own work based on data of European Innovation Scoreboard (EIS) 2023.

Based on the table, the G_{HU} indicates Hungary's SII as a proportion of the EU average SII, shedding light on Hungary's relative standing. Initially, in 2016, Hungary's SII stood at 68.568% of the EU's average, signalling an innovation performance moderately below the EU benchmark. As we progressed through the years, there was a discernible downward trend in G_{HU}, reaching a low of 0.6498 in 2019, before slightly improving to 0.6844 by 2022. This fluctuating trend reveals

a varying pace of innovation growth in Hungary compared to the EU average, highlighting specific periods of both decline and relative recovery in Hungary's innovation efforts.

The D_{HUt1} metric provides additional nuance by depicting the direction and volatility of the change in Hungary's innovation gap compared to the reference year 2016. The negative values recorded annually from 2017 to 2021 suggest a widening innovation gap between Hungary and the EU. Notably, the year 2019 marked the most significant annual decrease, aligning with a substantial innovation gap. However, in 2022, the trend slightly reversed, as indicated by the less negative value, suggesting a modest closing of the innovation gap.

Moving to the comparison of Estonia's performance as a 'moderate innovator country' offers important lessons that Hungary might apply to improve its own innovation strategy. The success of Estonia's digital transition demonstrates the value of funding digital infrastructure and encouraging digital literacy for creativity. Furthermore, Hungary may enhance its innovation performance by investing in human capital through high-quality education and initiatives to retain talent. Estonia's focus on non-R&D innovation investments highlights the importance of a diversified innovation strategy, which Hungary can adopt by broadening innovation funding and supporting small businesses and startups. The agile workforce and lifelong learning practices in Estonia suggest the need for Hungary to encourage job mobility and continuous education to keep up with emerging trends. Estonia's decline in patent applications serves as a cautionary tale for Hungary, emphasising the importance of maintaining a balanced innovation portfolio and monitoring outcomes closely. By learning from both, Estonia's successes and failures, Hungary can enhance its innovation capacity and performance in the future maybe through interdisciplinary pedagogy (Kumar and Deák, 2023). Adopting Estonia's successful policies in digital transformation, human capital development, and broad-based innovation investments can help Hungary elevate its innovation ecosystem and contribute to overall innovation advancement in Europe and beyond.

3.5. Results of DEA analysis

The DEA comparison shows innovation efficiency discrepancies between Denmark, Estonia, and Hungary. Denmark has the highest proxy efficiency score because it effectively converts its strong R&D investments, robust venture capital market, and highly skilled workforce into innovation outputs like patent activity, knowledge-intensive employment, and international scientific collaboration. Despite its smaller economy and fewer inputs than Denmark, Estonia has a highly efficient innovation system. Its strategy focuses on digital infrastructure and human capital development helps it turn limited resources into substantial innovation, outperforming Hungary. Hungary's efficiency score is the lowest of the

three, showing underutilisation of innovation contributions. Hungary has invested in R&D capacity and digital infrastructure, but innovation outputs have not yet matched these investments, revealing structural inefficiencies and limitations in its innovation ecosystem's commercialization and collaboration.

Table 2. Results of the DEA analysis for the three selected countries

Indicator	Denmark (2023)	Estonia (2023)	Hungary (2023)
Inputs			
Public-sector R&D (% GDP)	1.05 %	0.76 %	0.47 %
Business-sector R&D (% GDP)	1.75 %	0.98 %	0.72 %
Venture-capital investment (% GDP)	0.40 %	0.15 %	0.05 %
Human resources in S&T (% employment)	25 %	19 %	14 %
Broadband penetration, households (%)	97 %	92 %	82 %
Outputs			
Patent apps. to EPO per million population	145	72	45
Sales share of new-to-market products (%)	18 %	11 %	8 %
Employment in knowledge-intensive acts. (%)	21 %	16 %	11 %
Int. scientific co-publications per million	95	48	32

Source: own work based on DG ECFIN, 2023 Country Reports (EUROSTAT, 2024).

4. DISCUSSION

It is essential to understand and evaluate the recent policy reforms designed to enhance national innovation performance for several reasons. Firstly, this enables countries to learn from each other's approaches and adopt successful practices from various contexts. Regular evaluations enable nations to measure their progress against international benchmarks, establish achievable goals, and monitor advancements over time. Ongoing assessments also provide vital feedback, helping policymakers refine their strategies for optimal effectiveness. Additionally, these evaluations encourage international cooperation by showcasing successful methods that can be adapted and implemented across different countries, pooling resources and knowledge to address global issues like climate change and health emergencies.

These policies also generate jobs by encouraging the growth of new industries and business models, which in turn stimulate economic activity. Countries or subcontinents that excel in innovation improve their global competitiveness,

attracting investments and high-value industries. Furthermore, innovation policies that prioritise sustainability support the development of green technologies, minimising environmental impact and ensuring long-term ecological stability.

Furthermore, Table 3 depicts the latest strategies that various European countries have implemented to improve their innovation capabilities for future benefits. In 2022, the New European Innovation Agenda was introduced by the European Union as a demonstration. This ambitious strategy aims to promote innovation across Europe by improving policy frameworks at various levels, supporting the growth of tech companies, and leveraging new technologies like Artificial Intelligence, machine learning, etc. Germany launched the High-Tech Strategy 2025 program in 2021 with the intention of increasing funding and promoting collaborations between the public and private sectors. The goal of this plan is to improve the innovative capacities of startups and small and medium-sized enterprises while assisting them in thriving in a competitive market. To increase competitiveness and promote environmental sustainability, France has put in place a novel investment plan that gives green technology and digital transformation first priority. In order to promote innovation, Finland's RDI Roadmap 2025 initiative seeks to fortify partnerships between the public and private sectors as well as academic institutions. Italy's National Recovery and Resilience Plan places a strong emphasis on digitalisation, innovation, and the transition to greener technologies, supported by considerable financial investments. Employing a variety of tactics in different nations demonstrates a dedication to encouraging innovation, enhancing economic expansion, and ensuring lasting sustainability. By contrast, the Netherlands have prioritised sustainability and digital transformation in important sectors with its Mission-driven top sectors and innovation policy. The goal of Sweden's innovation partnership programs is to address societal issues through cooperation between the public, private, and academic sectors. Spain's Entrepreneurial Nation Strategy encourages a mindset of entrepreneurship in the southwest region and offers financial incentives to creative small and medium-sized businesses.

These policies represent strategic responses to the evolving global innovation landscape, demonstrating how EU countries are leveraging their unique strengths to drive economic growth, create jobs, and enhance global competitiveness.

Table 3. A compilation of recent policies adopted by various European countries

Country Name	Policy Adopted	Year of Adoption	Remarks	Reference
European Union	New European Innovation Agenda	2022	Focuses on scaling up deep-tech start-ups, improving policy frameworks, and fostering innovation ecosystems.	(European Commission, 2022)

Country Name	Policy Adopted	Year of Adoption	Remarks	Reference
Germany	High-Tech Strategy 2025: Strengthening the innovation ecosystem through increased funding for startups.	2021	Aims to support start-ups and SMEs through enhanced funding mechanisms and partnerships.	(Wittmann *et al.*, 2020)
France	France 2030: A 30 billion euro investment plan focusing on green technologies and digital transformation.	2021	Investments targeting ecological transition and digital innovations to boost competitiveness.	(France Diplomacy, 2024)
Finland	Research, Development, and Innovation (RDI) Roadmap 2025: Enhancing public-private collaboration.	2022	Encourages collaboration between academia, industry, and government to drive innovation.	(STIP Compass, 2024)
Italy	National Recovery and Resilience Plan: Focus on digitalisation, innovation, and green transition.	2021	Focuses on sustainable growth and digital transformation through significant investments.	(European Commission, 2024b)
Netherlands	Mission-Driven Top Sectors and Innovation Policy: Emphasising sustainability and digital transformation.	2021	Prioritizes sustainability and digital innovations in top sectors to drive economic growth.	(Larrue, 2021)
Sweden	Innovation Partnership Programmes: Collaboration between government, industry, and academia.	2022	Aims to address societal challenges through collaborative innovation efforts.	(ECCP, 2019)
Spain	Spain Entrepreneurial Nation Strategy: Supporting startups and innovative SMEs.	2021	Targets fostering an entrepreneurial culture and supporting innovative SMEs through various incentives.	(La Moncloa, 2021)

Source: own work based on the references of the table.

5. CONCLUSION

This analysis offers a comprehensive, multi-dimensional assessment of Hungary's innovation landscape by connecting empirical performance indicators with the latest European policy changes. Adding DEA to the EIS framework has revealed an interesting finding: Hungary's innovation problems are not just related

to insufficient investment, but also to inefficiencies in converting inputs into outputs. Despite large investments in R&D and digital infrastructure, Hungary trails behind its counterparts in patents, knowledge-intensive employment, and commercialisation. This trend is evident in both, historical data and the findings of the DEA analysis. Policies examined across the EU, such as Germany's High-Tech Strategy, France's emphasis on ecological innovation, and Finland's RDI Roadmap, provide concrete examples of how targeted and coordinated changes can increase innovation efficiency. Although Hungary has implemented positive measures, such as competence centers and joint Ph.D. programs, these initiatives can be improved to systematically align with national interests.

The DEA results indicate that Estonia demonstrates superior innovation efficiency compared to Hungary, even with smaller R&D budgets. This advantage is attributed to its emphasis on digital governance, investments in non-R&D innovation, and flexible human capital strategies. In contrast, Denmark integrates ongoing investments with stable policies to maintain its position at the forefront of innovation. Hungary should focus on enhancing the internal coherence of its innovation system. This involves not only increasing funding but also addressing structural bottlenecks, strengthening inter-institutional connections, and ensuring that policy incentives are aligned with quantifiable innovation outcomes.

Moreover, this study illustrates that assessing policy reforms in the absence of a structured analytical framework may lead to oversimplification. Incorporating DEA into the analysis allows us to transcend mere descriptive performance evaluations and shift towards diagnostics focused on efficiency-driven innovation. This methodological advancement brings considerable value to policy discussions, providing a scalable framework for other moderately innovative nations aiming to enhance their innovation capacity in a resource limited context. Hungary's future course must not only emulate the financial size of innovation leaders but also adopt a results-driven policy approach, ensuring that every euro invested returns corresponding societal and economic innovation advantages.

REFERENCES

AMPONSAH ODEI, S., LASISI, T. T. and KOLAWOLE ELUWOLE, K. (2024), 'Determinants of territorial innovations in the macroregion of Visegrád countries: a seemingly unrelated probit analysis', *Review of Regional Research*, 44 (1), pp. 73–118. https://doi.org/10.1007/s10037-024-00206-y

AUDRETSCH, B. D. and BELITSKI, M. (2023), 'The limits to open innovation and its impact on innovation performance', *Technovation*, 119, 102519. https://doi.org/https://doi.org/10.1016/j.technovation.2022.102519

AUDRETSCH, D. B. and BELITSKI, M. (2020), 'The role of R&D and knowledge spillovers in innovation and productivity', *European Economic Review*, 123. https://doi.org/10.1016/j.euroecorev.2020.103391

BAJKÓ, N., FÜLÖP, Z. and PÉRCSI, K. N. (2022), 'Changes in the Innovation-and Marketing--Habits of Family SMEs in the Foodstuffs Industry, Caused by the Coronavirus Pandemic in Hungary', *Sustainability (Switzerland)*, 14 (5). https://doi.org/10.3390/su14052914

BANKER, R. D., CHARNES, A. and COOPER, W. W. (1984), 'Some Models for Estimating Technical and Scale Inefficiencies in Data Envelopment Analysis', *Management Science*, 30 (9). https://doi.org/10.1287/mnsc.30.9.1078

BRÁS, G. R. (2023), 'Pillars of the Global Innovation Index by income level of economies: longitudinal data (2011-2022) for researchers' use', *Data in Brief*, 46, 108818. https://doi.org/10.1016/j.dib.2022.108818

CIAFFI, G., DELEIDI, M. and MAZZUCATO, M. (2024), 'Measuring the macroeconomic responses to public investment in innovation: evidence from OECD countries', *Industrial and Corporate Change*, 00, pp. 1–20. https://doi.org/10.1093/icc/dtae005/7591234

DEMPERE, J., QAMAR, M., ALLAM, H. and MALIK, S. (2023), 'The Impact of Innovation on Economic Growth, Foreign Direct Investment, and Self-Employment: A Global Perspective', *Economies*, 11 (7). https://doi.org/10.3390/economies11070182

DUTTA, S., LANVIN, B., LEON, L. and VINCENT, S. (2023), *Global Innovation Index 2023*, https://www.wipo.int/global_innovation_index/en/2023/ [accessed on: 04.03.2024].

DWORAK, E. (2020), 'The innovation gap between the polish economy and the European union', *Comparative Economic Research*, 23 (3), pp. 63–73. https://doi.org/10.18778/1508-2008.23.20

ECCP. (2019), *Swedish innovation partnership programmes*, https://www.clustercollaboration.eu/content/swedish-innovation-partnership-programmes [accessed on: 02.03.2024].

EU (2020), *Updating the 2020 New Industrial Strategy: Building a stronger Single Market for Europe's recovery*, https://commission.europa.eu/document/9ab0244c-6ca3-4b11-bef9-422c7eb34f39_en [accessed on: 03.03.2024].

EUROPEAN COMMISSION (2022), *A New European Innovation Agenda*, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52022DC0332 [accessed on: 02.03.2024].

EUROPEAN COMMISSION (2023), *European innovation scoreboard*. https://doi.org/doi:10.2777/119961

EUROPEAN COMMISSION (2024a), *EUROSTAT DATA*, https://ec.europa.eu/eurostat/web/science-technology-innovation/database [accessed on: 04.05.2024].

EUROPEAN COMMISSION (2024b), *Italy's recovery and resilience plan*.

EUROSTAT (2023), *Dataset SDG GOAL-9 (Industry, Innovation and Infrastructure)*, https://ec.europa.eu/eurostat/databrowser/explore/all/tb_eu?lang=en&subtheme=sdg.sdg_09&display=list&sort=category&extractionId=sdg_09_40 [accessed on: 04.05.2024].

EUROSTAT (2024), *European Innovation Scoreboard 2024 – Methodology Report & Dataset*, https://research-and-innovation.ec.europa.eu/document/download/074d5495-433a-440f-bcf9-dc620fce7af1_en?filename=ec_rtd_eis-2024-methodology-report.pdf [accessed on: 05.05.2024].

FERRARO, S., MÄNNASOO, K. and TASANE, H. (2023), 'How the EU Cohesion Policy targeted at R&D and innovation impacts the productivity, employment and exports of SMEs in Estonia', *Evaluation and Program Planning*, 97, 102221. https://doi.org/10.1016/j.evalprogplan.2022.102221

FRANCE DIPLOMACY (2024), *France Relance recovery plan: building the France of 2030*.

KATARINA, J. and PAVOL, K. (2019), 'An in-depth analysis of the summary innovation index in the V4 countries', *Journal of Competitiveness*, 11 (2), pp. 68–83. https://doi.org/10.7441/joc.2019.02.05

KIJEK, T. and MATRAS-BOLIBOK, A. (2018), 'INNOVATIVENESS OF EUROPEAN REGIONAL SPACE: CONVERGENCE OR DIVERGENCE?', *Acta Scientiarum Polonorum. Oeconomia*, 17 (1), pp. 59–65. https://doi.org/10.22630/aspe.2018.17.1.7

KOWALSKI, A. M. (2021), 'Dynamics and Factors of Innovation Gap Between the European Union and China', *Journal of the Knowledge Economy*, 12 (4), 1966–1981. https://doi.org/10.1007/s13132-020-00699-1

KOWALSKI, A. M. and RYBACKI, J. (2021), 'Moderate innovator trap-does the convergence of innovation performance occur in the world economy?', *Economies*, 9 (1). https://doi.org/10.3390/economies9010011

KUMAR, B. and DEÁK, C. (2023), 'Evolving Minds: A Literature-Driven and Empirical Exploration of STEAM Skill Development and Learning Approaches', *Journal of Innovation Management*, 11 (4), pp. 71–96. https://doi.org/10.24840/2183-0606_011.004_0004

La MONCLOA (2021, February 11), *Spain Entrepreneurial Nation Strategy*, https://www.lamoncloa.gob.es/lang/en/temas/entrepreneurial-nation/Documents/ENE_Executive%20Summary.pdf [accessed on: 02.03.2024].

LARRUE, P. (2021), *The design and implementation of mission-oriented innovation policies: A new systemic policy approach to address societal challenges*. https://doi.org/10.1787/3f6c76a4-en

LEBDIOUI, A., LEE, K. and PIETROBELLI, C. (2021), 'Local-foreign technology interface, resource-based development, and industrial policy: how Chile and Malaysia are escaping the middle-income trap', *The Journal of Technology Transfer*, 46 (3), pp. 660–685. https://doi.org/10.1007/s10961-020-09808-3

LEITÃO, J., de BRITO, S. and PEREIRA, D. (2024),'Organizational ambidexterity, open innovation and innovation outputs: How do followers and low-flyer EU countries innovate?', *International Journal of Innovation Studies*, 8 (2), pp. 186–235. https://doi.org/https://doi.org/10.1016/j.ijis.2024.01.001

LENGYEL, B. and CADIL, V. (2009), 'Innovation Policy Challenges in Transition Countries: Foreign Business R&D in the Czech Republic and Hungary', *Transition Studies Review*, 16 (1), pp. 174–188. https://doi.org/10.1007/s11300-009-0046-5

MARČETA, M. and BOJNEC, Š. (2020), 'Drivers of Global Competitiveness in the European Union Countries in 2014 and 2017', *Organizacija*, 53 (1), pp. 37–52. https://doi.org/10.2478/orga-2020-0003

PARK, S.-C. (2014), 'Innovation policy and strategic value for building a cross-border cluster in Denmark and Sweden', *AI & SOCIETY*, 29 (3), pp. 363–375. https://doi.org/10.1007/s00146-013-0460-4

POLYAKOV, M., KHANIN, I., SHEVCHENKO, G., BILOZUBENKO, V. and KORNEYEV, M. (2023), 'Determining the Key Factors of the Innovation Gap between EU Countries', *Problems and Perspectives in Management*, 21 (3), pp. 316–329. https://doi.org/10.21511/PPM.21(3).2023.25

ROUKANAS, S. (2021), 'Measuring Innovation of Countries', *KnE Social Sciences*, 5 (9), pp. 157–189. https://doi.org/10.18502/kss.v5i9.9892

SKARE, M., GAVUROVA, B. and RIGELSKY, M. (2024), 'Quantification of the impact of innovations in industry and infrastructure for sustainable circular economy production and consumption', *Journal of Innovation & Knowledge*, 9 (1), 100456.https://doi.org/10.1016/j.jik.2023.100456

STIP COMPASS (2024), *Innovation in firms and innovative entrepreneurship in Finland*, https://stip.oecd.org/stip/interactive-dashboards/countries/Finland/themes/TH3 [accessed on: 02.03.2024].

SZOPIK-DEPCZYŃSKA, K., CHEBA, K., BĄK, I., KĘDZIERSKA-SZCZEPANIAK, A., SZCZEPANIAK, K. and IOPPOLO, G. (2020), 'Innovation level and local development of EU regions. A new assessment approach', *Land Use Policy*, 99. https://doi.org/10.1016/j.landusepol.2020.104837

WITTMANN, F., ROTH, F., WITH, M. H., LINDNER, R., YORULMAZ, M., BRATAN, T., ARENS, M., ROHDE, C., OSTERTAG, K., PFAFF, M.-T., STAHLECKER, T., ZENKER, A. and STEINEBRUNNER, D. (2020), *First Mission Analysis Report of the Scientific Support Action to the German Hightech Strategy 2025*, https://www.isi.fraunhofer.de/content/dam/isi/dokumente/ccp/2020/Hightech%20Strategy%202025%20-%20first%20mission%20analysis%20report.pdf [accessed on: 04.04.2025].

COPE
Member since 2018
JM13710

EUROPEAN SPATIAL RESEARCH AND POLICY

Volume 33 2026 Number 1

https://doi.org/10.18778/1231-1952.33.1.10

Gábor PIRISI*, Éva MÁTÉ*, András TRÓCSÁNYI*

THE ECONOMIC SIGNIFICANCE OF SMALL TOWNS IN HUNGARY: IN LIGHT OF REINDUSTRIALISATION

Abstract. Small towns play a significant role in the settlement network, primarily serving as economic and service centres for rural areas. After 1990, deindustrialisation severely impacted small towns in Central and Eastern Europe, including Hungary, challenging their competencies. However, in the 2000s, a wave of reindustrialisation began, extending to the small-town level. This study attempts to assess the economic significance of Hungarian small towns and its changes between 2011 and 2022, connecting this to the effects of reindustrialisation and exploring the regional disparities in small-town development.

Key words: small towns, Hungary, reindustrialisation, spatial convergence.

1. INTRODUCTION AND OBJECTIVES

Research on small towns generally follows two, not always interconnected, trajectories. One line of inquiry focuses on the specific characteristics of small-town societies, particularly social capital, cohesion, and patterns of local attachment (Couch, 2016; Leetma *et al.*, 2013; Putnam, 2001). From this perspective, the

* Gábor PIRISI, Éva MÁTÉ, András TRÓCSÁNYI, University of Pécs, Institute of Geography and Earth Sciences, H-7624 Pécs, 6 Ifjuság str.; e-mails: pirisi.gabor@pte.hu, mate.eva@pte.hu, troand@gamma.ttk.pte.hu, ORCIDs: https://orcid.org/0000-0003-0179-3228, https://orcid.org/0000-0003-1013-8962, https://orcid.org/0000-0002-3477-0455

Received: 25.06.2025, Revised: 01.04.2026, Accepted: 14.04.2026

Funding information: The Authors declare that the research presented in the text of the article was financed by the University of Pécs Research Fund and the National Research, Development and Innovation Office in the framework of the project NKFI-1 SNN 148581 "(Hidden) Industrial Champions: Origins, Features and Futures of Industrial Small Towns. A comparative study of Hungary and Slovenia." **Conflicts of interests:** None. **Ethical considerations:** The Authors assure no violations of publication ethics and take full responsibility for the content of the publication. **The percentage share of the Author in the preparation of the work is:** G.P. 50%, E.M. 20%, A.T. 30%. **Declaration regarding the use of GAI tools:** The Authors hereby declare that they used Google Gemini for the following purpose: translation and language upgrades. Parts of the manuscript have originally been created in Hungarian language, it was translated to English by the AI, after review, authors used once again AI for the requested upgrade of the language quality. The Authors then carried out a thorough and critical review of the text, with particular attention to potential false, incomplete, or biased information, possible plagiarism or lack of proper/accurate authorship attribution and revised it accordingly.

small town is understood primarily as a distinct community. The second major approach examines small towns within the settlement hierarchy, often from demographic or economic-geographical viewpoints (Bartosiewicz *et al.*, 2019; Horeczki and Egyed, 2021; Steinführer *et al.*, 2016), interpreting them as nodes with particular functional roles in the wider urban network.

Most authors agree that these roles are best defined in relation to rural hinterlands (Courtney *et al.*, 2007; Pirisi, 2009; Yu *et al.*, 2023). Small towns typically act as local service centres, provide access to markets, and concentrate employment opportunities, functioning as commuting hubs (Vaishar and Zapletalová, 2009). However, towards the end of the 20th century and in the early 21st century, this economic and service-providing role was increasingly challenged (Hannemann, 2004), particularly due to the effects of deindustrialisation. In Central and Eastern Europe – including Hungary – deindustrialisation occurred more rapidly than in Western Europe as part of the post-socialist transition, embedded within broader global restructuring processes (Vaishar *et al.*, 2023).

These transformations disproportionately affected small towns reliant on light industry, food processing, or extractive sectors. The erosion of economic functions also contributed to outmigration and shrinkage (Ljubenović *et al.*, 2025; Makkai *et al.*, 2017). Although additional factors, such as the withdrawal of state functions, intensified the challenges faced by these settlements, the loss of industrial employment remained central.

If this interpretation holds, then reindustrialisation may represent a significant turning point in redefining the economic position of small towns. While debates on reindustrialisation – linked to concepts such as Industry 4.0, deglobalisation, and the shortening of supply chains – have gained prominence in Europe, they seldom focus specifically on small towns (Bole *et al.*, 2020; E. Nagy *et al.*, 2024). This may seem counterintuitive, given that rural areas often retain more accessible labour reserves than highly tertiary, labour-constrained metropolitan regions. Nonetheless, reindustrialisation also contrasts with alternative development perspectives that emphasise sustainability (Mayer and Knox, 2010), liveability (Fertner *et al.*, 2015) or tourism-based strategies (Cotella and Vitale Brovarone, 2022; Leśniewska-Napierała, 2017).

Despite extensive literature on small-town economic change, including numerous case studies, attempts to quantitatively assess the economic significance of small towns remain limited. Consequently, it is not yet clear how much their economic weight declined during deindustrialisation, nor whether measurable signs of reindustrialisation have emerged at this settlement scale.

This study, therefore, pursues two main objectives. First, it evaluates the economic importance of Hungarian small towns and examines how this has evolved between 2011 and 2022. Second, it investigates whether the effects of reindustrialisation are detectable in these towns. After reviewing theoretical connections between reindustrialisation and small towns, we analyse shifts in the economic

weight of small towns using Hungarian regional statistical data. Finally, we explore how observed reindustrialisation trends relate to changes in small-town economic significance.

2. REINDUSTRIALISATION

Reindustrialisation is a relatively recent economic – spatial process, typically referring to renewed industrial expansion following a period of deindustrialisation, often in a markedly different structural and geographical context (Czirfusz *et al*., 2008; Krugman, 1988). The principal motivations commonly associated with reindustrialisation include the enhancement of competitiveness, the reduction of import dependency, employment creation, and the mitigation of social and regional inequalities (Binz and Gong, 2022; Domański, 2003; Radosevic and Rozeik, 2005). These dynamics have manifested with particular intensity in East-Central Europe (Landesmann and Székely, 1995; Lux, 2012), where the post-socialist transition, coupled with sudden market opening and long-standing capital scarcity, rendered traditional industrial sectors – such as extractive industries, metallurgy, mechanical engineering, electronics, and textiles – economically unsustainable. Subsequent waves of industrial investors arrived in the region, either revitalising existing structures or establishing new greenfield sites (Czirfusz *et al.*, 2008).

Although the post-socialist states shared a broadly similar legacy of rapid deindustrialisation, each national context developed distinct characteristics (Eichler, 2005; Sokol, 2001). Nevertheless, reindustrialisation has been most comprehensively analysed in cases such as the former East Germany, the Czech Republic, Slovakia, Poland, Hungary, Romania, Bulgaria, and Slovenia. EU accession further shaped these trajectories by introducing both the opportunities and challenges of market liberalisation – through foreign direct investment and increased exposure to goods markets – while simultaneously granting access to substantial EU funds (Kiss, 2007; Radosevic and Rozeik, 2005). The adoption of common EU competitiveness and industrial policies (e.g., Industry 4.0), along with a unified regulatory framework (European Commission, 2020), created a more predictable environment for European investors and facilitated market access for external actors.

A defining feature of reindustrialisation in East-Central Europe is its strong reliance on pre-existing socialist and early post-socialist industrial structures, combined with rapid integration into European and global production networks driven predominantly by foreign direct investment (Landesmann and Székely, 1995). While this model has contributed significantly to technological upgrading, productivity growth (Capello and Cerisola, 2022), competitiveness, and export expansion (Reinert *et al*., 2009; Radosevic and Rozeik, 2005), it has also reinforced

dependency, exacerbated regional inequalities, and limited the emergence of knowledge-intensive or higher value-added domestic sectors (Bailey *et al.*, 2016; Kovács and Domonkos, 2024; Lux, 2017; Stojčić and Aralica, 2017, 2018).

Within this broader context, several industrial sectors have reshaped the regional economic landscape. The most profound transformation has been driven by the highly complex automotive industry (Molnár and Radics, 2021; Radosevic and Rozeik, 2005), which has established major new production sites across nearly all countries in the region. This has been accompanied by the expansion of extensive supplier networks and associated industries, including electronics, OEM activities, metalworking, rubber production, IT, and communications (Turienzo and Lampón, 2023). Alongside automotive dominance, reindustrialisation has also been reflected in segments of the food, chemical, pharmaceutical, furniture, electronics, and machinery-manufacturing sectors (Lengyel *et al.*, 2017; Lux, 2017).

Spatially, reindustrialisation exhibits clear and multi-scalar patterns (Lengyel *et al.*, 2017; Lux, 2017; Kovács and Domonkos, 2024). At the macro level, industrial investment first entered East-Central Europe from the 'core' EU economies, particularly in regions with more advanced infrastructures and innovation capacities. Former East Germany, the Czech Republic, Slovenia, and the western peripheries of Poland and Hungary formed the leading zones of early reindustrialisation. As transport infrastructures expanded and the EU enlarged, investment gradually spread to additional regions. At the meso level, the initial dominance of metropolitan and large-urban areas gave way to increasing concentration in medium-sized and small-town settings, which still possessed available labour reserves and brownfield redevelopment opportunities (Lengyel *et al.*, 2017). Across all cases, accessibility and infrastructural development were fundamental prerequisites. At the local scale, industrial sites systematically relocated from inner-urban brownfield belts to suburban and peri-urban areas, reflecting broader trends in urban restructuring.

Despite these developments, the specific role of small towns in reindustrialisation remains insufficiently explored. Regional-scale analyses tend to dominate the field, leaving the contribution of small towns implicit or overshadowed. Yet certain indicators hint at their growing role. EUROSTAT data, for example, shows that between 2015 and 2023 the share of industry in gross value added for predominantly urban regions remained nearly constant (15.3% → 15.5%), while rural regions – where small towns exert significant influence – experienced a notable increase (24.0% → 28.5%) (Eurostat, 2026).

From a theoretical perspective, Capello and Cerisola's (2023) typology of reindustrialisation – distinguishing upgrading, reorientation, and diversification – suggests that small towns may follow multiple, path-dependent trajectories. Scholars have also stressed the importance of local industrial culture and traditions in enabling advanced technological activities to emerge even in formerly peripheral industrial locations (Demirović Bajrami *et al.*, 2025; Pipan, 2018). However,

comprehensive analyses assessing the general extent to which small towns can be considered beneficiaries of reindustrialisation are still absent from the literature.

Beyond theoretical relevance, this question has significant implications for regional policy. If small towns were long viewed as the 'losers' of globalisation, it becomes essential to ask whether they might instead become 'winners' of recent deglobalisation and onshoring tendencies, including reindustrialisation. Equally, the issue may be framed in terms of whether a long-term development strategy can be anchored in positioning small towns as (re)industrial hubs, offering stable employment for rural populations that typically do not possess higher education qualifications.

At the European level, reindustrialisation gained political prominence primarily in the 2020s. Key milestones included 'A New Industrial Strategy for Europe' (European Commission, 2020) and the SME Strategy published concurrently. Subsequent revisions, accelerated by rapidly changing global conditions, culminated in new initiatives such as the European Chips Act (European Parliament and Council, 2023) and the recent proposal of the Industrial Accelerator Act (Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs, 2026). While these frameworks emphasise restoring autonomy in strategic sectors, fostering the green transition, and shortening supply chains, their spatial implications – particularly for small towns – remain secondary.

In the Hungarian context, reindustrialisation became an explicit development strategy during the 2010s. The Hungarian Prime Minister repeatedly emphasised the centrality of industrial production and industrial employment (Orbán, 2013), framing these objectives within a broader strategy of constructing a "work-based society" (Lakner and Tausz, 2016). According to members of the political elite, this orientation represents a crucial foundation for success in the 21st century (Orbán, 2017, 2024; Hungary Today, 2024). Despite this rhetoric, between 2011 and 2022 the share of industry in Hungary's GDP fell slightly (by 0.45%), while industrial employment remained essentially stagnant. These dynamics compare favourably with other Visegrád Group countries, where declines were more pronounced, but they nonetheless raise questions regarding the effectiveness of Hungary's reindustrialisation efforts. After more than a decade of policy emphasis, it is timely to assess the extent to which these developments have benefited small towns.

3. MATERIALS AND METHODS

For the purposes of this research, a small town is defined as a settlement with an urban status (town rank) whose population did not exceed 30,000 in 2022. In recent years, this threshold has become conventional in small-town studies, as empirical experience suggests that it best approximates the dividing line between

small and medium-sized towns (Pirisi and Trócsányi, 2015). The justification is twofold: first, at the time of data collection even the smallest county seated exceeded 30,000 inhabitants; second, many larger non-county-seat towns formally classified as urban ("cities with county rights") functioned as secondary regional centres rather than local small towns. Setting a 30,000-inhabitant threshold therefore ensures that the analysis focuses on towns whose institutional provision remains at most at the district level and whose functional embeddedness is primarily local. Although the use of administrative urban status as a lower boundary may appear somewhat arbitrary, the wave of formal urbanisation in the 2000s (Karsai and Trócsányi, 2019) resulted in a set of officially designated towns that, while not perfect, largely corresponds to settlements of genuine economic relevance.

Using this definition, the sample comprises 315 small towns with a combined population of 2.93 million. The smallest settlement included had slightly over 1,000 inhabitants, while the largest had exactly 30,000. For comparison, the analysis distinguishes three additional categories within the Hungarian settlement system: the capital city, 32 medium-sized and large cities, and 2,807 villages.

In several parts of the analysis, it was necessary to examine separately those small towns situated within metropolitan areas. These were identified based on their official classifications by the Hungarian Central Statistical Office (KSH, 2014). This delineation is widely used in spatial research and planning and it is grounded primarily in labour-market linkages – particularly commuting patterns – supplemented by several additional indicators. In practice, only the 32 small towns within the Budapest metropolitan region display distinct development pathways. By contrast, the 44 small towns classified within the agglomerations of regional cities form a coherent group with the remaining 239 non-agglomerated small towns.

The data was sourced from the KSH and accessed through the TEIR regional information system. Certain variables – such as the distribution of employed persons per economic sector – were only available from the 2022 census, which is why this year serves as the endpoint of the analysis. To maintain parsimony, the study focuses on the following indicators for each settlement:

– Permanent population,
– Number of active-age population (15–64 years),
– Number of employed persons within the settlement's population, specifically the number of employees in industry and construction (local residents only),
– Revenue of enterprises (at 2022 prices),
– Export revenue of enterprises (at 2022 prices),
– Number of people employed in the settlement,
– inbound and outbound commuter flows,
– Number of enterprises employing more than 250 people.

All indicators were collected for the years 2011 and 2022. The choice of these years was deliberate: census years provide a robust basis for comparison, and the period in question coincides with the era in which reindustrialisation became an

explicit policy priority in Hungary. The aim was, therefore, to examine both the baseline situation and the dynamics of change.

However, the dataset has notable limitations that must be considered when interpreting the results. At the settlement level, publicly available data do not distinguish between industrial and non-industrial activities with regard to revenues, commuting, large employers, and exports. Moreover, corporate statistics only include enterprises liable for corporate tax; consequently, major public institutions (e.g., hospitals) do not appear among large employers. In most small towns, large enterprises are manufacturing firms; exceptions include tourism-intensive towns and specialised service or logistics centres. Export revenue also serves as a useful proxy for industrial activity: according to KSH data, approximately 85% of Hungary's exports consist of merchandise trade, a share likely even higher in small-town economies. A substantial rise in export values therefore typically signals industrial expansion.

Another complication arises from the recording of data at the settlement of a company's registered headquarters, rather than at the location of production. Some well-known cases involve small-town production sites whose outputs are accounted for in larger towns or cities serving as headquarters. This issue generally underestimates the actual performance of small towns while inflating the economic weight of larger centres.

Static and dynamic indicators were generated from the data. For 2011, per capita revenue, employment rate, the share of inbound commuters, and the number of large enterprises served as baseline variables. These four inputs were standardised to z-scores, following an approach successfully applied in earlier studies of small-town differentiation (Konecka-Szydłowska *et al.*, 2018). The sum of these values served as an index of economic significance, based on which small towns were grouped into quartiles and classified as above average (upper quartile), average (2nd–3rd quartile) or below average (lower quartile). The same procedure was repeated using change ratios between 2011 and 2022, offering a simplified visualisation of dynamic trends. While not optimal for evaluating individual settlements, this approach effectively highlighted broader regional patterns.

In the final step, small towns affected by reindustrialisation were identified based on two distinct criteria. A town was categorised as Type R1 if:

– the share of industrial employees increased by at least 1 percentage point between 2011 and 2022 and

– the commuting balance (inbound/outbound commuters) improved by at least 25%.

A town was classified as Type R2 if:

– per capita export revenue at least doubled and

– the number of enterprises employing more than 250 people increased by at least one.

Maps were generated using QGIS 3.34, and all statistical analyses were conducted using descriptive regional analytical methods.

4. RESULTS

4.1. Economic weight of small towns

Our previous research has indicated that small towns closely align with the national average across a range of social and economic indicators (Trócsányi *et al.*, 2018). This context is essential when interpreting the results presented below. The total population of small towns – 2.93 million – represents approximately 30% of the national population. This proportion serves as a benchmark for assessing whether small towns are over or under-represented in various economic dimensions.

Table 1. Share of economic indicators by settlement category (2022)

Categories	Population [%]	Revenues [%]	Export revenues [%]	Companies with over 250 employees [%]	Share of industrial employees [%]	Share of incoming commuters [%]
Budapest	16.3	42.5	33.6	36.8	10.7	23.7
Other cities	22.9	24.6	31.9	27.9	22.9	29.9
Small towns	30.2	23.7	25.7	24.3	32.5	30.2
Villages	30.6	9.2	8.8	10.9	33.9	16.2

Source: own calculations and compilation based on KSH data.

Table 1 shows that the share of small towns is below the national average in terms of total revenue, export revenue, and the number of large enterprises. These indicators are strongly interrelated, and the moderate under-representation of small towns can be explained, at least in part, by the fact that firms headquartered in the capital or larger cities often conduct their actual production in small towns, but their performance is statistically attributed to their headquarters. However, the export share of small towns exceeds their revenue share, suggesting a relatively stronger industrial orientation – given the predominantly manufacturing origins of export activity.

A further indicator underlining this is the share of industrial employees. At 32.5%, small towns exhibit the highest value among all settlement categories. Their share of industrial employment surpasses that of large cities (27.5%) and, unsurprisingly, the capital (15.3%). Villages have an even higher proportion (33.9%), which reflects the concentration of manufacturing jobs in areas accessible from both small and large towns. Since corporate activities are inversely concentrated relative to industrial employment, it can be inferred that many industrial positions in towns – large and small – are filled by commuters from surrounding villages. Nonetheless, the commuting share of small towns precisely matches the national average, which is somewhat unexpected given their presumed functional centrality.

Table 2. Share of agglomerated and other small towns in small-town economic performance (2022)

Categories	**Number**	**Share of population** [%]	**Revenues** [%]	**Export revenues** [%]	**Companies with over 250 employees** [%]	**Share of industrial employees** [%]	**Share of incoming commuters** [%]
Small towns in the Budapest agglomeration	32	14.8	30.4	29.5	24.4	13.2	23.9
Other small towns	283	85.2	69.6	70.5	75.6	86.8	76.1

Source: own calculations and compilation based on KSH data.

Behind the average values of small towns lie substantial internal differences (Table 2). Most notably, the small towns of the Budapest agglomeration form a distinct group. Despite representing less than a sixth of the total small-town population, they generate roughly a third of all revenues and exports. Their above-average share of inbound commuters is also notable – particularly for settlements with suburban characteristics.

4.2. Trends in the changing significance of small towns

Between 2011 and 2022, Hungary experienced one of its most dynamic periods since the 1990 transition. During this period, average annual GDP growth approached 3% and per capita GDP in euros increased by 61%. Much of this expansion was driven by employment rather than productivity growth (Lengyel and Varga, 2018). The employment rate of 15–64-year-olds rose from 64.5% to 77.3%. These favourable macro-level trends are also reflected in small towns (Table 3).

Table 3. Change in selected economic indicators between 2011 and 2022 across different settlement categories

Categories	**Company revenues** [%]	**Export revenues** [%]	**Companies with over 250 employees** [%]	**Industrial employees** [%]	**Incoming commuters** [%]
Budapest	174	268	118	120	194
Other cities	203	249	105	116	150
Small towns	179	213	121	117	149
Villages	192	194	190	125	158
National average	183	238	120	119	160

Source: own calculations and compilation based on KSH data.

Across multiple indicators, the rate of change in small towns closely matched the national average. Yet a crucial observation is that, while static 2022 values often placed small towns near national norms, the overall dynamics suggested a relative lag. Small towns reached or exceeded the national rate of change only in two areas: growth in the number of large enterprises and growth in the number of industrial employees. In contrast, deviations in total revenue and export growth rates were notable, partly explained by the rapid – though low-base – growth of villages.

The marked increase in export revenues relative to total revenues indicated deepening integration into global markets and value chains. Similarly, the rise in inbound commuter flows – growing faster even than total employment – highlighted increasing labour-market integration. However, the increase in industrial employees represented little more than maintenance of the existing structure: nationally, the proportion of industrial employees remained essentially unchanged between 2011 and 2022 (28.3% → 28.2%). In small towns specifically, this share declined slightly (32.2% → 31.6%).

Table 4. Change in selected economic indicators in agglomerated and other small towns (2011–2022)

Categories	**Company revenues** [%]	**Export revenues** [%]	**Companies with over 250 employees** [%]	**Industrial employees** [%]	**Incoming commuters** [%]
Small towns in the Budapest agglomeration	215	331	161	133	170
Other small towns	164	185	113	115	143

Source: own calculations and compilation based on KSH data.

When small towns in the Budapest agglomeration are analysed separately, a markedly different pattern emerges. In these settlements, growth consistently exceeds the small-town average – especially in export revenues, but also in industrial employment and commuter inflows. Notably, more than half (23 of 44) of the new large enterprises established during the period were located in just 15% of small towns, predominantly in the agglomeration.

Economic concentration varied greatly by indicator. While industrial employees and commuters were relatively evenly distributed, large enterprises showed strong concentration, and revenue and export values were extremely concentrated. This was partly influenced by the headquarters-location issue previously discussed, which tends to exaggerate the centralisation of economic activity.

Between 2011 and 2022, concentration declined in four of the five indicators (revenue being the exception). The most substantial shift occurred in exports, which initially exhibited the highest concentration. Nevertheless, the pattern of deconcentration had limits. For indicators such as the number of large enterprises and industrial employees, the second quintile emerged as the clear beneficiary, suggesting that moderately developed small towns captured a disproportionate share of growth.

Table 5. Economic concentration in small towns

Categories	2011		2022	
	Share of the top 10 small towns [%]	Number of towns exceeding 50% of the total value	Share of the top 10 small towns [%]	Number of towns exceeding 50% of the total value
Revenues	42.0	15	45.0	13
Export revenues	62.0	6	55.2	8
Companies with over 250 employees	30.6	23	28.8	26
Industrial employees	12.4	71	11.6	74
Incoming commuters	20.2	43	19.3	44

Source: own calculations and compilation based on KSH data.

4.3. Reindustrialisation of small towns

Reindustrialisation was identified according to two distinct criteria. Type R1 towns experienced growth in both the share of industrial employees and in commuting balance; Type R2 towns saw significant increases in export revenue and in the number of large enterprises. In total, 20 towns were categorised as Type R1 and 22 as Type R2, with only two towns fulfilling both criteria – resulting in 40 reindustrialising small towns.

Average population sizes differed between the types: Type R1 towns averaged around 9,000 inhabitants, whereas Type R2 towns averaged approximately 12,200. Overall, these 40 reindustrialising towns constituted 13% of all small towns and 15% of the small-town population. Larger small towns were somewhat more likely to fall into this group: 11% of towns with <10,000 inhabitants, 15% of those between 10,000 and 20,000, and 22% of those above 20,000 were

categorised as reindustrialising. Geographically, only three towns lied within the Budapest agglomeration and three on its outer fringe; five functioned as suburbs of major regional cities (Fig. 1.)

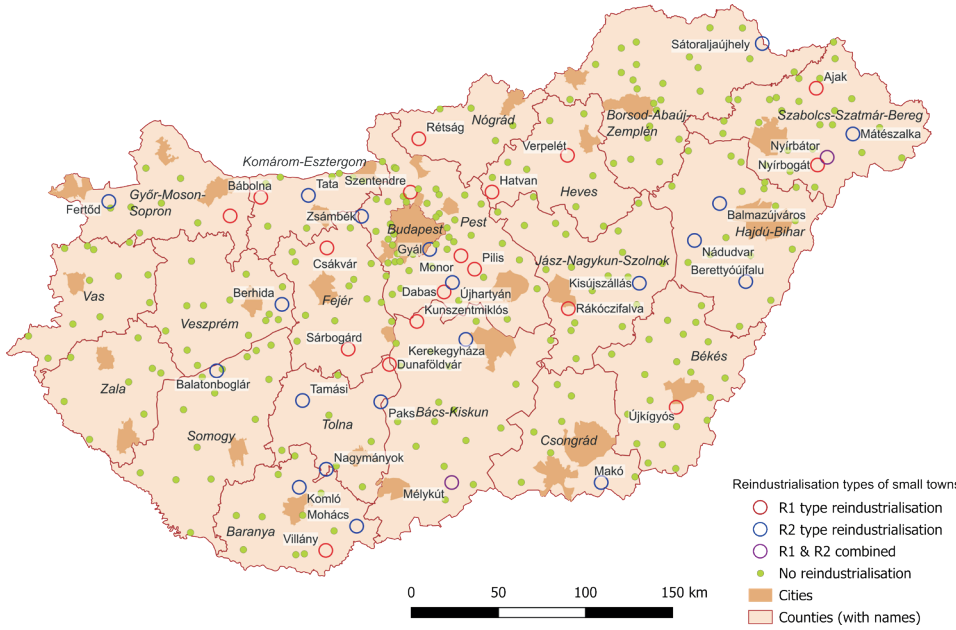


Fig. 1. Reindustralisation types of small towns

Source: own edition based on KSH-data.

A defining feature of this group is the dynamic expansion of large enterprises. The number of firms employing over 250 people in reindustrialising towns tripled from 17 in 2011 to 52 in 2022. Their share of all large enterprises in small towns rose from 8.3% to 20.8%. However, it remains uncertain how many of these firms represented genuinely new investments. The simultaneous decline in the number of mid-sized enterprises (50–250 employees) by 40 raises questions: this pattern may suggest that industrial growth in reindustrialising towns was driven at least partly by the expansion of locally embedded small and medium-sized firms rather than by new greenfield arrivals.

Previous research (Trócsányi *et al.*, 2018) indicated that many of these towns had limited or secondary industrial traditions prior to reindustrialisation. Only a minority – including Mohács, Hatvan, Komló, and Berhida – fit the profile of former industrial towns experiencing genuine recovery after long-term decline. Other cases included formerly suburban settlements without distinct economic profiles (e.g., Pilis, Újhartyán, Rákóczifalva), agrarian towns (e.g., Nádudvar, Bábolna), and regional service centres (e.g., Berettyóújfalu, Csákvár).

4.4. Spatiality of small-town transformation

There has long been a consensus in academic literature regarding the fundamental elements defining Hungary's spatial structures. The determining features of the spatial structure that emerged after the political transition include: the significant economic weight of the capital city and its region, a north-west to (south-)east development slope, the relative weakness of regional centres, and the underdevelopment of tiny-village areas located in external and internal peripheries, some with highly fragmented structures (Nemes-Nagy, 2000; Pénzes *et al.*, 2015; Rechnitzer *et al.*, 2014). These conditions mean that the capital city, interpreted as a separate region, accounts for 168% of the EU's GDP per capita (calculated on a PPP basis). The three more developed regions, covering the north-western parts of the country and encompassing the capital's agglomeration, stand at 65–68%, while the four less developed regions (including the southwest in addition to the whole of Eastern Hungary) are at 48–54%, forming a tripartite structure in terms of development.

These conditions are also reflected in the context of small towns. Figure 1 visualises this by combining static data from 2011 (colouring of the symbols) with changes between 2011 and 2022 (shape of the symbols). It is visible that economically significant small towns are found almost exclusively in the Northwest and the Budapest agglomeration. Outside these areas, only a few important industrial sites (e.g., Paks with Hungary's only nuclear power plant, Tiszaújváros, a centre of petrochemicals, etc.) or spa towns and tourist centres fall into this category. The reverse is also true: the developed, central, and north-western regions generally feature small towns with less than average economic weight.

However, the average and less developed categories do not separate so clearly in space; rather, the data suggests that small towns with the least economic weight are concentrated along the country's borders (external peripheries) and often along county borders (internal peripheries).

If we compare the static picture with its change dynamics (above average growth, average, below average growth), the spatial pattern changes significantly. Higher dynamism is linked to lower levels of development. This is not only visible in the spatial representation (the changes in small towns in Győr-Moson-Sopron, Vas or Veszprém counties are particularly noteworthy) but also statistically demonstrable, as there is a correlation coefficient of -0.13 between the 2011 Z-score values and the change values, indicating a very weak but negative connection. Only 16% of small towns that were above average in development in 2011 showed high dynamism, while 35% of the least developed ones did.

It is not necessarily true that dynamically developing settlements are found only in peripheral locations. While we do see such small towns in both internal and external peripheries – such as the southern part of Bács-Kiskun County, the

eastern region of Jász-Nagykun-Szolnok County, and even in the north-eastern border areas – they are also commonly concentrated at the edges of central regions. For example, this can be observed on the southeastern fringe of the Budapest agglomeration or in the southern part of Fejér County, which is generally considered developed but has distinct divides.

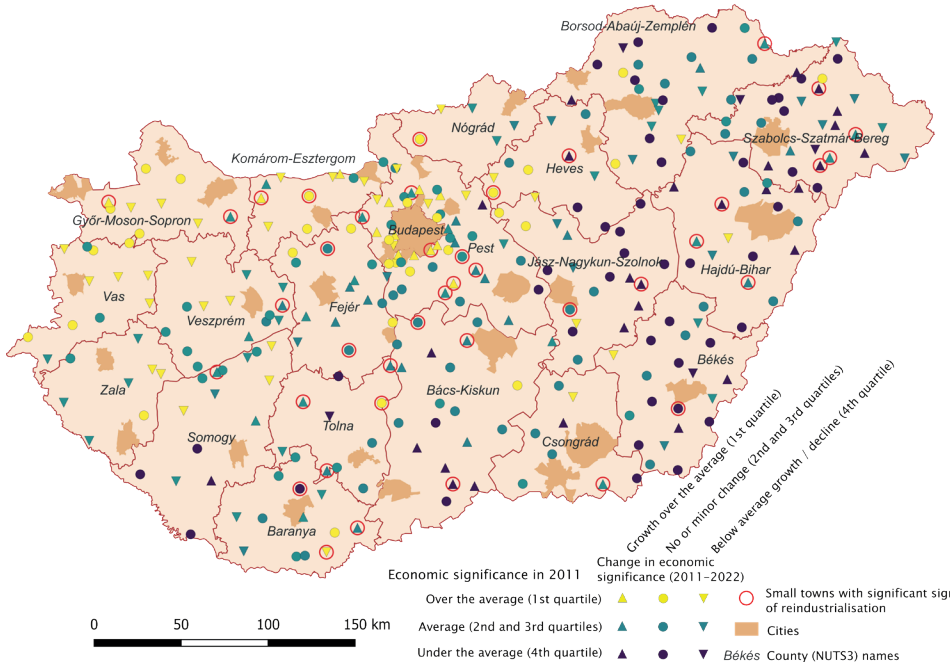


Fig. 2. Economic significance of small towns (2011), their change (2011–2022), and their involvement in reindustrialisation

Source: own edition based on KSH-data.

In terms of population, the catching-up small towns tend to be smaller. The average population of high-dynamism settlements in the lowest development category is 6,800, although it is also true that the average population of low-base but declining settlements is even smaller (5,900) and significantly lags dynamic (15,000) or declining (11,500) small towns that started from a higher base.

Reindustrialisation is closely linked to dynamic development. In fact, 35% of small towns in the upper quartile, known for their rapid growth, were classified as being affected by reindustrialisation. In contrast, only 5.5% of towns in all other quartiles fell into this category. Looking at it from another angle, towns undergoing reindustrialisation were evenly distributed among

all groups in 2011. However, by 2022, small towns in the high-development group were significantly overrepresented, accounting for 45% of all reindustrialising small towns.

5. DISCUSSION

A central issue when interpreting the results concerns the longstanding debate on convergence versus divergence in regional development. This question has been the focal point of spatial research for decades – even under the planned economy – and it grew substantially in importance after the political transition of the 1990s. Early transition years were characterised by rapid social polarisation, which manifested strongly at the territorial level (Kovács, 2004; Rechnitzer, 2012).

From the outset, assessments of these processes have been shaped by two factors:

(1) the theoretical framework applied, and

(2) the spatial scale of analysis.

Macro-level studies focusing primarily on GDP have generally highlighted the European convergence of the Hungarian economy as a whole (Herz and Vogel, 2003). Over time, however, this optimism weakened. By the second half of the 2010s, even amid comparatively strong economic growth (Lengyel and Varga, 2018), doubts about convergence resurfaced, as Hungary's regions continued to lag behind those of other Central European transition countries (Benedek and Kocziszky, 2015).

In contrast, studies adopting a critical geographical perspective (G. Nagy *et al.*, 2012; Timár, 2007) or exploring sub-regional and local dynamics (Bakucs and Fertő, 2020) emphasised social and spatial polarisation from the beginning, highlighting processes of marginalisation and the limited effectiveness of territorial policies. Previous small-town research similarly concluded that long-term disparities persist (Pirisi and Trócsányi, 2015).

Against this backdrop, the present research offers a more nuanced perspective on small-town development. The findings reveal a trend towards partial equalisation during the 2010s: less developed small towns generally experienced faster growth than their more developed counterparts, resulting in a decline in the concentration of economic performance. Given that employment expansion was a central component of Hungary's growth model during this period, it is unsurprising that many peripheral areas – where labour reserves remained available – were able to benefit.

However, this equalisation is neither uniform nor universal. The most dynamic catching-up processes occurred in territories located at the edges of existing

development poles, such as the southeastern fringe of the Budapest agglomeration, northern Bács-Kiskun County, and southern Fejér County. What appears as territorial equalisation is, therefore, partly explained by the outward extension of central, already strong regions and only to a lesser extent by genuine improvements in peripheral areas. For most small-town residents, relative position within the national hierarchy remains the dominant component of their lived experience.

A broader question concerns the success or limitations of reindustrialisation as a development strategy. Evaluating reindustrialisation is inherently complex. In many regions with strong industrial legacies, reindustrialisation is viewed as essential for socio-economic recovery (Krzysztofik *et al.*, 2019), reflecting the deeply path-dependent nature of industrial transitions. However, the number of small-town case studies remains limited compared with regional-scale analyses. Existing research raises additional considerations: for instance, some authors have emphasised the role of reindustrialisation in community rebuilding (Cercleux *et al.*, 2022), while others – using a more literal understanding of reindustrialisation – have warned that local labour-force limitations may prevent small towns from engaging in advanced industrial trajectories (Dabasi-Halász *et al.*, 2021). This raises doubts about the long-term viability of strategies based on the traditional heavy industry. Consequently, complementary or hybrid development models, including tourism–industry co-evolution, have gained increasing attention (Napierała *et al.*, 2022).

The findings of this study only partially support such concerns. While small towns exhibit high employment rates and growing levels of commuting – both from surrounding villages to towns and from small towns to larger centres – labour reserves are indeed becoming increasingly constrained. In this context, the organised import of foreign labour, already evident in Hungary (Jankó *et al.*, 2024), may introduce social tensions, particularly in smaller and more socially cohesive communities.

The results also suggest that multiple pathways of small-town reindustrialisation coexist. The distinction between Type R1 and Type R2 towns captures this diversity well. While Type R2 reindustrialisation is more closely associated with the entry or expansion of major external investors, Type R1 reflects more organic development – linked to regional labour-market integration and the growth of locally embedded firms. This aligns with case studies that highlight the role of local industrial traditions, workforce skills, and institutional legacies, and emphasise the importance of small and medium-sized enterprises integrating into wider production networks (Molnár *et al.*, 2022; Molnár and Lengyel, 2015).

Overall, reindustrialisation appears to have partially fulfilled the expectations placed upon it. It has contributed to employment expansion, local economic dynamism, and, crucially, the re-integration of surrounding rural areas into the economic orbit of small towns. Rising industrial employment in villages is closely linked to the strengthening of nearby small towns. Yet the concentration of revenue and

export performance remains high, raising questions about the long-term sustainability of reindustrialisation-led growth, particularly in peripheral locations. While reindustrialisation can provide short to medium-term momentum, its capacity to drive lasting structural change in the broader small-town space remains uncertain.

6. SUMMARY

This study set out to explore the economic weight of small towns in Hungary and how it changed between 2011 and 2022, a period characterised by relatively rapid national growth. During these years, reindustrialisation played a central role in economic policy. Accordingly, the research also sought to assess whether reindustrialisation represents a realistic development trajectory for small towns.

The findings indicate that small towns contributed slightly less to Hungary's economic output than their share of the population would imply. However, this discrepancy was modest. Small-town enterprises played a substantial role in employment generation, particularly in manufacturing, where they were over-represented compared with larger urban centres.

The period between 2011 and 2022 did not fundamentally alter this overall picture. Nevertheless, the processes of spatial deconcentration and partial territorial equalisation were more pronounced than before. Economically weaker small towns generally recorded substantial growth in revenues, the number of large enterprises, and employment – especially industrial employment.

Reindustrialisation played a non-negligible part in these developments. The 40 small towns identified as reindustrialising displayed significantly higher dynamism than those not affected by industrial expansion. At the same time, the findings show that reindustrialisation did not substantially transform the established spatial structure of the small-town system. Many of the apparent equalisation effects reflected the outward extension of already developed regions, rather than widespread improvements across peripheral areas. In the peripheries, reindustrialisation tends to manifest as isolated cases of accelerated growth, producing a mosaic of 'islands' rather than coherent regional uplift.

Importantly, reindustrialisation – through increasingly integrated labour markets – strengthened the employment base not only of small towns but also of their rural hinterlands. Rising industrial employment in villages suggests that reindustrialising small towns have partially rebuilt the functional linkages that had weakened during the post-socialist transition.

Overall, the study concludes that reindustrialisation can enhance the economic dynamism of small towns and support local and regional labour markets. However, its long-term capacity to reshape the broader small-town landscape remains uncertain, especially in structurally disadvantaged peripheral regions.

REFERENCES

BAILEY, D., LENIHAN, H. and DE RUYTER, A. (2016), 'A cautionary tale of two «tigers»: Industrial policy 'lessons' from Ireland and Hungary?', *Journal of the Local Economy*, 31 (8), pp. 873–891. https://doi.org/10.1177/0269094216677779

BAKUCS, Z. and FERTŐ, I. (2020), 'Convergence or Divergence? Analysis of Regional Development Convergence in Hungary', *Eastern European Countryside*, 25 (1), pp. 121–143. https://doi.org/10.12775/eec.2019.005

BARTA, G., CZIRFUSZ, M. and KUKELY, G. (2008), 'Re-industrialisation in the World and in Hungary', *European Spatial Research and Policy*, 15 (2), pp. 5–26.

BARTOSIEWICZ, B., KWIATEK-SOŁTYS, A. and KUREK, S. (2019), 'Does the process of shrinking concern also small towns? lessons from Poland', *Quaestiones Geographicae*, 38 (4), pp. 91–105. https://doi.org/10.2478/quageo-2019-0039

BENEDEK, J. and KOCZISZKY, G. (2015), 'Paths of Convergence and Polarization in the Visegrád Countries', [in:] LANG, T., HENN, S., EHRLICH, K. and SGIBNEW, W. (eds), *Understanding Geographies of Polarization and Peripheralization: Perspectives from Central and Eastern Europe and Beyond*, pp. 217–234, Palgrave Macmillan. https://doi.org/10.1057/9781137415080_12

BINZ, C. and GONG, H. (2022), 'Legitimation dynamics in industrial path development: New-to-the-world versus new-to-the region industries', *Regional Studies*, 56 (4), pp. 605–618. https://doi.org/10.1080/00343404.2020.1861238

BOLE, D., KOZINA, J. and TIRAN, J. (2020), 'The socioeconomic performance of small and medium sized industrial towns: Slovenian perspectives', *Moravian Geographical Reports*, 28 (1), pp. 16–28. https://doi.org/10.2478/mgr-2020-0002

CAPELLO, R. and CERISOLA, S. (2023), 'Regional reindustrialization patterns and productivity growth in Europe', *Regional Studies*, 57 (1), pp. 1–12. https://doi.org/10.1080/00343404.2022.2050894

CERCLEUX, A. L., SORENSEN, A., MERCIU, F. C., SAGHIN, I., PARASCHIV, M., SECĂREANU, G., SĂGEATĂ, R. and IANOŞ, I. (2022), 'Community re-creating of a small industrial town in Southeast Europe: lessons from Fieni, Romania', *Mitteilungen Der Österreichischen Geographischen Gesellschaft*, 164, pp. 311–336. https://doi.org/10.1553/moegg164s311

COTELLA, G. and VITALE BROVARONE, E. (2022), 'Tourism as an opportunity to effectively counteract marginalisation: the case of the Italian national strategy for inner areas', *European Spatial Research and Policy*, 29 (2), pp. 59–77. https://doi.org/10.18778/1231-1952.29.2.04

COUCH, J. (2016), *The small-town Midwest: Resilience and hope in the twenty-first century*, University of Iowa Press. https://doi.org/10.1353/book44994

COURTNEY, P., MAYFIELD, L., TRANTER, R., JONES, P. and ERRINGTON, A. (2007), 'Small towns as "sub-poles" in English rural development: Investigating rural-urban linkages using sub-regional social accounting matrices', *Geoforum*, 38 (6), pp. 1219–1232. https://doi.org/10.1016/j.geoforum.2007.03.006

DABASI-HALÁSZ, Z., LIPTÁK, K., SÁFRÁNYNÉ GUBIK, A. and VARGA, B. (2021), 'Human resources requirements for reindustrialisation in Borsod-Abaúj-Zemplén county', *Studia Mundi – Economica*, 8 (4), pp. 55–71. https://doi.org/10.18531/Studia.Mundi.2021.08.04.55-71

DEMIROVIĆ BAJRAMI, D., PETROVIĆ, M. D., TURGEL, I. D., RADOVANOVIĆ, M. M. and BUGROVA, E. D. (2025), 'Reindustrializing the Hidden Gems: A Systematic Review of Creative Efforts in Second-Tier Cities', *Urban Science*, 9 (12). https://doi.org/10.3390/urbansci9120493

DIRECTORATE-GENERAL FOR INTERNAL MARKET, INDUSTRY, ENTREPRENEURSHIP AND SMES 2026: COM(2026)100 - Proposal for a Regulation on establishing a framework of measures for accelerating industrial capacity and decarbonisation in strategic sectors (Industrial Accelerator Act). 4 March 2026.

DOMAŃSKI. B. (2003), 'Industrial Change and Foreign Direct Investment in the Postsocialist Economy: the case of Poland', *European Urban and Regional Studies*, 10 (2), pp. 99–118. https://doi.org/10.1177/0969776403010002001

EICHLER, M. (2005), 'Explaining postcommunist transformations: Economic nationalism in Ukraine and Russia', [in:] HELLEINER, E. and PICKEL, C. (eds), *Economic Nationalism in a Globalizing World, Cornell Studies in Political Economy*, Ithaca: Cornell University Press, pp. 69–87. https://doi.org/10.7591/9781501726620-006

EUROPEAN COMMITTEE (2020), A New Industrial Strategy for Europe. Brussels 10.3.2020 COM(2020) 102 final, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX-:52020DC0102 [accessed on: 12.01.2026].

EUROPEAN PARLIAMENT AND EUROPEAN COUNCIL (2023), Establishing a framework of measures for strengthening Europe's semiconductor ecosystem and amending Regulation (EU) 2021/694 (Chips Act). Regulation (EU) 2023/1781 of the European Parliament and of the Council, Brussels, 13 September 2023.

EUROSTAT (2026), *Gross value added at basic prices by other typologies*. https://doi.org/10.2908/URT_10R_3GVA

FERTNER, C., GROTH, N. B., HERSLUND, L. and CARSTENSEN, T. A. (2015), Small towns resisting urban decay through residential attractiveness. Findings from Denmark, *Geografisk Tidsskrift-Danish Journal of Geography*, 115 (2), pp. 119–132. https://doi.org/10.1080/00167223.2015.1060863

HANNEMANN, Ch. (2004), *Marginalisierte Städte. In Probleme, Differenzierungen und Chancen ostdeutscher Kleinstädte im Schrumpfungsprozess*, Berlin. Berliner Wissenschafts-Verlag.

HERZ, B. and VOGEL, L. (2003), *Regional Convergence in Central and Eastern Europe: Evidence from a Decade of Transition*. Universität Bayreuth Rechts- Und Wirtschaftswissenschaftliche Fakultät Wirtschaftswissenschaftliche Diskussionspapiere, 13 (3), pp. 1–30. https://doi.org/10.2139/ssrn.988275

HORECZKI, R. and EGYED, I. (2021), 'Small town development in peripheral areas', *Deturope – The Central European Journal of Regional Development and Tourism*, 13 (2), pp. 52–65. https://doi.org/10.32725/det.2021.013

HUNGARY TODAY (2024), *Construction of One Hundred New Factories to Start This Year*, The Foreign Minister's video announcement, https://hungarytoday.hu/construction-of-one-hundred-new-factories-to-set-off-this-year/ [accessed on: 20.01.2026].

JANKÓ, F., CZIRFUSZ, M. and BERKI, M. (2024), 'Migratory birds: Dehumanization of migrant workers in West Hungary', *Population, Space and Place*, 30 (5). https://doi.org/10.1002/psp.2760

KARSAI, V. and TRÓCSÁNYI, A. (2019), 'Aki kimarad(t), lemarad(t)? – A település sikeressége és a városi cím', *Földrajzi Közlemények*, 143 (4), pp. 339–357. https://doi.org/10.32643/fk.143.4.4

KISS, E. (2007), 'Foreign Direct Investment in Hungary. Industry and its spatial effects', *Eastern European Economics*, 45 (1), pp. 6–28. https://doi.org/10.2753/EEE0012-8775450101

KONECKA-SZYDŁOWSKA, B., TRÓCSÁNYI, A. and PIRISI, G. (2018), 'Urbanisation in a formal way? The different characteristics of the "newest towns" in Poland and Hungary', *Regional Statistics*, 8 (2), pp. 135–153. https://doi.org/10.15196/RS080202

KOVÁCS, O. and DOMONKOS, E. (2024), 'Deindustrialisation and reindustrialisation patterns in V4 countries–industry 4.0 as a way forward?', *Post-Communist Economies*, 36 (4), pp. 432–463. https://doi.org/10.1080/14631377.2024.2323834

KOVÁCS, Z. (2004), 'Socio-economic transition and regional differentiation in Hungary', *Geographical Bulletin*, 1 (2).

KRUGMAN, P. R. (1988), *Deindustrialization, Reindustrialization, and the Real Exchange Rate*. Working Paper 2586. https://doi.org/10.3386/w2586

KRZYSZTOFIK, R., KANTOR-PIETRAGA, I. and KŁOSOWSKI, F. (2019), 'Between Industrialism and Postindustrialism—the Case of Small Towns in a Large Urban Region: The Katowice Conurbation', *Poland. Urban Science*, 3 (3). https://doi.org/10.3390/urbansci3030068

KSH (2014), *Magyarország településhálózata 1 - Agglomerációk, településegyüttesek*, Central Statistical Office, Hungary.

LAKNER, Z. and TAUSZ, K. (2016), 'From a Welfare to a Workfare State: Hungary', *Challenges to European Welfare Systems*, pp. 325–350. https://doi.org/10.1007/978-3-319-07680-5_15

LANDESMANN, M. A. and SZÉKELY, I. P. (eds) (1995), *Industrial restructuring and trade reorientation in Eastern Europe*, 60, Cambridge University Press.

LEETMA, K., NUGA, M. and ORG, A. (2013), 'Entwicklungsstrategien und soziales Kapital in den schrumpfenden Kleinstädten Südestlands', [in:] BURDACK, J. and KRISZÁN, Á. (eds), *Kleinstädte in Mittel- und Osteuropa: Perspektiven und Strategien lokaler Entwicklung*, 19, pp. 31–52, Institut für Länderkunde.

LENGYEL, I. and VARGA, A. (2018), 'A magyar gazdasági növekedés térbeli korlátai – helyzetkép és alapvető dilemmák', *Közgazdasági Szemle*, 65 (5), pp. 499–524. https://doi.org/10.18414/ksz.2018.5.499

LENGYEL, I., VAS, Z., SZAKALNE KANO, I., and LENGYEL, B. (2017), 'Spatial differences of reindustrialization in a post-socialist economy: manufacturing in the Hungarian counties', *European Planning Studies*, 25 (8), pp. 1416–1434. https://doi.org/10.1080/09654313.2017.1319467

LEŚNIEWSKA-NAPIERAŁA, K. (2017), 'The potential of cultural heritage of national minorities in small towns – the case of Brzeziny', *Space – Society – Economy*, 19, pp. 105–120. https://doi.org/10.18778/1733-3180.19.06

LJUBENOVIĆ, M., PROTIĆ, I. B., BRANKOVIĆ, M. D., ĐEKIĆ, J. and IGIĆ, M. (2025), 'Identifying characteristics and typology of small shrinking towns in Serbia: The case of the Region of Southern and Eastern Serbia', *Acta Geographica Slovenica*, 65 (1), pp. 7–23. https://doi.org/10.3986/AGS.13717

LUX, G. (2012), 'Reindusztrializáció Magyarországon', [in:] BARANYI, B., and FODOR, I. (eds), *Környezetipar, újraiparosítás és regionalitás Magyarországon*, Pécs, Magyarország, Debrecen, MTA Közgazdaság- és Regionális Tudományi Kutatóközpont Regionális Kutatások Intézete, pp. 21–34.

LUX, G. (2017), 'A külföldi működő tőke által vezérelt iparfejlődési modell és határai Közép-Európában', *Tér és Társadalom*, 31 (1), pp. 30–52. https://doi.org/10.17649/TET.31.1.2801

LUX, G. (2021), 'Manufacturing in the post-industrial city: The role of a "hidden sector" in the development of Pécs, Hungary', [in:] CUDNY, W. and KUNC, J. (eds), *Growth and Change in Post-socialist Cities of Central Europe*, Abingdon: Routledge, pp. 94–112. https://doi.org/10.4324/9781003039792-6

LUX, G. (2025), 'A kiegészítő újraiparosodás térbeli folyamatai és korlátjai Magyarországon', [in:] SZANYI, M., SZUNOMÁR, Á. and TÖRÖK, Á. (eds), *Trendek és töréspontok VI.: trendváltás és túlélés*, Budapest, Akadémiai Kiadó, pp. 109–115.

MAKKAI, B., MÁTÉ, E., PIRISI, G. and TRÓCSÁNYI, A. (2017), 'Where Have All the Youngsters Gone? The Background and Consequences of Young Adults' Outmigration from Hungarian Small Towns', *European Countryside*, 9 (4), pp. 789–807. https://doi.org/10.1515/euco-2017-0044

MAYER, H. and KNOX, P. (2010), 'Small-town sustainability: Prospects in the second modernity', *European Planning Studies*, 18 (10), pp. 1545–1565. https://doi.org/10.1080/09654313.2010.504336

MOLNÁR, E. and LENGYEL, M. I. (2015), 'Újraiparosodás és útfüggőség: gondolatok a magyarországi ipar területi dinamikája kapcsán', *Tér és Társadalom*, 26 (4), pp. 42–59. https://doi.org/10.17649/TET.29.4.2726

MOLNÁR, E., SAIDI, F. A. and SZABÓ, K. (2022), 'Strategic coupling on the European periphery: A case study of a small Hungarian town', *Tér és Társadalom*, 36 (3), pp. 122–144. https://doi.org/10.17649/tet.36.3.3424

MOLNÁR, E. and RADICS, ZS. (2021), 'Automotive Production Networks: an Economic Dimension of Intraregional Cooperation in East-Central Europe', [in:] CHIRODEA, F., ŢOCA, C.-V. and ŞOPRON, L. (eds), *Europe in a changing world: opportunities and challenges: In Honorem Professor Ioan Horga*, Oradea, Debrecen, Oradea University Press, Debrecen University Press, pp. 265–280.

NAGY, E., BRÓDY, L. S. and MIHÁLY, M. (2024), 'Locked In: Reindustrialisation and the Production of Multiple Marginalities in an Old Mining Town of Hungary', *Antipode*. https://doi.org/10.1111/anti.13069

NAGY, G. (2007), 'Divergencia vagy konvergencia - Az átmenet gazdasági térfolyamatainak mérlege földrajzos szemmel', *Tér és Társadalom*, 21 (1), pp. 35–51. https://doi.org/10.17649/TET.21.1.1092

NAGY, G., NAGY, E. and TIMÁR, J. (2012), 'The Changing Meaning of Core–Periphery Relations in a Non-Metropolitan "Urban Region" at the Hungarian–Romanian Border', *DisP – The Planning Review*, 48 (2), pp. 93–105. https://doi.org/10.1080/02513625.2012.721613

NAPIERAŁA, T., LEŚNIEWSKA-NAPIERAŁA, K., NALEJ, M. and PIELESIAK, I. (2022), 'Co-evolution of tourism and industrial sectors: the case of the Bełchatów industrial district', *European Spatial Research and Policy*, 29 (2), pp. 149–173. https://doi.org/10.18778/1231-1952.29.2.09

NEMES-NAGY, J. (2000), 'The new regional structure in Hungary', [in:] GORZELAK, G., MAIER, G. and PETRAKOS, G. (ds), *Integration and transition in Europe: The economic geography of interaction*, pp. 170–186, Routledge.

ORBÁN, V. (2013), *Prime Minister Viktor Orbán's State of the Nation Speech. Government of Hungary*, https://2010-2014.kormany.hu/en/prime-minister-s-office/the-prime-ministers-speeches/prime-minister-viktor-orban-s-state-of-the-nation-speech [accessed on: 20.05.2026].

ORBÁN, V. (2017), *Magasabb fokozatba kapcsol az iparosítás* (Industrialization moves to a higher gear). The Prime Minister's speech at the opening ceremony of the new battery-factory of Samsung SDI at Göd, Hungary, https://2015-2022.miniszterelnok.hu/2017-ben-magyarorszagon-magasabb-fokozatba-kapcsol-az-iparositas/ [accessed on: 20.05.2026].

ORBÁN, V. (2024), *Egy világrendszerváltás idején szükség van egy magyar nagystratégiára is* (In a time of global transformation, a Hungarian grand strategy is also required) – The Prime Minister's speech at the 33rd Annual Bálványos Summer Open University in Tusnádfürdő, https://youtu.be/-q-ghe63zic [accessed on: 14.12.2025].

PÉNZES, J., MOLNÁR, E. and PÁLÓCZI, G. (2015), 'Local Labour System After the Turn of the Millennium in Hungary', *Regional Statistics*, 5 (2), pp. 62–81. https://doi.org/10.15196/RS05204

PIPAN, T. (2018), 'Neo-industrialization models and industrial culture of small towns', *GeoScape*, 12 (1), pp. 10–16. https://doi.org/10.2478/geosc-2018-0002

PIRISI, G. (2009), 'Város vagy nem város? Dilemmák a formális és a funkcionális városfogalom kettőssége kapcsán', *Területi Statisztika*, 12 (2), pp. 129–136.

PIRISI, G. and TRÓCSÁNYI, A. (2015), 'Between shrinking and blooming: the crossroad of small towns' urbanisation in Hungary', *Annales Universitatis Paedagogicae Cracoviensis Studia Geographica*, 8 (1), pp. 12–28.

PRISECARU, P. (2014), 'Eu Reindustrialization Policy', *Knowledge Horizons – Economics*, 6 (2), pp. 21–25.

PUTNAM, R. D. (2001), *Bowling alone: The collapse and revival of American community*, Simon and Schuster. https://doi.org/10.1145/358916.361990

RADOSEVIC, S. and ROZEIK, A. (2005), *Foreign direct investment and restructuring in the automotive industry in Central and East Europe*, UCL, School of Slavonic and East Europoean Studies Working Papers No. 53.

RECHNITZER, J. (2012), 'The Features of the Transition of Hungary's Regional System', *Discussion Papers*, 32, pp. 5–54.

RECHNITZER, J., PÁTHY, Á. and BERKES, J. (2014), 'Stability and Changes of the Hungarian City-Network', [in:] SOMLYÓDYNÉ PFEIL, E. (ed.), *Industrial districts and cities in Central Europe*, Universitas-Győr Nonprofit Ltd, pp. 109–130.

REINERT, E. S., KATTEL, R. and SUURNA, M. (2009), *Industrial restructuring and innovation policy in Central and Eastern Europe since 1990*, 23, TUT Ragnar Nurkse Department of Innovation and Governance.

SOKOL, M. (2001), 'Central and Eastern Europe a decade after the fall of state-socialism: Regional dimensions of transition processes', *Regional Studies*, 35 (7), pp. 645–655. https://doi.org/10.1080/00343400120075911

STEINFÜHRER, A., VAISHAR, A. and ZAPLETALOVÁ, J. (2016), 'The small town in rural areas as an underresearched type of settlement. Editors' introduction to the special issue', *European Countryside*, 8 (4), pp. 322–332. https://doi.org/10.1515/euco-2016-0023

STOJČIĆ, N. and ARALICA, Z. (2018), '(De)industrialisation and lessons for industrial policy in Central and Eastern Europe', *Post-communist economies*, 30 (6), pp. 713–734. https://doi.org/10.1080/14631377.2018.1443251

STOJČIĆ, N., and ARALICA, Z. (2017), 'Choosing right from wrong: Industrial policy and (de)-industrialization in Central and Eastern Europe', *Radni materijali EIZ-a*, 3, pp. 5–36.

TIMÁR, J. (2007), 'Different Scales of Uneven Development – in a (No Longer) Post-socialist Hungary', *Treballs de La Societat Catalana de Geografia*, 64, pp. 103–128.

TRÓCSÁNYI, A., PIRISI, G. and MÁTÉ, É. (2018), 'An interpretation attempt of Hungarian small towns' shrinking in a post-socialist transformation context', *Chasopys Socialno-Ekonomichnoyi Heohrafiyi / Human Geography Journal*, 24 (1), pp. 5–20. https://doi.org/10.26565/2076-1333-2018-24-01

TURIENZO, J. and LAMPÓN, J. F. (2023), 'New mobility technologies as incentive to location decisions: relocation strategy in the automotive industry', *Kybernetes*, 52 (11), pp. 5444–5459.

VAISHAR, A. and ZAPLETALOVÁ, J. (2009), 'Small towns as centres of rural micro-regions', *European Countryside*, 1 (2), pp. 70–81. https://doi.org/10.2478/v10091/009-0006-4

VAISHAR, A., ŠŤASTNÁ, M. and ZAPLETALOVÁ, J. (2023), 'Small industrial towns in Moravia: a comparison of the production and post-productive eras', *European Planning Studies*, 31 (8), pp. 1776–1796. https://doi.org/10.1080/09654313.2022.2110377

YU, Z., YUAN, D., ZHAO, P., LYU, D. and ZHAO, Z. (2023), 'The role of small towns in rural villagers' use of public services in China: Evidence from a national-level survey', *Journal of Rural Studies*, 100, 103011. https://doi.org/10.1016/j.jrurstud.2023.103011

Member since 2018
JM13710

EUROPEAN SPATIAL RESEARCH AND POLICY

Volume 33 2026 Number 1

https://doi.org/10.18778/1231-1952.33.1.11

Dorota JEGOROW *, **Piotr RUBAJ** *

LONG-TERM EU ENERGY DEPENDENCE ON RUSSIA AND ITS TRANSFORMATION AFTER 2022

Abstract. This article examines the long-term evolution of the European Union's dependence on Russian mineral fuels and its transformation after 2022. The analysis combines Eurostat trade data for 1999–2021 with complementary post-invasion evidence from European and international sources. Using structural comparisons and correlation-based diagnostics, the study identifies dominant fuel categories and differences in adjustment across Member States. The findings show that oil and gas created deep path dependencies that limited the speed of decoupling. Although direct imports fell sharply after 2022 and diversification accelerated, the process remains uneven and indirect exposure has not disappeared. The article contributes by linking historical trade structures with the emerging post-war regime and by distinguishing between transit roles and domestic energy policy. The results inform debates on EU energy security and the governance of diversification. The results indicate that diversification capacity is strongly conditioned by pre-existing infrastructure and trade geography.

Key words: energy security, EU energy policy, mineral fuel imports, Russia-EU trade relations, import dependence and diversification.

* Dorota JEGOROW, Piotr RUBAJ, John Paul II Catholic University of Lublin, Faculty of Social and Technical Sciences, Racławickie Avenues 14, 20-950 Lublin, Poland; e-mails: dorotajegorow@kul.pl, piotr.rubaj@kul.pl, ORCIDs: https://orcid.org/0000-0002-0968-4109, https://orcid.org/0000-0003-3734-5830

Received: 05.12.2025, Revised: 23.02.2026, Accepted: 27.02.2026

Funding information: The John Paul II Catholic University of Lublin. **Conflicts of interests:** None. **Ethical considerations:** The Authors assure no violations of publication ethics and take full responsibility for the content of the publication. **The percentage share of the Author in the preparation of the work is:** D.J. 50%, P.R. 50%. **Declaration regarding the use of GAI tools:** The Authors hereby declare that they used ChatGPT (OpenAI) for language editing and stylistic improvement of selected parts of the manuscript. The tool was used to improve clarity, grammar, and readability of the text. It was not used to generate scientific content, data analysis, or original research findings.

1. INTRODUCTION

Supply shocks in the market for energy raw materials following Russia's invasion of Ukraine have reshaped the European political and economic debate. The discussion has become dominated by concerns over international trade, the continuity of strategic energy supplies and the broader implications for the functioning of EU Member States. Although the main suppliers of energy raw materials to the European Union have changed in recent years, Russia has long remained the dominant provider of all major fuel categories, particularly natural gas, crude oil, and coal. The disruption of these supplies after 2022, combined with unprecedented price increases, created serious economic, social, and political challenges across the EU.

Against this background, this article examines the scale and evolution of EU imports of mineral fuels, lubricants and related materials from Russia across individual EU Member States and fuel categories. The analysis focuses on the period 1999 to 2021, when detailed Eurostat data are available, and is supplemented with post-2022 figures from the European Commission, the International Energy Agency (IEA), and specialised research institutes in order to capture the rapid structural changes that followed the outbreak of the war.

The political direction of reducing fossil fuel dependence has been formally anchored in key EU strategic documents, most notably the European Green Deal and the REPowerEU plan adopted after the outbreak of the war. These frameworks combine climate objectives with urgent security-of-supply measures, explicitly calling for a rapid reduction of imports of Russian fossil fuels, diversification of suppliers and acceleration of renewable energy deployment (European Commission, 2019; European Commission, 2022).

In 2024, the total value of energy raw material imports to the EU amounted to EUR 375.9 billion, representing a decline of 16.2% compared with 2023. EU-Russia trade fell to approximately EUR 67.5 billion, with imports from Russia at EUR 35.9 billion, of which about 62% consisted of mineral fuels. The share of Russian gas in the EU demand dropped to roughly 12–13%, down from 40–48% before 2022, reflecting a profound shift driven by rising LNG imports and alternative seaborne deliveries (European Commission, 2024; Bruegel, 2024).

Data for 2022 to 2024 confirm a marked reduction in the EU's dependence on Russian energy resources, driven primarily by increased LNG imports and the diversification of supply routes towards Norway, the United States, Qatar, and Azerbaijan. Nevertheless, several EU Member States have remained more vulnerable due to infrastructural and market constraints. Despite the decline in volumes, the EU still paid approximately EUR 21.9 billion for Russian fossil

fuels in 2024, which has had important political and budgetary implications (CREA, 2025). At the same time, the role of Norway and the United States as principal suppliers of gas and oil has expanded significantly. According to the World Energy Outlook 2023, the United States has become the largest LNG supplier to Europe, while Norway's share in pipeline gas deliveries reached record levels (IEA, 2023).

The transformation of European energy relations after 2022 has generated an intense academic and policy debate. Scholars emphasise the tension between market integration, infrastructure inertia and geopolitical risk, pointing to the difficulty of rapidly replacing historically embedded supply structures. Particular attention is paid to diversification capacity, institutional coordination and the uneven exposure of Member States.

Existing literature has extensively examined the EU's dependence on Russian energy supplies, although most studies focus on the pre-2022 period or offer primarily qualitative assessments of post-invasion developments (Goldthau and Sitter, 2020; Mata Pérez *et al.*, 2019; Rybak *et al.*, 2022; Weiner *et al.*, 2025). Quantitative, longitudinal research that systematically compares the structure and volume of imports across major fuel types and EU Member States before and after 2022 remains scarce (Ah-Voun *et al.*, 2024; Czech and Wielechowski, 2023; Finley and Mikulska, 2023; Goldthau and Youngs, 2023; LaBelle, 2024; Sampedro *et al.*, 2024; Spiro *et al.*, 2025). This article addresses this gap by providing an empirical analysis of EU energy imports from Russia over the period 1999 to 2024 and by examining the uneven pace of the decoupling process.

The methodological approach used in this article is based on the analysis of Eurostat trade data and the comparison of import structures across EU Member States and fuel categories. The study identifies the largest importers of Russian energy resources, assesses long-term structural changes and evaluates the extent to which EU countries have been able to replace Russian supplies with alternative sources. The results aim to contribute to the ongoing scientific and policy debate on European energy security, diversification strategies, and the long-term implications of the geopolitical realignment triggered by Russia's invasion of Ukraine.

The novelty of this study lies in three elements. First, it provides a long-term, harmonised dataset covering the period from 1999 to 2024, enabling comparison between the pre-war dependency regime, and the emerging post-2022 order. Second, it distinguishes between direct import reduction and the persistence of indirect channels through trade hubs and third countries. Third, it interprets statistical patterns through the lens of structural path dependence, showing why rapid political decisions do not automatically translate into immediate market outcomes.

2. LITERATURE REVIEW

Energy policy in the 21st century has been shaped primarily by environmental objectives, including the reduction of greenhouse gas emissions and the expansion of renewable energy sources within the energy mix. These goals had been intended to mitigate adverse climate change effects and stabilise long-term temperature growth. However, the supply shocks triggered by Russia's invasion of Ukraine, occurring shortly after the global disruptions caused by the COVID-19 pandemic, significantly altered the priorities of the EU. The concept of energy neutrality temporarily receded, while concerns over security of supply and geopolitical vulnerability gained renewed prominence. Recent studies highlight the need to reassess established theories linking contemporary crises with energy security, emphasising new risks and threats emerging from geopolitical instability (Basdekis *et al*., 2022; Katsampoxakis *et al.*, 2022). Recent research has highlighted the growing importance of governance resilience and multilevel coordination in the EU's energy transition, especially under crisis conditions (Labelle, 2024). This growing uncertainty has underscored the strategic importance of energy raw materials and their supply chains for political and economic decisionmakers (Jonek-Kowalska, 2022).

Energy consumption patterns and the structure of the energy mix in individual EU Member States reflect both historical supply arrangements and long-term dependencies, particularly those involving Russia (Flores Chamba *et al.*, 2019; Nielsen *et al.*, 2018). Differences in technological development and investment in national energy systems further shape the capacity of EU Member States to adjust to supply disruptions (Jonek-Kowalska, 2022). Research on the energy transition shows clear differences in the pace of RES deployment between Western and Central Eastern European countries, which is also confirmed by the findings of Puttachai *et al.* (2022). At the same time, the global network of supply and demand for mineral fuels remains complex and only partially understood, which complicates analyses of structural vulnerabilities (Dong *et al.*, 2020). These developments are reflected in an expanding body of research examining the systemic vulnerabilities of global energy markets. Traditional international trade theories face limitations when applied to multilayered global fuel markets characterised by numerous actors and intricate interdependencies (An *et al.*, 2014; Shirazi and Fuinhas, 2023; Wu *et al*., 2021; Sun *et al.*, 2023).

Issues relating to raw material linkages in Europe are widely discussed in economic reports, statistical publications, and policy analyses. Key examples include European Energy, Annual Report 2021 (European Commission, 2021), Global Energy Review 2021 (IEA, 2021), Energy Security in the EU's External Policy (European Parliament, 2020), European Union Energy Policy Review (IEA, 2022), and Oil and Gas Industry Outlook 2022 (Deloitte, 2022). A range of spe-

cialised online platforms also monitor market trends, macroeconomic developments, trading dynamics, and geopolitical risks. These include FitchSolutions, the EIA, and OPEC.

The question of dependencies in strategic energy markets has also been addressed extensively in academic research. For example, Nuryyev *et al.* (2021) examined the stability of gas supply systems, emphasising the high investment requirements and operational challenges of large scale transmission infrastructure. Their findings suggest that Russia cannot rapidly reorient gas flows from Europe to Asia due to infrastructural, financial, and temporal constraints. Lim *et al.* (2021) analysed global supply chain dynamics in energy markets and have argued that factors which historically supported the expansion of global value chains, such as technology transfer, capital mobility, and labour flows, now face growing geopolitical and economic pressures.

Another strand of literature focuses on how political and economic shocks reshape global energy trade. Zhou *et al.* (2022) have examined the evolution of international crude oil competition networks, noting that the market is subject to substantial volatility driven by pandemics, armed conflicts, and broader geopolitical tensions. Their work also highlights the growing importance of Asian and African economies, which are expected to play an increasingly central role in global oil demand. Related research addresses national level markets and demand determinants, such as Manowska *et al*. (2021), who explored the implications of EU climate neutrality goals for Poland's energy strategy and future demand for natural gas and other fuels.

A particularly relevant body of literature examines the EU's response to the energy crisis, with emphasis on diversification and resilience of supply chains. Goldthau *et al.* (2020) have argued that energy security in a geopolitical context depends less on autarky and more on flexibility and diversification of supply routes. Tagliapietra (2022) discussed the EU's rapid shift towards LNG following the invasion of Ukraine, emphasising infrastructural and regulatory constraints identified in Bruegel (2022). These studies offer important insights into the challenges of transitioning away from a dominant supplier.

The literature addressing economic and political interconnections in energy raw material markets is vast and continues to expand. Additional contributions include analyses of renewable energy integration (Chebotareva *et al.*, 2022) and the structural evolution of oil trade networks (Niu *et al.*, 2023). Although these studies offer valuable perspectives, they also reveal a clear research gap: few works provide a comparative, quantitative and long-term analysis of the EU's dependence on Russian mineral fuels that spans both the pre-2022 period and the transformative years following the invasion of Ukraine. The present study responds to this gap by integrating longitudinal Eurostat data with post-2022 sources in order to assess the scale, structure and evolution of EU Russia energy trade.

3. DATA AND METHODS

This study is based on quantitative data derived primarily from the Eurostat international trade database. Five time series describing the value of imports from Russia to the EU were constructed for the period 1999 to 2021 and expressed in euros on an annual basis. The analysis covers the following product groups:

1. Mineral fuels, lubricants and related materials (MF);
2. Coal, coke and briquettes (CC);
3. Petroleum, petroleum products and related materials (PP);
4. Natural and manufactured gas (GAS);
5. Electric current (EL).

The objective of the analysis is to identify the scale, structure, and long-term evolution of EU imports of mineral fuels from Russia, with particular attention to variations across EU Member States and fuel categories. The period 1999 to 2021 was selected because Eurostat discontinued detailed reporting of trade flows with Russia after 2021. For the years 2022 to 2024, additional information was collected from updated Eurostat and European Commission releases, IEA reports, and specialised analytical sources, including Bruegel and the Centre for Research on Energy and Clean Air. These sources were used in a complementary manner to capture the structural adjustments that occurred after the Russian invasion of Ukraine.

The empirical strategy combines descriptive statistics, correlation analysis, and regression diagnostics. First, changes in the value and structure of imports are examined using dynamic indices and relative shares of the individual fuel categories within MF. Second, Pearson correlation coefficients are applied to assess the degree of co-movement between MF and its component categories. Third, an ordinary least squares regression model is estimated with MF as the dependent variable and CC, PP, GAS, and EL as independent variables. The model is intended to explore the internal structure of MF and the relative contribution of its components.

In order to examine the internal structure of mineral fuel imports, a dependence analysis was conducted using the Pearson correlation coefficient. In the next step, a linear regression model was constructed with MF as the dependent variable and CC, PP, GAS, and EL as independent variables:

The choice of this analytical form follows from the research objective, which involves identifying the direction and intensity of the contribution of individual fuel categories to the value of MF imports from Russia to the EU between 1999 and 2021. The model is used to assess the internal structure of MF and to explore how strongly each category co-varies with the aggregate import value.

Preliminary diagnostics indicated the presence of multicollinearity among the explanatory variables; therefore, regression results are interpreted with caution and mainly serve a structural, illustrative purpose.

In addition to aggregate EU level data, selected descriptive statistics and cluster analysis were applied to Member State level information to identify the largest importers within each fuel category and to track changes in their relative positions over time. This approach has enabled the study to account for the heterogeneity of import patterns within the EU.

Direct dependency refers to fuels physically imported from Russia under bilateral trade relations. Indirect dependency captures situations in which Russian-origin energy resources reach EU markets after processing, blending or rerouting through third countries or trading hubs. While statistically less visible, these channels may preserve structural exposure despite official diversification.

The research design supports the evaluation of the following hypotheses: H1: The structure of MF imports from Russia to the EU, in terms of type and value, remains relatively stable over time. H2: EU Member States are significantly dependent on imports of energy raw materials from Russia. H3: Russia's military aggression in Ukraine redefined the priorities of EU energy policy. H4: Despite political declarations and sanctions, EU Member States continue to exhibit direct and indirect dependence on Russian energy imports, indicating limited effectiveness of diversification measures.

The verification of Hypothesis H4 required not only classical quantitative procedures but also qualitative assessment of policy reports and secondary sources due to the lack of complete Eurostat data after 2021. This supplementary evidence contributes to a more comprehensive understanding of the effectiveness of recent diversification efforts and the persistence of indirect import channels through third countries.

4. RESULTS AND EMPIRICAL STUDIES

The total value of EU imports of mineral fuels, lubricants and related materials (MF) from Russia between 1999 and 2021 exceeded EUR 2 trillion, with the annual average amounting to roughly EUR 88 billion. The highest annual value, slightly above EUR 157 billion, was recorded in 2012, reflecting both elevated global energy prices and the sustained role of Russia as the EU's dominant energy supplier. Throughout the entire period, the structure of MF imports was characterised by a clear dominance of petroleum and petroleum products (PP). Natural and manufactured gas (GAS) occupied the second-largest position, whereas coal (CC) and electric current (EL) together accounted for slightly over 3% of total MF imports (Fig. 1). This asymmetry reflects the long-term orientation of the European energy system, where oil and gas formed the strategic backbone of energy supply, pricing, and infrastructure.

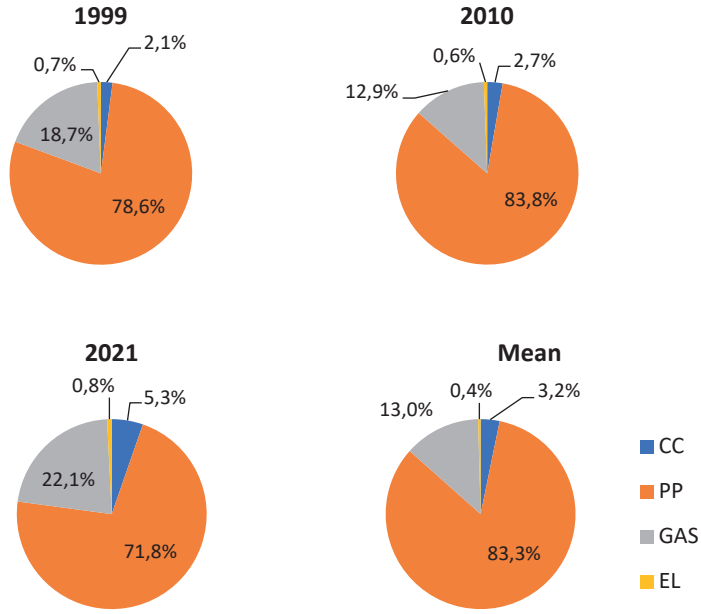


Fig. 1. Structure of imports of mineral fuels, lubricants and related materials according to the main categories

Source: own work based on the Eurostat data.

4.1. Long-term growth and structural shifts in MF imports

Between 1999 and 2021, the value of MF imports increased nearly six-fold. This substantial rise was driven mainly by PP and GAS, although CC displayed the highest relative increase – almost fifteen-fold. The impressive surge in the CC index, amounting to an approximately 160% increase in its share of MF, results primarily from its very low baseline in 1999 rather than from a fundamental structural shift. By contrast, PP displayed only a slight relative decline in its share within MF, yet the absolute value of PP imports grew more than five-fold, illustrating the importance of long-term price movements on global oil markets and the stable role of PP in the energy mix (Table 1).

Table 1. Results of the analysis of the dynamics of MF value and its particular components

2021/1999	**MF**	**CC**	**PP**	**GAS**	**EL**
Value in EUR*	5.78	14.97	5.28	6.83	6.91
Share w MF**	–	159.02%	-8.65%	18.18%	19.62%
2010/1999	**MF**	**CC**	**PP**	**GAS**	**EL**
Value in EUR*	6.62	8.77	7.06	4.58	5.96
Share w MF**	–	32.34%	6.59%	-30.88%	-9.96%

2021/2010	MF	CC	PP	GAS	EL
Value in EUR*	0.87	1.71	0.75	1.49	1.16
Share w MF**	–	95.72%	-14.29%	70.98%	32.85%

* Index, ** Relative increase

Source: own work based on Eurostat data.

PP remained the structural anchor of MF despite its modest decline in relative share. GAS strengthened its position after 2010, reflecting the EU's shift toward gas-fired power generation, while CC, although volatile, experienced temporary surges connected with both market and regulatory changes. EL maintained a marginal role throughout the period.

4.2. Country-level concentration of MF imports

Cluster analysis confirms a high geographical concentration of MF imports. More than 90% of EU imports of MF from Russia between 1999 and 2021 were directed to only thirteen EU Member States, with Germany, the Netherlands, Italy, Poland, and France together accounting for over half. Germany was the largest importer over the two-decade period; however, in the most recent decade, the Netherlands overtook Germany, reflecting its hub function (Fig. 2).

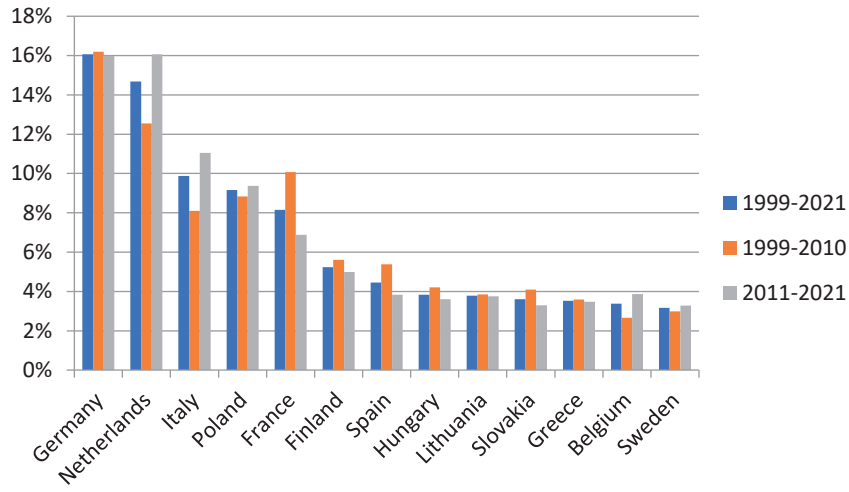


Fig. 2. The share of MF imports according to the main trade partners between 1999 and 2021 and in selected sub-periods of the years 1999–2021 (exporters which received up to 90% of imports)

Source: own work based on the Eurostat data.

By 2021, the Netherlands became the leading importer of MF, followed by Italy and Germany. Relative to 1999, the Dutch share of total EU MF imports increased nearly five-fold. Germany, by contrast, reduced its share by approximately 36%, partly due to diversification measures adopted after 2014 and changes in the configuration of European supply chains (Fig. 3).

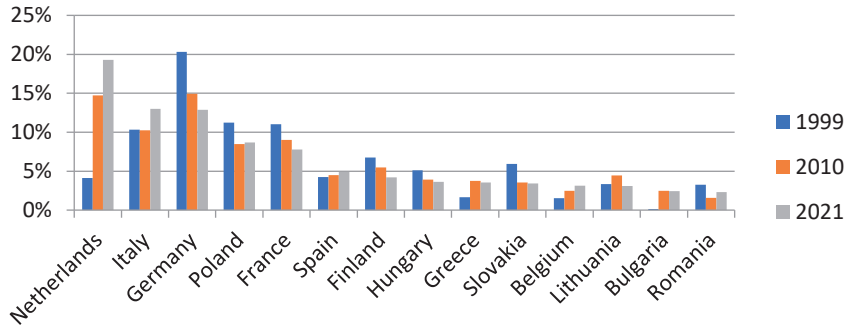


Fig. 3. The share of MF imports according to the main trade partners from the EU in selected years according to the classification from 2021 (exporters which received up to 90% of MF imports from Russia)

Source: own work based on the Eurostat data.

4.3. Category-specific analysis: CC, PP, GAS and EL

4.3.1. Coal, coke and briquettes (CC)

The Netherlands was the largest importer of CC in 2021, having increased its share of EU CC imports by nearly 350% compared to 1999. Germany, positioned second, recorded an increase of roughly 20%, while Italy – third in rank – expanded its share by around 61% (Fig. 4).

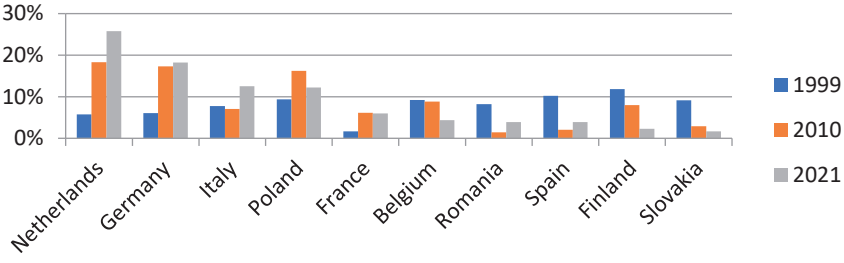


Fig. 4. The share of CC imports according to the main trade partners from the EU in selected years according to the classification from 2021 (exporters which totally received up to 90% of CC imports from Russia)

Source: own work based on the Eurostat data.

The strong rise in Dutch CC imports reflects its hub function. Germany's limited growth corresponds with its gradual coal phase-out policy, while Italy's moderate increase reflects industrial demand patterns.

4.3.2. Petroleum and petroleum products (PP)

The Netherlands was also the largest importer of PP in 2021, with its share rising by almost 360% compared with 1999. Germany, ranked second, reduced its share by 36% over the period, reflecting long-term diversification. Poland, also classified in the second/top group in 2021, recorded a slight decline of around 5% (Fig. 5).

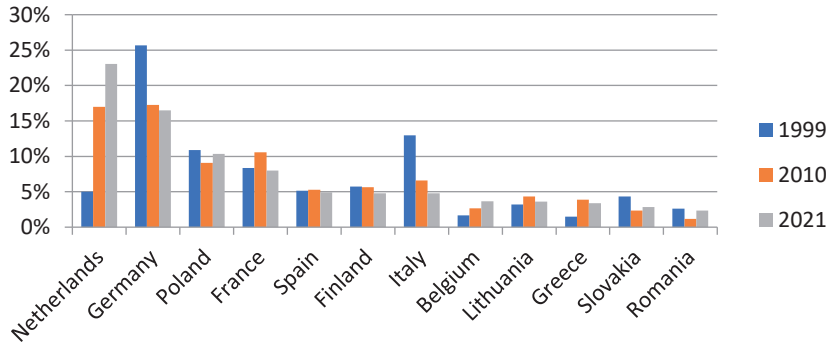


Fig. 5. The share of PP imports according to the main trade partners from the EU in selected years according to the classification from 2021 (exporters which totally received up to 90% of PP imports from Russia)

Source: own work based on the Eurostat data.

PP trade reflects both consumption patterns and the growing importance of EU refining and distribution hubs. The Netherlands dominates, reflecting its hub function within European distribution networks.

4.3.3. Natural and manufactured gas (GAS)

Italy was the largest importer of GAS, followed by Hungary and France. Relative analysis is not feasible due to the presence of zero values in certain years, which distort percentage comparisons (Fig. 6).

Italy's strong dependence on Russian gas reflects both pipeline geography and long-standing contractual arrangements. Hungary's high exposure is shaped by limited diversification options in Central Europe, while France's position is influenced by LNG infrastructure and mixed sourcing strategies.

A crucial development occurred after 2021. Russia's share in the EU gas supplies dropped to 12–13% by 2024 (European Commission, 2024). This reflects a structural realignment driven by LNG imports and increased pipeline deliveries from Norway, the United States, and Qatar.

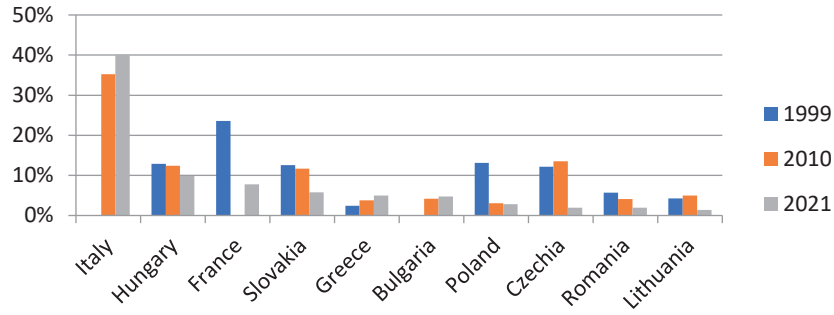


Fig. 6. The share of GAS imports according to the main trade partners from the EU in selected years according to the classification from 2021 (exporters which totally received up to 90% of GAS imports from Russia)

Source: own work based on the Eurostat data.

4.3.4. Electric current (EL)

Russia supplied EL almost exclusively to three EU Member States: Bulgaria, Belgium, and Austria. Their combined share in total EL imports exceeded 99.7% in 1999–2021, with Bulgaria being the clear leader in this narrow category (Fig. 7).

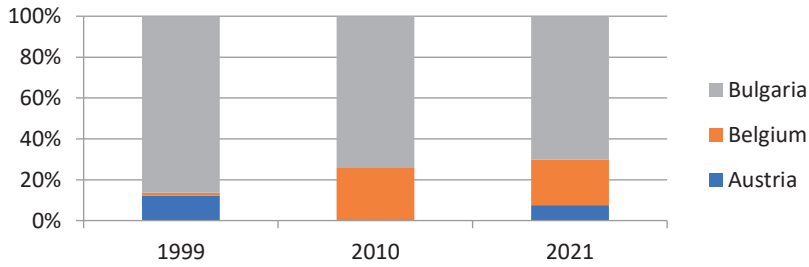


Fig. 7. The share of EL imports according to the main trade partners from the EU in selected years according to the classification from 2021

Source: own work based on the Eurostat data.

4.4. Import patterns in 2022–2024

The value of EU energy imports in 2024 reached EUR 375.9 billion (16.2% less than in 2023). Imports from Russia decreased to EUR 35.9 billion, with mineral fuels constituting approximately 62% (~EUR 22.3 billion). The share of Russian gas fell to 12–13%, signalling a shift toward LNG and intensified imports from Norway, the USA, Qatar, and Azerbaijan (IEA 2024).

These results confirm that the structural dependency observed in 1999–2021 was dramatically reshaped after 2022. However, the degree of diversification varies significantly across EU Member States, and indirect imports through third countries remain analytically relevant.

To understand how these post-2022 structural changes relate to the historical dynamics of MF imports, the next section examines the internal co-movement between individual fuel categories.

4.5. Correlation analysis and internal co-movement of MF components

To better understand the internal structure of mineral fuel imports, Pearson correlation coefficients were calculated between MF and its four component categories (CC, PP, GAS, and EL). The results reveal exceptionally strong positive correlations, particularly between MF and PP, and between MF and GAS. As shown in Table 2, PP exhibits the strongest correlation with MF (0.995), followed by GAS (0.833). These two categories dominate MF both in terms of value and volatility, which explains the near-perfect synchronisation of their long-term trends already visible in the relative dynamics presented in Table 1.

The strength of these correlations indicates that changes in MF are primarily driven by fluctuations in PP and GAS imports. This sensitivity aligns with the characteristics of EU-Russia energy relations, where oil and gas prices jointly respond to global commodity cycles, geopolitical tensions and supply disruptions. Coal (CC), despite its marginal contribution to MF (as shown in Table 1, low share but high proportional index), also displays a strong correlation with MF (0.700), mainly due to price-driven volatility during crisis years. Electric current (EL), despite showing a statistically significant correlation, remains structurally negligible due to its extremely small share in MF imports (Table 2).

Table 2. Pearson Correlation Results

Pearson Correlation (Sig.)	MF	CC	PP	GAS
CC	0.700**(0.000)	–	–	–
PP	0.995**(0.000)	0.646**(0.001)	–	–
GAS	0.833**(0.000)	0.773**(0.000)	0.778**(0.000)	–
EL	0.628**(0.001)	0.683**(0.000)	0.579**(0.004)	0.733**(0.000)

** Correlation is significant at the 0.01 level (2-tailed)

Source: own work based on Eurostat data.

The correlation structure demonstrates that PP and GAS constitute the backbone of the EU's long-term dependence on Russian mineral fuels. Their strong

co-movement foreshadows the multicollinearity patterns observed in subsequent regression analysis. This is consistent with structural characteristics of the European energy system, where oil and gas markets respond simultaneously to external shocks and exhibit highly synchronised price cycles. The proportional changes shown in Table 1 confirm that PP and GAS overwhelmingly determine the behaviour of MF over time.

4.6. Regression analysis and structural interpretation

Because MF is arithmetically constructed as the sum of its components, regression cannot be interpreted in a causal or predictive sense. Instead, it serves as a diagnostic device demonstrating the mechanical dominance of PP and GAS within the aggregate.

Based on the correlation patterns described above, a regression analysis was conducted to assess how the four fuel categories collectively explain variation in MF imports. The initial model exhibited very high explanatory power ($R^2 = 1.000$), which is mechanically expected given the accounting identity between MF and its components, indicating that the independent variables closely mirrored the movement of MF.

Table 3. Regression Results – Model Summary

Model fit			Analysis of variance				Durbin-Watson
R Square	Std. error	F	df1	df2	Sig.*	R Square	
1.000	567,043,173	164,800	4	19	<0.001	1.417	1.000

* Acceptable level: Sig. <0.05

Source: own work based on Eurostat data.

To assess whether the very high explanatory power of the model resulted from structural properties of the dataset, diagnostic testing was performed, the results of which are summarised in Table 4.

Table 4. Regression Results – Parameter Estimates and Collinearity Statistics

Variable	Unstandardised Coefficients		t	Sig.	Collinearity Statistics	
	β_n, n=1,…,4	Std. error			Tolerance	VIF
CC	0.938	0.125	7.526	0.000	0.086	11.564
PP	1.012	0.005	186.458	0.000	0.073	13.619
GAS	0.899	0.048	18.828	0.000	0.040	25.212
EL	2.647	0.928	2.853	0.000	0.096	10.419

* Acceptable level: Sig. <0.05; Dependent Variable: MF; VIF - Variance Inflation Factor

Source: own work based on Eurostat data.

To address this, a second model was estimated with GAS removed. As indicated in Table 5, the overall explanatory power of the model ($R^2 = 1.000$) remains high, yet the sharp increase in the standard error and the substantial decrease in the F-statistic indicate a loss of model precision after removing GAS.

Table 5. Regression Results – Model Summary (new model)

Model fit			Analysis of variance				Durbin-Watson
R Square	Std. error	F	df1	df2	Sig.*	R Square	
1.000	2,450,476,908	11,759	3	19	<0.001	1.127	1.000

* Acceptable level: Sig. <0.05

Source: own work based on Eurostat data.

In the reduced model, the number of predictors decreases to three (CC, PP, EL), which is reflected in the adjusted degrees of freedom. Although the reduced model formally retains an R^2 of 1.000, the sharp increase in the standard error and the dramatic drop in the F-statistic indicate a substantial loss of explanatory precision. This confirms that GAS captures unique structural variance within MF and cannot be reliably excluded.

Table 6 shows that VIF values declined to the range of 8–9, which, although still high, indicates improved stability of coefficient estimates.

Table 6. Regression Results – Parameter Estimates and Collinearity Statistics (new model)

Variable	Unstandardised Coefficients		t	Sig.	Collinearity Statistics	
	β_n, n=1,…,3	Std. error			Tolerance	VIF
CC	1.890	0.492	3.842	0.001	0.104	9.656
PP	1.076	0.018	58.791	0.000	0.121	8.291
EL	10.005	3.636	2.751	0.012	0.117	8.570

* Acceptable level: Sig. <0.05; Dependent Variable: MF; VIF - Variance Inflation Factor

Source: own work based on Eurostat data.

The coefficients in Table 6 correspond to the reduced model that includes only three predictors (CC, PP, EL), following the exclusion of GAS.

Because PP dominates MF imports (Table 1), and because the exclusion of GAS significantly reduces model precision as shown in Table 5, the influence of PP overwhelms the remaining components, making it statistically difficult to isolate the independent effects of CC and EL. The Durbin–Watson statistic (1.417,

Tables 3 and 5) indicates no clear autocorrelation, suggesting that the primary issue is structural interdependence rather than model mis-specification.

It is important to emphasise that the regression model has a deterministic character, as the aggregate MF variable is by definition the sum of its four components (CC, PP, GAS, and EL). This mathematical identity guarantees a perfect fit ($R^2 = 1.000$) in the absence of measurement error, regardless of the underlying statistical relationships. The purpose of the regression analysis in this study is, therefore, not predictive; rather, it is used as a diagnostic tool to reveal the extent of multicollinearity among the MF components and to illustrate their structural interdependence within the EU-Russia energy trade system. Given the accounting identity between variables, latent-factor approaches would not substantially increase explanatory insight. The aim is structural illustration rather than dimensional reduction.

Because MF is arithmetically defined as the sum of its components, the regression inevitably exhibits a deterministic character. The very high R^2 therefore reflects the accounting structure of the variables rather than statistical explanatory strength. In this context, the model should be interpreted as an illustration of internal proportionality within MF.

Given the accounting identity between variables, latent-factor approaches would not substantially increase explanatory insight. The objective is not dimensional reduction but a transparent presentation of how strongly the aggregate is mechanically driven by its dominant components. Consequently, the regression results complement the correlation evidence (Table 2) and the long-term dynamics presented earlier (Table 1), while detailed parameter interpretation should be treated with caution.

4.7. Structural differentiation among EU Member States

While aggregate MF values show strong long-term dependence on Russia, country-level patterns reveal considerable asymmetry across the EU. Cluster analysis grouped EU Member States based on the scale and structure of their MF imports. More than 90% of total MF imports were concentrated in thirteen EU Member States, with Germany, the Netherlands, and Italy forming the core group, followed by Poland and France.

The role of the Netherlands increased significantly, especially after 2010. This reflects, as discussed earlier, the strategic position of Rotterdam as the EU's largest seaborne energy hub, handling crude oil, refined products and LNG. Italy's position strengthened particularly in GAS imports, supported by long-term pipeline connections and diversified import terminals. Germany, once the dominant importer, reduced its relative share due to diversification efforts initiated after 2014 and strengthened after 2021.

Central and Eastern European (CEE) EU Member States displayed notable dependence in CC and GAS imports. Hungary's and Slovakia's high exposure resulted from limited diversification pathways, while Poland's role was shaped primarily by PP imports and refinery operations.

4.8. Post-2022 structural transformation

The post-2022 period marks a profound shift in the EU-Russia energy relations. Although Eurostat no longer publishes full bilateral trade data after 2021, aggregated data show that the collapse of Russian pipeline gas flows was only partially offset by LNG and alternative pipeline imports. By 2024, Russia's share in EU gas demand fell to 12–13%. LNG imports from the United States and Qatar increased sharply, while Norway consolidated its position as the EU's largest pipeline supplier.

Despite reduced volumes, the EU still imported approximately EUR 22.3 billion in mineral fuels from Russia in 2024, representing around 62% of total remaining EU-Russia trade. Adjustment speed varied across EU Member States due to differences in infrastructure capacity, regasification terminals, long-term contracts and domestic energy strategies.

Recent evidence suggests that some Member States continue to import significant volumes of Russian liquefied natural gas. According to IEEFA-based reporting, Belgium's Zeebrugge terminal was the largest entry point for Russian LNG into the EU in 2024 (The Brussels Times, 2025; WNP, 2025). Meanwhile, in the 2023–2024 period, France increased its Russian LNG imports by 81%, with deliveries costing approximately EUR 2.68 billion (Kalus, 2025). These data underline that, despite EU-wide efforts to diversify energy sources and reduce pipeline dependence on Russia, structural and infrastructural ties continue to bind some member states to Russian supply – complicating the narrative of a uniform decoupling across the EU.

Despite the EU's declared objective of phasing out Russian gas imports by 2027, the implementation of this policy remains politically fragmented among Member States. Several Central and Eastern European countries, including Hungary and Slovakia, have openly questioned the feasibility of a full embargo, arguing that existing long-term contracts, infrastructural limitations and national energy security considerations prevent an immediate cessation of Russian supplies. Such positions illustrate that formal EU-level decisions do not automatically translate into uniform implementation across the EU, and that the process of disentangling from Russian energy remains subject to legal and political contestation. This highlights that achieving meaningful decoupling requires not only technical diversification but also institutional coordination and a shared approach to the distribution of transition costs (Gadawa, 2025).

The findings indicate a major structural reconfiguration of the EU's energy system. However, the long-term patterns recorded in Table 1 remain essential for understanding why the decoupling process has been uneven. Member State-level disparities and indirect import channels through intermediaries or third countries demonstrate that EU dependence has decreased but not been fully eliminated. These results highlight both long-term progress and persistent vulnerabilities within the European energy architecture. These structural developments provide the empirical basis for the verification of the research hypotheses presented in the methodological section, particularly those related to dependence and diversification patterns.

5. DISCUSSION

The empirical findings presented in this study make it possible to evaluate the four research hypotheses and situate the results within the broader academic debate on EU energy security. The empirical findings presented in this study make it possible to evaluate the four research hypotheses and situate the results within the broader academic debate. The hypotheses serve as analytical guidelines rather than strict econometric propositions. The first hypothesis (H1), which assumed that the structure of MF imports from Russia would remain relatively stable over time, cannot be fully confirmed. Although PP and GAS consistently dominated the import basket, the shifts observed among EU Member States – particularly the rising importance of the Netherlands and Italy and the relative decline of Germany – demonstrate that the system was more dynamic than initially assumed. The post-2022 transformation, marked by the collapse of Russian pipeline gas and the rapid expansion of LNG imports, further underscores this structural evolution (European Commission, 2024; IEA, 2023). The case of the Netherlands illustrates the distinction between transit dependency and domestic energy strategy. A large proportion of Russian fuels registered in Dutch statistics is linked to the logistical and refining functions of Rotterdam as a European hub, rather than to final national consumption. In terms of national policy, the Netherlands simultaneously pursues ambitious offshore wind expansion and decarbonisation targets. This asymmetry implies that trade statistics may exaggerate national exposure while underestimating the regional economic relevance of port and logistics activities. Such a mismatch may generate future debates on compensation mechanisms within EU solidarity frameworks.

The second hypothesis (H2), positing that EU Member States were significantly dependent on Russian mineral fuels, is strongly supported by the evidence. Russian MF formed the backbone of EU-Russia trade relations between 1999 and 2021, shaping energy security policy and reinforcing long-term infrastructural de-

pendencies (Flores-Chamba *et al.*, 2019; Nielsen *et al.*, 2018). This dependence was uneven across the EU, being particularly pronounced in Germany, Italy, Hungary, Slovakia, and several CEE states.

The third hypothesis (H3), which anticipated that Russia's invasion of Ukraine would redefine EU energy policy priorities, is strongly supported by the observed developments. Numerous authors emphasise that crises reorganise policy hierarchies and shift attention away from environmental objectives toward security and resilience (Basdekis *et al.*, 2022; Katsampoxakis *et al.*, 2022). After 2022, diversification accelerated, mainly through LNG and alternative pipeline suppliers (Jonek-Kowalska, 2022; Goldthau and Sitter, 2020).

The fourth hypothesis (H4), suggesting that EU dependence on Russian energy would persist directly or indirectly despite political declarations and sanctions, receives partial empirical support. Direct imports declined sharply, yet the EU still paid around EUR 21.9 billion for Russian fossil fuels in 2024 (CREA, 2025). Indirect imports via third countries such as India and China grew significantly, illustrating the difficulty of fully severing trade ties in globalised markets (CREA, 2025; Trade Map, 2025). This confirms that decoupling is uneven, limited and structurally constrained.

These findings align with existing literature that highlights the complexity of global energy supply chains, the limitations of traditional trade theory in analysing strategic commodity flows, and the growing influence of geopolitical shocks on energy markets (An *et al.*, 2014; Shirazi and Fuinhas, 2023; Wu *et al.*, 2021; Sun *et al.*, 2023). They also reinforce evidence on path dependence in infrastructure-based energy systems (Nuryyev *et al.*, 2021; Lim *et al.*, 2021). The strong co-movement of MF components (Table 2) supports the argument that structural interdependencies shape both market behaviour and policy responses (Goldthau and Sitter, 2020).

The study faces several limitations. The discontinuation of detailed Eurostat reporting after 2021 restricts the comparability of post-2022 data. The main limitation results from the structural nature of the dataset, in which aggregate indicators are mechanically linked to their components. This reduces the scope for advanced econometric interpretation and shifts the emphasis toward structural and descriptive insight. In addition, indirect trade flows remain partly invisible in official statistics, which complicates precise measurement of the true scale of continued exposure.

Future research should aim to incorporate more complete post-2022 data to assess the permanence of observed structural shifts. It will be essential to deepen the analysis of indirect trade flows by combining customs, maritime and third-country trade data to capture rerouted Russian exports. Additionally, country-level case studies – particularly for Germany, Italy, the Netherlands, and CEE states – could offer valuable insights into the heterogeneous strategies and adaptation capacities that shape the evolving European energy landscape.

6. CONCLUSIONS

The analysis presented in this study makes it possible to identify several important conclusions regarding the nature and evolution of the European Union's energy dependence on Russia between 1999 and 2024. The findings show that Russian energy raw materials formed a central element of the EU's import structure for more than two decades and influenced trade patterns, infrastructure development, and strategic decision-making within the EU. Although petroleum products and natural gas consistently dominated mineral fuel imports, the structure was not entirely stable. Changes occurred both in the composition of imported fuel types and in the distribution of imports among EU Member States, with the Netherlands and Italy becoming increasingly important and Germany's share gradually declining.

The developments after 2022 marked a decisive shift. Russia's invasion of Ukraine disrupted long-established supply routes and exposed the risks associated with concentrated import dependencies. Diversification progressed rapidly, although unevenly across Member States. Despite this progress, the process of reducing dependence remains incomplete. Differences in national energy systems, the persistence of long-term contractual arrangements and the increasing role of indirect imports through third countries illustrate how deeply historical dependencies continue to shape today's energy relations.

Overall, the results indicate that the EU's energy security is closely linked to the flexibility of supply options, the resilience of infrastructure and the EU's capacity to adapt to geopolitical shocks. They also indicate the need for policies that better account for regional differences, particularly in the EU Member States that have traditionally been more exposed to supply risks, including those in Central and Eastern Europe. Strengthening solidarity mechanisms, improving coordination and supporting strategic investments will be essential for achieving a more balanced and resilient energy system.

From a research perspective, the study highlights the importance of continued monitoring of energy trade flows in a rapidly changing geopolitical environment. Future work should focus on improving methods for identifying indirect imports, analysing the long-term implications of the EU's energy transition for external dependency and examining the different adjustment strategies pursued by individual the EU Member States. As the EU continues to reshape its energy system and moves toward climate neutrality, understanding these processes will be essential for ensuring economic stability and strategic security.

REFERENCES

AH-VOUN, D., CHYONG, C. K. and LI, C. (2024), 'Europe's energy security: From Russian dependence to renewable reliance', *Energy Policy*, 184, 113856. https://doi.org/10.1016/j.enpol.2023.113856

AN, H., ZHONG, W., CHEN, Y., LI, H. and GAO, X. (2014), 'Features and evolution of international crude oil trade relationships: A trading-based network analysis', *Energy*, 74, pp. 254–259. https://doi.org/10.1016/j.energy.2014.06.095

BANKIER.PL (2023), 'Jedynie siedem krajów UE zmniejszyło import z Rosji', https://www.bankier.pl/wiadomosc/Media-jedynie-siedem-krajow-UE-zmniejszylo-import-z-Rosji-8468680.html [accessed on: 15.02.2025].

BASDEKIS, C., CHRISTOPOULOS, A., KATSAMPOXAKIS, I. and NASTAS, V. (2022), 'The Impact of the Ukrainian War on Stock and Energy Markets: A Wavelet Coherence Analysis', *Energies*, 15 (21), 8174. https://doi.org/10.3390/en15218174

BRUEGEL (2022), 'REPowerEU: Will EU countries really make it work?', https://www.bruegel.org/blog-post/repowereu-will-eu-countries-really-make-it-work [accessed on: 18.09.2025].

BRUEGEL (2024), 'Future European Union gas imports: Balancing different objectives', https://www.bruegel.org/analysis/future-european-union-gas-imports-balancing-different-objectives [accessed on: 16.09.2025].

CREA (2025), 'EU imports of Russian fossil fuels in third year of invasion surpass financial aid sent to Ukraine', https://energyandcleanair.org/publication/eu-imports-of-russian-fossil-fuels-in-third-year-of-invasion-surpass-financial-aid-sent-to-ukraine/ [accessed on: 24.10.2025].

CHEBOTAREVA, G., TVARONAVIČIENĖ, M., GORINA, L., STRIELKOWSKI, W., SHIRYAEVA, J. and PETRENKO, Y. (2022), 'Revealing Renewable Energy Perspectives via the Analysis of the Wholesale Electricity Market', *Energies*, 15 (3), 838. https://doi.org/10.3390/en15030838

CZECH, K. and WIELECHOWSKI, M. (2023), 'Russian aggression against Ukraine and the changes in European Union countries' macroeconomic situation: Do energy intensity and energy dependence matter?', *Economics and Business Review*, 9 (4). https://doi.org/10.18559/ebr.2023.4.1073

DELOITTE (2022), '2022 Oil and Gas Industry Outlook, Deloitte Insights', https://www2.deloitte.com [accessed on: 13.08.2023].

DONG, G., QING, T., DU, R., WANG, C., LI, R., WANG, M., TIAN, L., CHEN, L., VILELA, A. L. M. and STANLEY, H. E. (2020)., 'Complex network approach for the structural optimization of global crude oil trade system', *Journal of Cleaner Production*, 251, 119366. https://doi.org/10.1016/j.jclepro.2019.119366

EUROPEAN COMMISSION (2019), 'The European Green Deal, Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions', Brussels, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52019DC0640 [accessed on: 01.02.2026].

EUROPEAN COMMISSION (2021), 'European Energy: Annual Report 2021, Directorate-General for Energy', Brussels, https://energy.ec.europa.eu [accessed on: 13.08.2023].

EUROPEAN COMMISSION (2022), 'REPowerEU Plan, Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions', Brussels, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52022DC0230 [accessed on: 01.02.2026].

EUROPEAN COMMISSION (2024), 'EU trade relations with Russia. Facts, figures and latest developments', https://policy.trade.ec.europa.eu/eu-trade-relationships-country-and-region/countries-and-regions/russia_en [accessed on: 27.11.2024].

EUROPEAN PARLIAMENT (2020), 'Energy Security in the EU's External Policy, European Parliamentary Research Service', Brussels, https://www.europarl.europa.eu/thinktank [accessed on: 13.08.2023].

EUROSTAT (2023), 'EU energy mix and import dependency', https://ec.europa.eu/eurostat/statistics-explained/index.php?title=EU_energy_mix_and_import_dependency#EU_energy_dependency_on_Russia [accessed on: 27.11.2024].

EUROSTAT (2025), 'Imports of energy products to the EU down in 2024', https://ec.europa.eu/eurostat/web/products-eurostat-news/w/ddn-20250321-1 [accessed on 21.03.2025].

FINLEY, M. and MIKULSKA, A. (2023), *Wielding the Energy Weapon: Differences Between Oil and Natural Gas*. https://doi.org/10.25613/G9P2-3F78

FLORES-CHAMBA, J., LÓPEZ-SÁNCHEZ, M., PONCE, P., GUERRERO-RIOFRÍO, P. and ÁLVAREZ-GARCÍA, J. (2019), 'Economic and Spatial Determinants of Energy Consumption in the European Union', *Energies*, 12 (21), 4118. https://doi.org/10.3390/en12214118

GADAWA, M. (2025), 'Historyczna decyzja ws. Rosyjskiego gazu. Węgry oburzone. Reagują', Money.pl – portal finansowy, https://www.money.pl/gospodarka/ue-konczy-z-rosyjskim-gazem-wegry-i-slowacja-juz-odpowiadaja-7228474176781248a.html [accessed on: 04.12.2025].

GOLDTHAU, A. C. and YOUNGS, R. (2023), 'The EU Energy Crisis and a New Geopolitics of Climate Transition', *JCMS: Journal of Common Market Studies*, 61 (S1), pp. 115–124. https://doi.org/10.1111/jcms.13539

GOLDTHAU, A., EICKE, L. and WEKO, S. (2020), 'The Global Energy Transition and the Global South', [in:] HAFNER, W. M. and TAGLIAPIETRA, S. (eds), *The Geopolitics of the Global Energy Transition*, 73, pp. 319–339. Springer International Publishing. https://doi.org/10.1007/978-3-030-39066-2_14

GOLDTHAU, A. and SITTER, N. (2020), 'Power, authority and security: The EU's Russian gas dilemma', *Journal of European Integration*, 42 (1), pp. 111–127. https://doi.org/10.1080/07036337.2019.1708341

IEA (2021), *Global Energy Review 2021*, International Energy Agency, Paris, https://iea.blob.core.windows.net/assets/d0031107-401d-4a2f-a48b-9eed19457335/GlobalEnergyReview2021.pdf [accessed on: 15.07.2023].

IEA (2022), *European Union Energy Policy Review*, International Energy Agency, Paris, https://www.oecd.org/en/publications/iea-energy-policy-reviews_8550daed-en.html [accessed on: 15.07.2023].

IEA (2023), *World Energy Outlook 2023 – Analysis*, https://www.iea.org/reports/world-energy-outlook-2023 [accessed on: 17.05.2024].

IEA (2024), *Share of European Union gas demand met by Russian supply, 2001-2024 – Charts – Data and Statistics*, https://www.iea.org/data-and-statistics/charts/share-of-european-union-gas-demand-met-by-russian-supply-2001-2024 [accessed on: 17.09.2025].

JONEK-KOWALSKA, I. (2022), 'Multi-criteria evaluation of the effectiveness of energy policy in Central and Eastern European countries in a long-term perspective', *Energy Strategy Reviews*, 44, 100973. https://doi.org/10.1016/j.esr.2022.100973

KALUS, K. (2025), 'LNG z Rosji. Głównym odbiorcą w Europie jest Francja', Money.pl – portal finansowy, https://www.money.pl/gospodarka/lng-z-rosji-glownym-odbiorca-w-europie-jest-francja-7126476393933632a.html [accessed on: 04.12.2025].

KATSAMPOXAKIS, I., CHRISTOPOULOS, A., KALANTONIS, P. and NASTAS, V. (2022), 'Crude Oil Price Shocks and European Stock Markets during the COVID-19 Period', *Energies*, 15 (11), 4090. https://doi.org/10.3390/en15114090

LABELLE, M. C. (2024), 'Breaking the era of energy interdependence in Europe: A multidimensional reframing of energy security, sovereignty, and solidarity', *Energy Strategy Reviews*, 52, 101314. https://doi.org/10.1016/j.esr.2024.101314

LIM, B., YOO, J., HONG, K. and CHEONG, I. (2021), 'Impacts of Reverse Global Value Chain (GVC) Factors on Global Trade and Energy Market', *Energies*, 14 (12), 3417. https://doi.org/10.3390/en14123417

MANOWSKA, A., RYBAK, A., DYLONG, A. and PIELOT, J. (2021), 'Forecasting of Natural Gas Consumption in Poland Based on ARIMA-LSTM Hybrid Model', *Energies*, 14 (24), 8597. https://doi.org/10.3390/en14248597

MATA PÉREZ, M. D. L. E., SCHOLTEN, D. and SMITH STEGEN, K. (2019), 'The multi-speed energy transition in Europe: Opportunities and challenges for EU energy security', *Energy Strategy Reviews*, 26, 100415. https://doi.org/10.1016/j.esr.2019.100415

NIELSEN, H., WARDE, P. and KANDER, A. (2018), 'East versus West: Energy intensity in coal-rich Europe, 1800–2000', *Energy Policy*, 122, pp. 75–83. https://doi.org/10.1016/j.enpol.2018.07.006

NIU, X., CHEN, W. and WANG, N. (2023), 'Spatiotemporal Dynamics and Topological Evolution of the Global Crude Oil Trade Network', *Energies*, 16 (4), 1728. https://doi.org/10.3390/en16041728

NURYYEV, G., KOROL, T. and TETIN, I. (2021), 'Hold-Up Problems in International Gas Trade: A Case Study', *Energies*, 14 (16), 4984. https://doi.org/10.3390/en14164984

PUTTACHAI, W., PHADKANTHA, R. and YAMAKA, W. (2022), 'The threshold effects of ESG performance on the energy transitions: A country-level data', *Energy Reports*, 8, pp. 234–241. https://doi.org/10.1016/j.egyr.2022.10.187

RYBAK, A., RYBAK, A. and KOLEV, S. D. (2022), 'The import of energy raw materials and the energy security of the European Union – the case of Poland', *Gospodarka Surowcami Mineralnymi – Mineral Resources Management*, pp. 29–48. https://doi.org/10.24425/gsm.2022.143630

SAMPEDRO, J., VAN DE VEN, D.-J., HOROWITZ, R., RODÉS-BACHS, C., FRILINGOU, N., NIKAS, A., BINSTED, M., IYER, G. and YARLAGADDA, B. (2024), 'Energy system analysis of cutting off Russian gas supply to the European Union', *Energy Strategy Reviews*, 54, 101450. https://doi.org/10.1016/j.esr.2024.101450

SHIRAZI, M. and FUINHAS, J. A. (2023), 'Portfolio decisions of primary energy sources and economic complexity: The world's large energy user evidence', *Renewable Energy*, 202, pp. 347–361. https://doi.org/10.1016/j.renene.2022.11.050

SPIRO, D., WACHTMEISTER, H. and GARS, J. (2025), 'Assessing the impacts of oil sanctions on Russia', *Energy Policy*, 206, 114739. https://doi.org/10.1016/j.enpol.2025.114739

SUN, X., WEI, Y., JIN, Y., SONG, W. and LI, X. (2023), 'The evolution of structural resilience of global oil and gas resources trade network', *Global Networks*, 23 (2), pp. 391–411. https://doi.org/10.1111/glob.12399

THE BRUSSELS TIMES (2025), 'Zeebrugge is the top destination for Russian LNG in Europe', https://www.brusselstimes.com/1449926/zeebrugge-main-destination-for-russian-lng-in-europe?utm= [accessed on: 04.12.2025].

TRADE MAP (2025), *Trade statistics for international business development*, https://www.trademap.org/Index.aspx [accessed on: 17.09.2025].

WEINER, C., KOTEK, P. and TAKÁCSNÉ TÓTH, B. (2025), 'Two decades of changing dependency on Russian gas in Central and Eastern Europe: Strategies versus achievements', *Journal of Contemporary European Studies*, 33 (2), pp. 324–343. https://doi.org/10.1080/14782804.2024.2385978

WNP (2025), 'Belgijski port jest bramą dla rosyjskiego LNG', https://www.wnp.pl/energia/belgijski-port-jest-brama-dla-rosyjskiego-lng,995731.html [accessed on: 04.12.2025].

WU, G., PU, Y. and SHU, T. (2021), 'Features and evolution of global energy trade network based on domestic value-added decomposition of export', *Energy*, 228, 120486. https://doi.org/10.1016/j.energy.2021.120486

ZHOU, X., ZHANG, H., ZHENG, S., XING, W., ZHAO, P. and LI, H. (2022), 'The Crude Oil International Trade Competition Networks: Evolution Trends and Estimating Potential Competition Links', *Energies*, 15 (7), 2395. https://doi.org/10.3390/en15072395

COPE
Member since 2018
JM13710

EUROPEAN SPATIAL RESEARCH AND POLICY

Volume 33 2026 Number 1

https://doi.org/10.18778/1231-1952.33.1.08

Mohammadhossein DEHGHAN POUR FARASHAH *

URBAN REGENERATION OF INDUSTRIAL HERITAGE CITIES: A COMPARATIVE STUDY OF TEXTILE MANUFACTURING IN ŁÓDŹ (POLAND) AND YAZD (IRAN)

Abstract. This study conducts a comparative analysis of the urban regeneration processes in Łódź, Poland, and Yazd, Iran. Despite the fact that both cities share a common historical background in textile manufacturing, they are characterised by distinct political, cultural, and socio-economic contexts. This research synthesises the findings of six doctoral papers to explore the values associated with textile manufacturing heritage, the role of post-industrial functions in urban management, and the determinants influencing urban regeneration. The methodology employed semi-structured interviews with stakeholders, complemented by fieldwork and observational analyses of textile manufacturing heritage sites, with a particular emphasis on revitalisation projects. While the Historic Urban Landscape framework examines the principles of spatial integration, the critical heritage studies approach evaluates the representation of heritage and the construction of meaning. By integrating comparative perspectives from Central European and Middle Eastern contexts, this research provides transferable strategies for policymakers, urban planners, and heritage managers aimed at fostering equitable, culturally informed, and sustainable urban transformation within industrial districts.

Key words: revitalisation, adaptive reuse, heritage value, Historic Urban Landscape, critical heritage study, industrial heritage tourism, Łódź, Poland, Yazd, Iran.

* Mohammadhossein DEHGHAN POUR FARASHAH, University of Lodz, Doctoral School of Social Science, Matejki 21/23, 90-237 Łódź, Poland; e-mail: mohammadhossein.dehghan.pour.farashah@edu.uni.lodz.pl, ORCID: https://orcid.org/0000-0001-7947-4230

Received: 30.11.2025, Revised: 22.03.2026, Accepted: 01.04.2026

Funding information: University of Lodz. **Conflicts of interests:** None. **Ethical considerations:** The Author assures no violations of publication ethics and takes full responsibility for the content of the publication. **Declaration regarding the use of GAI tools:** Not used.

1. INTRODUCTION

Heritage plays a pivotal role in shaping the identity and perception of a city, which is inherently influenced by emotional responses and lived experiences (Walczak, 2015). The conventional definitions of heritage have been fundamentally challenged by the emergence of critical heritage studies (CHS) as a significant subfield. This approach examines the historical, sociocultural, governmental, and political dimensions of heritage (Gentry and Smith, 2019; Lixinski *et al.*, 2024). CHS adopts a people-oriented approach that examines the reception, negotiation, and transformation of heritage across temporal contexts (Smith, 2006; Witcomb and Buckley Am, 2013). In contrast to an approach to heritage preservation that emphasises material and intrinsic values, the CHS underscores the foundational relationship between the community and the continuity of heritage (Poulios, 2014). This foundational relationship may encompass urban spaces that embody complex layers of societal memory and cultural narratives, thereby facilitating the navigation of their historical contexts and the formation of collective memories (Soyer and Tunca, 2025). Urban regeneration can significantly influence the landscape of collective memory and emotional attachment within local populations, while also complicating the power dynamics among the stakeholders involved (Sacco *et al.*, 2013).

The concept of heritage is expanded to encompass elements that have, until recently, received insufficient attention, such as industrial heritage. The legacy of our recent industrial past serves as a significant representation of a rich production culture, which necessitates preservation and revitalisation as a recognised aspect of heritage (Alba Dorado, 2023). Industrial heritage encompasses significant historical, social, cultural, technical, commercial, and aesthetic value, thereby constituting an essential component of our cultural legacy (Dehghan Pour Farashah, 2024; Mo *et al.*, 2022). In the late 20th century, the revitalisation and utilisation of industrial heritage sites emerged as effective strategies for promoting urban regeneration in Britain, serving as a reference point for other countries (Couch *et al.*, 2008; Zhang *et al.*, 2022). Industrial heritage serves as both a source of cultural identity and a commodity that contributes to economic development; however, tensions frequently arise between these dual functions (Yang *et al.*, 2019). Historic industrial sites are integral to tourism development and urban regeneration initiatives, providing opportunities for efficient new uses despite inherent challenges (Pickard, 2018). Transforming industrial heritage buildings into innovative spaces presents significant potential for hosting cultural events, leisure activities, and tourism (Lee *et al.*, 2022; Murzyn, 2016; Navratil *et al.*, 2018). Furthermore, the revitalisation of these structures can lead to substantial improvements in environmental quality (Becchio *et al.*, 2018). The revitalisation of industrial heritage sites has the potential to catalyse urban regeneration when implemented through an

integrated development framework that encompasses physical, economic, social, and cultural dimensions (Sun and Chen, 2023).

Based on ICOMOS, conservation encompasses the methodologies for maintaining and managing alterations to heritage buildings in a manner that preserves and enhances their heritage value. This approach may involve strategies aimed at safeguarding the heritage value of assets through minimal intervention (ICOMOS, 2013). In contrast, preservation primarily emphasizes the protection of heritage buildings from deterioration, destruction, or inappropriate modifications, typically by maintaining them in their existing condition. Preservation is generally regarded as a more static process than conservation, prioritising the retention of the original material and form of the building (Venice Charter, 1964). In practice, preservation is implemented for structures of significant value or when the emphasis on historical authenticity is paramount. Revitalisation is defined as the reintegration of heritage buildings into the social and economic context of a community, frequently requiring active community participation and the implementation of urban regeneration strategies. Pendlebury (2008) characterised revitalisation as a dynamic process designed to restore a heritage site through investment and adaptive reuse, often associated with the broader context of urban regeneration. This process integrates cultural, social, and economic objectives while promoting both the preservation of the building and its reintegration into contemporary society. Adaptive reuse refers to the practice of repurposing buildings for new functions while preserving their heritage values. Bullen and Love (2011) have argued that adaptive reuse constitutes a sustainable strategy, enabling structures to meet contemporary requirements without necessitating complete demolition or extensive modification. This research considers all relevant activities, placing particular emphasis on revitalisation efforts. Additionally, the activities conducted in the case studies are incorporated into the broader process of urban regeneration within districts characterised by industrial heritage.

CHS and collective memory emphasise the processes through which local communities construct, interpret, and contest industrial heritage (Assmann, 2011; Wertsch, 2021). Sun and Chen (2023) have contended that the unique significance of the industrial area is rooted in its historical and contemporary functions as a hub for the furniture and building materials industries. Retired workers, labour unions, and communities whose livelihoods have been shaped by industrial activities are currently confronted with the challenge of preserving and commemorating their industrial heritage (Smith and Campbell, 2017). These sites elicit intricate emotional responses that encompass both feelings of loss and pride (Dehghan Pour Farashah, Ghaderi, *et al.*, 2025). Industrial heritage also encompasses the cities, sites, and transformations that have substantial implications for urban planning. The recognition and management of industrial heritage sites, encompassing preservation, revitalisation, and selective demolition, are intricately linked to the conflicts that emerge within planning practices (Oevermann and Mieg, 2014b). Consequently,

management and revitalisation of industrial heritage are closely interconnected with endeavours in urban and regional planning, alongside the tensions that emerge in the remembrance of heritage (Douet, 2016; Oevermann and Mieg, 2014a). The built environments linked to industrial history predominantly display a mundane character, defined by intricate, expansive, polluted, or otherwise degraded landscapes (Smith, 2006). Lu *et al.* (2020) have asserted that, in recent years, the value of industrial heritage has been recognised within a broader context, shaped by urban regeneration initiatives, rather than being evaluated exclusively according to the standards and norms delineated in conventional heritage discourses and their associated frameworks. According to CHS, there is a significant emphasis on the necessity of context-sensitive approaches for comprehending heritage as a dynamic and contested process within post-industrial urban environments (Dehghan Pour Farashah *et al.*, 2026). Therefore, the revitalisation of industrial heritage through a comprehensive approach has the potential to enhance both the appreciation and value of such heritage (Babutsalı Alpler *et al.*, 2020).

The Historic Urban Landscape (HUL) recommendation, which integrates socioeconomic development with the regeneration of urban heritage, was endorsed by the UNESCO General Conference in 2011 (UNESCO, 2011). The HUL approach reflects the evolution of heritage philosophy over the past three decades and the dynamic role of heritage within cities (Bandarin, 2019). The framework emphasises the recognition and analysis of the global and local, tangible and intangible, environmental and cultural, as well as the interconnected layers of urban environments (Taylor, 2016). The HUL approach advocates for a re-evaluation of urban regeneration and conservation strategies (Dehghan Pour Farashah, 2024). The novelty of this approach lies in its comprehensive perspective on cities, which incorporates social, cultural, and economic dimensions. Consequently, the HUL framework distinguishes itself as an innovative approach to addressing contemporary urban challenges within the context of regeneration (UNESCO, 2011). The multi-layered nature of industrial heritage value necessitates that the regeneration process incorporates an appropriate approach (Dehghan Pour Farashah, 2023). The HUL approach is well-suited for the regeneration of industrial heritage, as it considers all relevant values necessary to transform these sites into liveable spaces.

Hence, it is imperative to incorporate the regeneration of industrial heritage into the HUL approach. In this context, Dehghan Pour Farashah (2024) has presented a four-step conceptual planning framework that encompasses recognition, partnership efforts, diagnosis and feasibility, and intervention action. Recognition and partnership initiatives encompass the identification and classification of industrial heritage values, as well as the engagement of stakeholders in the development of innovative governance strategies. Diagnosing issues related to industrial heritage sites and conducting feasibility studies for adaptable urban uses could enhance living standards and create a balance between quality of life and urban development. Intervention actions consider both the tangible and intangible values of industrial

heritage in the context of regeneration, aiming to address the existing barriers. Furthermore, the parameters for adaptive reuse initiatives that facilitate urban regeneration and the conservation of industrial heritage are essential to consider. Thus, the novelty of this research lies in the integration of industrial heritage regeneration with the HUL approach, which enhances urban planning practices and policies in cities characterised by industrial heritage. Furthermore, this research conceptualises heritage not as a static remnant of the past, but as an ongoing, contested process in which memory, identity, and socio-political relations are inextricably intertwined.

Existing research has concentrated on the urban regeneration of industrial heritage cities through case studies of Yazd, Iran, and Łódź, Poland. Each case study exemplifies the industrial heritage cities in Central Europe and West Asia, characterised by distinct socio-economic, socio-cultural, and physical conditions. These two cities functioned as pivotal centres for textile manufacturing; however, the majority of textile factories have been closed since the 1990s, primarily due to urban development and the influx of imported textiles (Dehghan Pour Farashah *et al.*, 2025; Walczak, 2015). Due to the obsolescence of their original functions, several factories in these two cities have undergone transformations in usage since the 2000s (Dehghan Pour Farashah and Pourzakarya, 2025; Walczak and Kępczyńska-Walczak, 2024). The present study synthesises the conclusions of six doctoral research articles pertaining to urban regeneration within the context of textile manufacturing sites. This enables me to investigate the following questions:

1. What are the values of the textile manufacturing heritage in Yazd and Łódź?
2. What is the role of post-industrial functions in the urban management of Yazd and Łódź?
3. What determinants influenced urban regeneration within the context of industrial heritage spaces in Yazd and Łódź?

This study is significant as the exploration of urban regeneration in industrial heritage cities is imperative for the promotion of inclusive and sustainable urban heritage development. The conclusions derived from this research may elucidate the characteristics of urban regeneration in these two cities, which exemplify Central Europe and West Asia, respectively. This study highlights that the values of industrial heritage are linked to the process of regeneration. Simultaneously, this study contributes to the discourse on community engagement in the process of adaptive reuse, elucidating how industrial heritage can be addressed within the context of contemporary urban development. The results of this study can assist policymakers, heritage experts, and urban designers in developing heritage statements that resonate with local populations and ensure the efficacy of urban regeneration initiatives. Figure 1 illustrates the conceptual and methodological framework of the paper. The overarching research question concerning urban regeneration in industrial heritage cities is examined through a comparative case study approach, focusing on the cities of Łódź and Yazd. The HUL approach serves as the primary spatial-planning framework, structuring the analysis of industrial heritage within the context of broader

urban systems. Empirical research is conducted through fieldwork, observation, and semi-structured interviews, yielding qualitative data that are analysed using coding and thematic analysis. The CHS approach constitutes the interpretive layer, exploring the dynamics of memory, identity, power, and value negotiation within the regeneration process. While the HUL framework scrutinises the principles of spatial integration, the CHS approach critically assesses the representation of heritage and the construction of meaning. The integration of these theoretical perspectives with empirical analysis informs the paper's findings on the efficacy of regeneration, governance, and socio-spatial transformation.

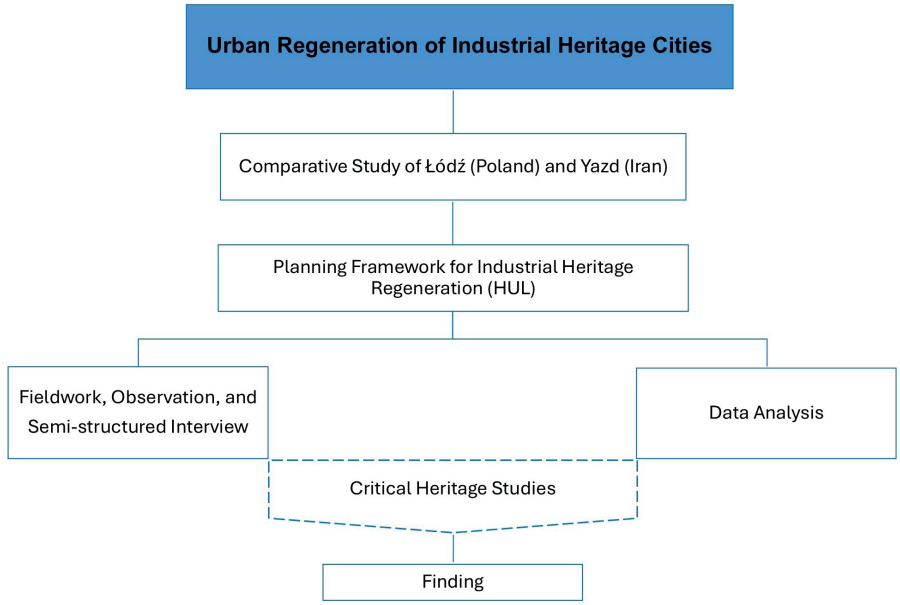


Fig. 1. Research process

Source: own work.

2. MATERIALS AND METHODS

2.1. Justification of comparative study and site selection

The choice of Łódź (Poland) and Yazd (Iran) is informed by a comparative research design that seeks to investigate the role of industrial heritage-led urban regeneration in different socio-economic, cultural, and institutional settings. Both

cities were prominent textile production hubs in the 19th and early 20th centuries, and both underwent a rapid process of deindustrialisation from the late 20th century onwards, leaving large numbers of obsolete industrial sites. This common industrial heritage offers a controlled setting for comparison, while the different political systems, planning cultures, values, and economic structures offer a setting to explore how context influences regeneration outcomes. From the perspective of socio-economic geography, this Central Europe and West Asia comparative study enables the discovery of general principles and context-dependent limitations in spatial management and urban regeneration. The criteria for selecting industrial heritage sites in Łódź and Yazd were meticulously defined to ensure consistency and validity in the comparative analysis of the two case studies (Table 1). Firstly, only sites exceeding one hectare in size were included, facilitating a focus on large-scale industrial sites with significant spatial impacts on the surrounding urban environment. Secondly, the selection was restricted to sites that have undergone revitalisation or adaptive reuse initiatives, enabling an examination of the outcomes of regeneration efforts, rather than focusing on abandoned or inactive industrial sites. Thirdly, all selected sites are either formally or socially recognised as industrial heritage sites, ensuring that the study investigates historically embedded urban environments rather than newly developed areas. Finally, the selected sites share a historical connection to textile production, thereby establishing functional equivalence between Łódź and Yazd as textile-based industrialised cities. By concentrating on large textile factories recognised for their heritage status and currently undergoing transformation, the study explores functionally equivalent post-industrial spaces, thereby enhancing the methodological rigor pertaining to the regeneration of industrial heritage in urban contexts.

Table 1. Criteria for selection of industrial heritage sites

Selection Criterion	Operational Definition	Analytical Purpose	Comparative Function (Łódź–Yazd)
Minimum site area	Industrial complex ≥ 1 hectare	Ensures spatial significance and urban impact	Selects large-scale post-industrial areas in both cities
Revitalisation / adaptive reuse	Site undergoing or completed regeneration	Enables analysis of regeneration processes and outcomes	Allows comparison of transformation trajectories
Heritage recognition	Identified as industrial heritage site	Focus on historically embedded urban landscapes	Ensures historical equivalence
Textile industrial function	Former textile factory	Maintains sectoral consistency	Links cities through shared industrial legacy

Source: own work.

2.2. Data collection and data analysis

This study is based on a comparative study derived from a larger research project conducted during the PhD program. Comparative study in the social sciences is exemplified in cross-cultural or comparative research that aims to analyse differences and similarities across various countries or cultures (Lambert, 2001). In relation to data collection, the author employed semi-structured interviews with experts and professionals, complemented by fieldwork and observational analyses of textile manufacturing heritage sites, with particular emphasis on revitalisation projects in these two cities. This observation involved two years of fieldwork conducted in Łódź and Yazd, spanning from 2022 to 2024. To analyse the status of textile heritage sites within the contexts of Łódź and Yazd, the author engaged in multiple tours as a tourist throughout this period. The fieldwork and observational analysis conducted during the tours were systematically documented utilising photography and note-taking as the primary methods. Following each tour, the notes were elaborated upon and refined for data analysis, incorporating references to the corresponding photographs. The observations encompass a thorough analysis of the condition of industrial heritage sites and their contextual environments. The adaptation and modification of these sites for new purposes, along with the interactions between users and heritage spaces, have been thoroughly documented. The narratives and values articulated by the tour guides constituted the most significant aspect of the observation, as they encapsulated the textile manufacturing heritage. Furthermore, the repurposing of textile factories for various functions and the involvement of local communities were noted, prompting the formulation of follow-up questions for the tour guide. In examining the relationship between the two distinct data sets (observations and semi-structured interviews), identifying contradictions among the statements underscores potential issues of falsification.

Regarding semi-structured interviews, 46 interviews were conducted in Łódź from November 2023 to March 2024, and 32 interviews were conducted in Yazd from July 2023 to September 2023. The interview guidelines were developed in accordance with the literature review and aligned with the study's research questions and objectives. Interviews were seized at the time of data saturation. The interviewees were recognised experts in the disciplines of architecture, urban studies, economics, and tourism. Additionally, eight interviewees in Łódź were former employees of textile factories, while six interviewees in Yazd had similar backgrounds. The snowball sampling was employed for the participant selection to ensure balanced representation between the public and private sectors, as well as between academic and practitioner domains. Initial invitation messages were dispatched to experts in Yazd, followed by subsequent telephone calls. In the case of Łódź, experts were solicited for interviews through email correspondence. Interviews with participants were conducted in their offices or in a nearby café in

Persian, Polish, and English, while ensuring adherence to anonymity protocols. A voice recorder was utilised during the interviews, with the consent of the participants, and the recordings were subsequently transcribed. Each interview had a duration ranging from 80 to 120 minutes, with the Polish and Persian interviews translated into English for analytical purposes. Content, thematic, and reflexive thematic analysis techniques were employed to analyse the texts using Atlas.ti software (version 8). The textual data were analysed utilising these techniques to elucidate underlying themes (Ghaderi *et al.*, 2020). The data was coded in accordance with the research inquiries and subsequently classified based on semantic and conceptual relationships, followed by appropriate labelling. A network of coding groups was established, featuring a principal theme for each network along with supplementary sub-codes to elucidate the interconnections among concepts (Ghaderi *et al.*, 2024). In the results section, excerpts from the interview findings are presented from five distinct studies.

2.3. Yazd

The city had historically been inhabited predominantly by Jewish, Zoroastrian, and Muslim communities. Yazd began to gain prominence in the Sasanian Empire (438–457) due to its strategic location near the Silk and Spice Roads on the Central Iranian plateau (Fig. 2). This location exemplifies the adaptation to and utilisation of limited resources for survival in a desert environment. The cultural heritage of Yazd, encompassing earthen architecture and traditional handicrafts, has largely remained preserved throughout the years (Dehghan Pour Farashah *et al.*, 2025). The presence of skilled artisans, along with the rich history of the textile industry in Yazd, has significantly contributed to the establishment of modern industrial institutions at the beginning of the 20th century (Dehghan Pour Farashah and Pourzakarya, 2025). The importation of industrial machinery from Europe and the United States facilitated the establishment of large-scale factories, which significantly contributed to the economy of Yazd for more than fifty years (Ramazankhani, 2016). These factories were characterised by distinctive architectural patterns and designs that were indicative of their historical context (Dehghan Pour Farashah *et al.*, 2019). Since the 1990s, several textile factories in Yazd were closed due to urban development, environmental concerns, economic recessions, and shifts toward service-oriented and heavy manufacturing sectors (Dehghan Pour Farashah and Pourzakarya, 2025; Esfahani and Pesaran, 2009). Due to their substantial dimensions, advantageous urban locations, and the adaptability of their modular structures, these entities paved the way for conversion into diverse uses. However, there has been a lack of adequate efforts to promote awareness of these sites in Yazd in comparison to other heritage buildings (Samadzadehyazdi *et al.*, 2020).

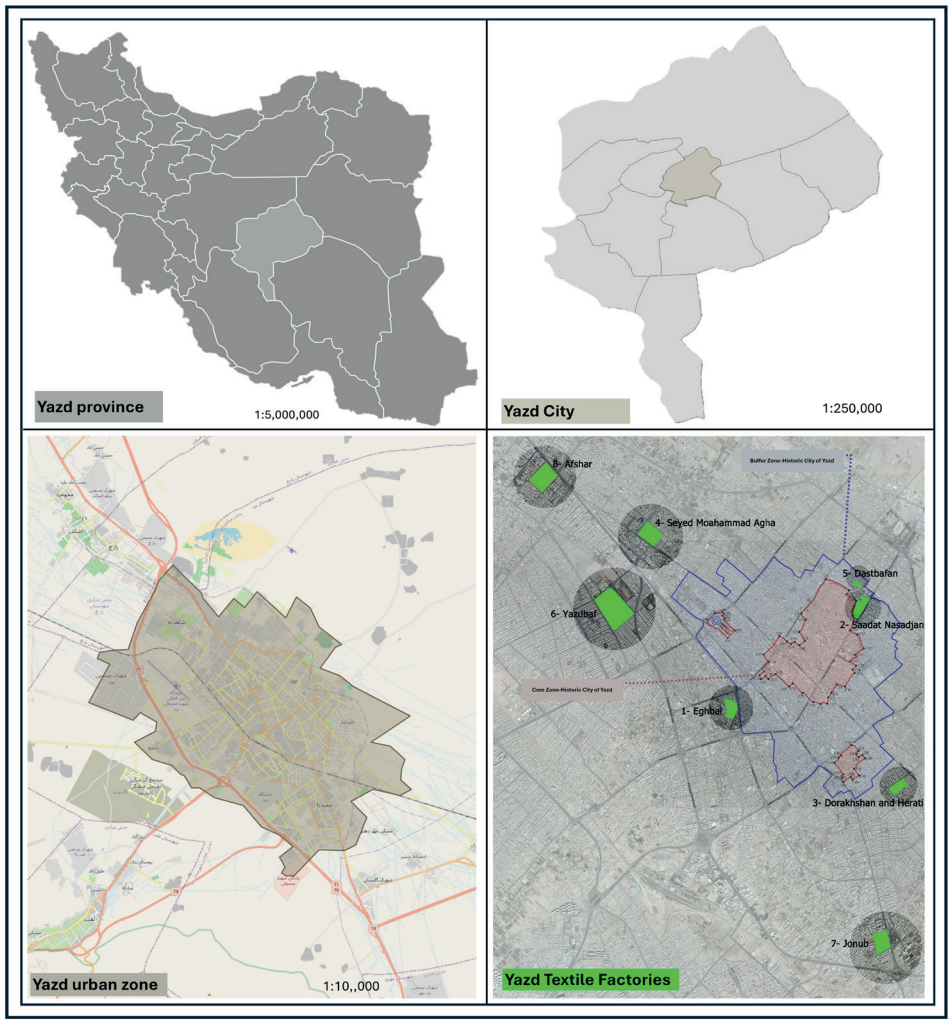


Fig. 2. Location of Yazd province in Iran, location of Yazd city and urban zone, and location of textile factories

Source: own work.

2.4. Łódź

Łódź is located in the central region of Poland and was granted city rights in 1423, maintaining a modest status as a settlement until the 18th century (Fig. 3). The city underwent a transformation into a rapidly developing centre of industry, primarily in the field of textile manufacturing, in 1820, as a result of a decision made by the authorities (Dehghan Pour Farashah *et al.*, 2025).

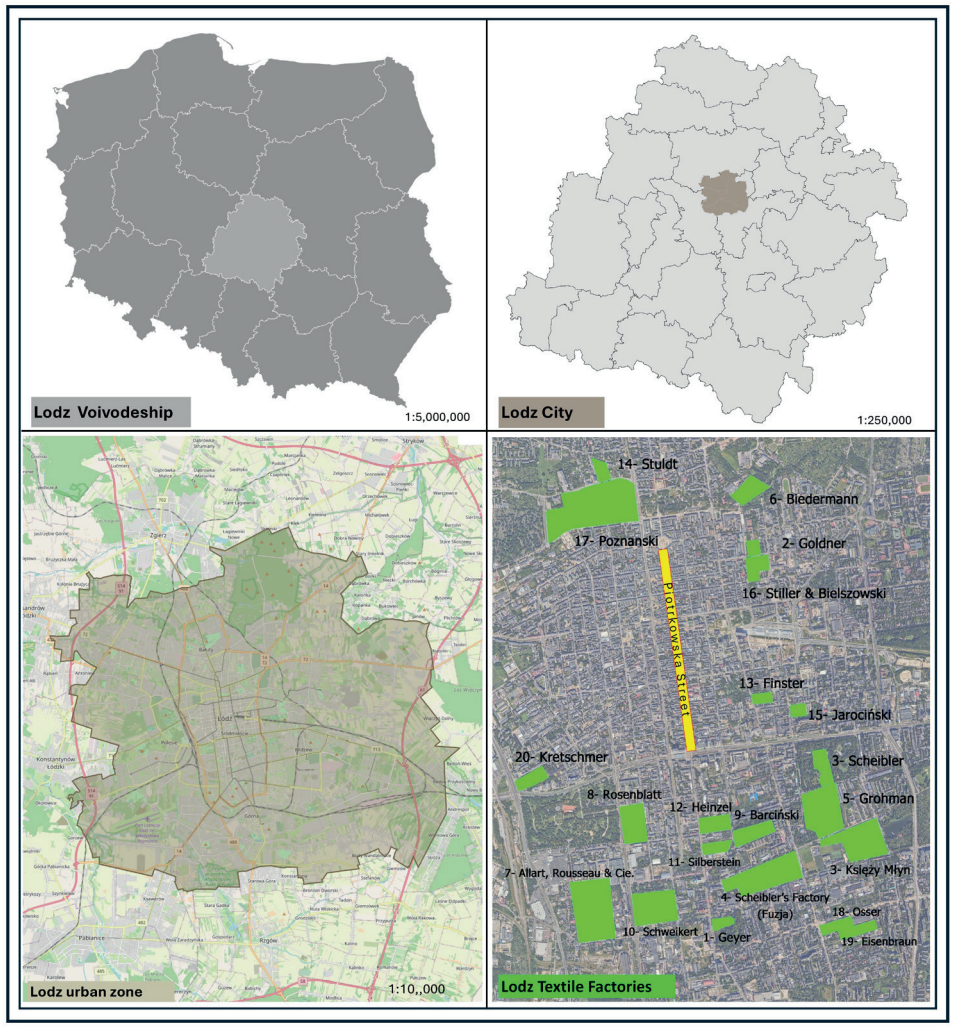


Fig. 3. Location of Łódź voivodeship in Poland, location of Łódź city and urban zone, and location of textile factories

Source: own work.

Individuals from various regions of Europe, including southern Germany, Silesia, Bohemia, and Jewish communities, migrated to Łódź. Accordingly, Łódź was a multicultural city characterised by the coexistence of diverse groups, including Jewish, German, Russian, and Polish populations (Mokras-Grabowska and Mroczek-Żulicka, 2024). The city experienced a relatively stable period of growth and expansion during the socialist era, following a phase of rapid development in the 19th and early 20th centuries. Following the political transformation that

occurred in 1989, the city subsequently experienced a decline (Galuszka, 2022). This also resulted in the collapse of the textile industry, necessitating the development of new uses for its abandoned industrial heritage sites in order to reinvent the identity of Łódź. Since the early 2000s, there has been a growing number of adaptive reuse projects involving these sites. These textile factories have been repurposed as educational institutions, commercial centres, cultural venues, and residential complexes (Walczak, 2015). The revitalisation efforts pertaining to former textile factories in the early 2000s coincided with the transition to a more consumption-oriented society. This movement has facilitated the preservation of Łódź's unique identity while simultaneously adapting to the post-industrial economic landscape (Dehghan Pour Farashah *et al.*, 2025).

3. FINDING

Following the application of the selection criteria delineated in Table 1, an initial compilation of textile industrial sites was generated for both case study cities. Based on the minimum area criterion of one hectare, eight textile factory complexes were identified in Yazd, while twenty were identified in Łódź. Subsequently, additional criteria pertaining to adaptive reuse/revitalisation status, designation as industrial heritage sites, and historical connections to textile production were employed to further refine the list. This systematic filtering process ultimately resulted in the selection of five textile factories in Yazd and nine in Łódź for further analysis (Tables 2 and 3). Factories highlighted in red are designated as selected factories. The shortlisted industrial heritage sites served as the foundation for the empirical research, which informed the execution of fieldwork, stakeholder interviews, and qualitative analysis procedures, as discussed in the subsequent section on data and research methods. The maps included in Fig. 2 and 3 primarily fulfil an informational and locational role, delineating the broader administrative context of the case-study cities within their respective regions. However, the empirical scope of this research is constrained to specific post-industrial textile heritage sites situated within the administrative boundaries of the cities of Łódź and Yazd. Consequently, the analysis concentrates on urban regeneration processes at both the site and city levels, rather than on development dynamics at the regional scale.

3.1. Recognition of the value of textile manufacturing heritage

According to the findings in Yazd, one of the critical preconditions for reuse is the identification of the historical and cultural value of textile factories prior to the initiation of the reuse process. Such values evoke emotions of pride and a sense of

place attachment that are intrinsically linked to the historical context of the city. Besides their architectural importance, these factories are mainly valued for their social and economic impact. They help make the city livelier and offer jobs to people from different parts of Yazd. The change in land use from revitalisation has improved the urban economy and brought added economic value to the local community. Adaptive reuse supports sustainable urban planning by mitigating suburban sprawl and contributes to sustainable construction by reducing material consumption. This concept aligns with the perspective that industrial heritage buildings represent reusable assets. Several cases illustrate how adaptive reuse can transform sites that are perceived negatively, resulting in enhanced local security, increased land value for the surrounding neighbourhood, and improved prospects for tourism development. The success of these revitalisation cases fundamentally relies on social values and community engagement. Experts emphasised that collective memory and social interaction should be considered during the conversion of factories, thereby facilitating public familiarity with heritage and revitalising the memories associated with textiles. Additionally, former workers should be involved in the revitalisation process, potentially as investors. Furthermore, certain uses, such as cultural and creative industries, can create social value; however, former workers are restricted from visiting, resulting in limited connection with the general public. In Yazd, the textile factories exhibit significant potential for diversification into new uses, largely due to their expansive areas, adaptable modular structures, and comparatively fewer preservation restrictions compared to other categories of heritage. The presence of multiple buildings within a site may contribute to the effectiveness of the revitalisation phasing plan. In addition to the value of industrial heritage in Iran, it is important to recognise that political, cultural, and religious factors impose constraints on certain new uses. Furthermore, some of these new uses appear to have been adopted from European models without consideration for their feasibility or the needs of Yazd. Table 2 presents a compilation of textile factories located in Yazd that occupy an area exceeding one hectare.

Table 2. List of textile factories of Yazd

Factory. No	**Name of factory**	**Year when established**	**Year when closed**	**Current condition**	**Revitalisation completion date**	**Area (hectare)**
1	Eghbal	1931	1978	Reused (Yazd Science and Technology Park)	2006	3.65
2	Saadat Nasadjan	1934	2000s	Under revitalisation for hotel	2026	10

Table 2 (cont.)

Factory. No	Name of factory	Year when established	Year when closed	Current condition	Revitalisation completion date	Area (hectare)
3	Dorakhshan and Herati	1935	1980s	Reused (Innovation Factory)	2022	4.1
4	Seyed Moahammad Agha	1948	2000s	Abandoned	Not applicable	8.47
5	Dastbafan	1948	1980s	Abandoned and school	1990s	1.16
6	Yazdbaf	1956	Not applicable	Active (in its original function)	Not applicable	14
7	Jonub	1959	2003	Reused as seasonal exhibitions and museum	2017	5.37
8	Afshar	1963	2010s	Abandoned	Not applicable	12.1

Note: Factories highlighted in red are designated as selected factories.

Source: own work.

Table 3 delineates twenty textile factories located in Łódź, each occupying a land area exceeding one hectare.

Table 3. List of textile factories of Łódź

Factory. No	Name of factory	Year when established	Year when closed	Current condition	Revitalisation completion date	Area (hectare)
1	Geyer's White Factory	1837	1990	Museum	1960	2.88
2	Ferdinand Goldner's factory	1883 - 1896	1995	University	2001	1.1
3	Księży Młyn (Priest's Mill)	1824	2006	Offices and housing	2024	10
4	Scheibler's Factory (Western part – now "Fuzja")	1878	2003	Residential, offices and restaurant	2024	18.5

Factory. No	Name of factory	Year when established	Year when closed	Current condition	Revitalisation completion date	Area (hectare)
5	Grohman factory	1888	2003	Abandoned / office, conference, cultural and exhibition centre	2013	1.45
6	Biedermann factory	1863	1990	Destroyed and new factory	Not applicable	4.4
7	Allart, Rousseau & Cie.	1879	1989	Abandoned and destroyed / housing	Not applicable	8.8
8	Rosenblatt factory	1880	1934	Lodz University of Technology / Mostly new buildings	1945	7.6
9	Salomon Barciński factory	1884	2004	Residential Dental Medic / completely new buildings	Not applicable	4.8
10	F.W. Schweik-ert factory	1908	1994	Lodz University of Technology Library / partly new buildings	2002	8.7
11	Markus Silberstein Factory	1896	1980	Apartment rental agency / partly destroyed, partly abandoned, partly office	2000	2.4
12	J. Heinzel dyeing and printing house	1861	1925	Destroyed, buildings from 20th century	Not applicable	4
13	Teodor Finster factory	1881	1990s	Offices and Social Sciences Academy / labor Office	2000s	1.6

Table 3 (cont.)

Factory. No	Name of factory	Year when established	Year when closed	Current condition	Revitalisation completion date	Area (hectare)
14	Jan Stüldt factory	1886	1937	Destroyed	Not applicable	1.8
15	Factory of Zygmunt Jarociński	1889	1995	Abandoned	Not applicable	1.5
16	Stiller and Bielszowski Factory	1876	1950s	Warehouses / Little factories	2000s	1.7
17	Izrael Poznański's factory	1872-1892	1992	Arts centre, shopping mall, and leisure complex	2006	27
18	Osser	1903	1995	Abandoned / workshops	Not applicable	4
19	Eisenbraun	1894	1950s	Workshops	Not applicable	2,8
20	Kretschmer	1880	1990s	Hotel, apartments	2013	2

Note: Factories highlighted in red are designated as selected factories.

Source: own work.

In Łódź, the process of heritage legitimisation has been undertaken by governmental bodies, municipalities, local communities, and particularly private enterprises over the past 25 to 30 years. Prior to this period, considerable debate occurred in Poland concerning whether these textile factories should be regarded as heritage and deemed worthy of protection. Other heritage is generated by well-known and prominent individuals. In contrast, the heritage of textile manufacturing is associated with ordinary individuals, such as servants and labourers. Therefore, although these post-industrial buildings may not represent the quintessential showcase of Łódź, they can significantly contribute to the urban identity of the city. The cultural, historical, and symbolic significance of Łódź's textile manufacturing heritage exemplifies how industrial heritage shapes local pride and collective memory, highlighting the city's identity as an industrial hub. The heritage value encompasses not only immovable heritage buildings but also the narratives of workers, the socio-economic impact of textile manufacturing, and Łódź's unique position within both Poland and Europe. Preserving and celebrating this heritage is essential for fostering a sense of place and belonging among residents. How-

ever, for some individuals, these factories epitomised a notion of memory and trauma within the context of heritage. This collective memory intensified during the 1990s, particularly following the closure of most factories that had formerly provided employment for a substantial number of individuals, many of whom subsequently encountered significant challenges in securing new job opportunities. Nonetheless, a pivotal shift in this perspective occurred in 2006, with the introduction of Manufaktura as the first textile factory repurposed for contemporary uses. The integration of industrial heritage values into the tourism landscape of Łódź involves engaging diverse audiences to promote the city as a distinctive destination for industrial heritage tourism. The effective interpretation of industrial heritage is essential for fostering meaningful visitor experiences that engage with the site's cultural and historical significance. Table 4 shows the comparative analysis of Yazd and Łódź.

Table 4. Comparative summary of the recognition of textile manufacturing heritage in Yazd and Łódź

Comparative dimension	**Yazd**	**Łódź**	**Key comparative insight**
Initial recognition of heritage value	Recognition of textile factories as heritage is a precondition for adaptive reuse and is still emerging; value identification must precede revitalisation.	Heritage recognition evolved through a long process of debate and legitimisation over 25–30 years, led by public authorities and private actors.	Yazd is at an early, value-discovery stage, while Łódź reflects a mature, institutionalised recognition process.
Dominant types of heritage value	Social and economic value dominates, alongside architectural significance; factories are valued for liveliness, employment, and urban economy.	Cultural, historical, and symbolic values are central, including workers' narratives and the city's identity as an industrial hub.	Yazd emphasises functional and socio-economic value, whereas Łódź emphasises symbolic, narrative, and identity-based value.
Emotional and memory-related associations	Pride, place attachment, and collective memory linked to the city's textile past; revitalisation aims to reactivate these memories.	Collective memory is strong but ambivalent, combining pride with trauma linked to factory closures and post-socialist transition.	Memory in Yazd is largely affirmative, while in Łódź it is contested, shaped by both nostalgia and socio-economic loss.
Role of community and former workers	Community engagement and inclusion of former workers (even as investors) are viewed as critical to successful reuse, though not always realised.	Workers' histories are recognised as part of heritage narratives, but direct involvement is less emphasized in current revitalisation practices.	Yazd stresses active participation, while Łódź focuses more on representation and interpretation of workers' histories.

Table 4 (cont.)

Comparative dimension	Yazd	Łódź	Key comparative insight
Perceived role of adaptive reuse	Adaptive reuse is seen as a tool for sustainable urban planning, economic revitalisation, improved security, and tourism potential.	Adaptive reuse marked a turning point in heritage perception (e.g., Manufaktura, 2006), integrating heritage into tourism and urban branding.	In Yazd, reuse is framed as potential and opportunity; in Łódź, it is a proven catalyst for revalorisation.
Constraints shaping heritage recognition	Political, cultural, and religious factors limit acceptable new uses; some reuse models are imported without local adaptation.	Constraints are mainly historical and socio-economic, linked to post-industrial decline and restructuring rather than cultural restrictions.	Heritage recognition in Yazd is shaped by contextual and normative constraints, while Łódź is shaped by structural and historical transitions.
Scale and physical potential of factory sites	Large plots, modular structures, and fewer preservation restrictions allow flexible reuse and phased revitalisation.	Large-scale complexes exist, but many sites face strict preservation rules or partial demolition and reconstruction.	Yazd's heritage offers greater physical flexibility, whereas Łódź's heritage faces higher conservation complexity.
Integration into tourism narratives	Tourism potential is acknowledged but unevenly realised; some new uses limit public access and engagement.	Industrial heritage is increasingly embedded in tourism strategies, emphasising interpretation and visitor experience.	Yazd shows latent tourism integration, while Łódź demonstrates strategic tourism incorporation.

Source: own work.

3.2. Role of post-industrial functions in urban management

In Yazd, post-industrial functions play a fundamental role in urban management, which is linked to the comprehensive regeneration and adaptive reuse of textile manufacturing heritage. This approach aims to achieve multifaceted economic, social, and physical revitalisation. Industrial heritage tourism is increasingly acknowledged as a compelling strategy employed by post-industrial cities to strengthen their economic frameworks and facilitate the revitalisation of the tourism sector within urban management. Textile factories hold considerable significance as they integrate modern industrial design with prominent features of traditional Iranian architecture. These buildings are distinguished from other heritage buildings due to their large scale, which is particularly conducive to the development of tourism facilities, accommodations, and large hotels. Their open-form and flexible architecture facilitates the allocation of multiple uses, including conversion into creative tourism centres or design spaces such as cinemas, necessitating minimal architectural intervention. The experts in Yazd identified several

post-industrial functions that offer essential social and recreational amenities for the community, including shopping centres, restaurants, coffee shops, and recreational green spaces. Furthermore, the adaptive reuse of certain textile factories has facilitated the establishment of educational and innovation centres. Notably, the Eghbal factory has been transformed into the Yazd Science and Technology Park, while the Dorakhshan and Herati factories have been repurposed as an Innovation Factory. Both of these factories were slated for demolition and conversion into shopping malls following their closure in the 1990s. However, through the collaboration of cultural heritage advocates and municipal authorities, these sites were revitalised, resulting in the regeneration of their surrounding neighbourhoods, particularly in the instances of the Dorakhshan and Herati factories. As part of the industrial heritage tourism process, the inclusion of active factories is encouraged in the presentation of textile manufacturing heritage. Despite these potentials, urban management efforts encounter significant challenges, particularly the inadequate consideration of these factories in the master plan of Yazd. Moreover, the presence of numerous historical buildings designated as UNESCO World Heritage Sites has resulted in the underutilisation of industrial heritage for tourism purposes. Therefore, planning authorities ought to prioritise the preservation of textile heritage factories and emphasise the enhancement of connections between these industrial sites and wider urban regeneration initiatives in Yazd (Fig. 4).

Fig. 4. Textile factories before and after revitalisation in Yazd

Source: own work and ICHHTO.

The events of the 1990s in Łódź heralded a significant collapse of the industry that extended beyond mere economic considerations. This decline also encompassed the disintegration of the social and community dimensions that are integral to the industry. Initially, during the transition to capitalism, factories prioritised the dismantling of social structures, viewing them as impediments to their operational efficiency. Industrial heritage sites have garnered increased attention from society in the wake of the revitalisation of textile factories. The concept of the contemporary city emerges

from the regeneration of industrial heritage, which reflects the evolving nature of urban planning through the integration of heritage into modern urban concepts. The textile factory complex exemplifies the „15-minute city" concept, which represents a contemporary urban planning model cantered on accessibility and sustainability. The economic and political context of a country can significantly influence the considerations surrounding heritage and regeneration practices. When societal and governmental priorities diverge, concerns regarding heritage are likely to be marginalised. Although the Central Museum of Textiles is recognised as the city's inaugural tourist attraction, the Manufaktura has emerged as a prominent tourist destination. This development signifies a substantial milestone for industrial heritage tourism in Łódź, effectively integrating modern facilities with historic amenities. In addition to the specific factories that have been revitalised for the purposes of tourism and hospitality, there exists potential for urban explorers to engage with factories that have yet to undergo revitalisation. Following the closure of textile factories in the 1990s, Łódź experienced a significant population decline and is recognized as a shrinking city within Poland. Retaining young residents after the completion of their studies is critical to the city's future sustainability. Consequently, the majority of interviewees acknowledged that the overall utilisation of the former textile factories could be more effectively oriented towards serving community purposes. Public engagement and stakeholder contributions, particularly from individuals previously connected to textile manufacturing in Łódź, are prominently discussed in relation to the role of post-industrial functions in urban management. The prevailing sentiment was that community-centric heritage reuse within revitalisation projects distinguishes these initiatives as unique to local residents and contributes to the creation of a more equitable urban environment. Furthermore, the importance of revitalising these areas for public use underscores the necessity of preserving not only historical memories but also ensuring the availability and accessibility of diverse spaces for all local residents (Fig. 5). Table 5 shows the comparative analysis of Yazd and Łódź.

Fig. 5. Textile factories before and after revitalisation in Łódź

Source: own work and Miasto Łódź.

Table 5. Comparative summary of the role of post-industrial functions in urban management in Yazd and Łódź

Comparative dimension	Yazd	Łódź	Key comparative insight
Role of post-industrial functions in urban management	Post-industrial functions are central to comprehensive urban regeneration, supporting economic, social, and physical revitalisation through adaptive reuse.	Post-industrial functions are framed as instruments for redefining the contemporary city following industrial collapse and socio-economic transition.	Yazd emphasises strategic regeneration potential, while Łódź reflects post-transition urban restructuring.
Economic and tourism-oriented functions	Industrial heritage tourism is viewed as a key urban management strategy, with factories reused for hotels, creative tourism, and tourism-related services.	Industrial heritage tourism is well established, with Manufaktura becoming a major destination integrating heritage with commercial and leisure uses.	Tourism in Yazd is emergent and underutilised, whereas in Łódź it is consolidated and emblematic.
Social and community-oriented functions	Factories provide social and recreational amenities (restaurants, green spaces, shopping, cultural venues), though community needs are not fully embedded in planning frameworks.	Strong emphasis on community-oriented reuse, equity, and public access to ensure heritage serves local residents, especially in a shrinking city context.	Yazd focuses on service provision, while Łódź prioritises community-centered urban equity.
Educational and innovation-related reuse	Adaptive reuse supports educational and innovation functions (e.g., Science and Technology Park, Innovation Factory), contributing to neighbourhood regeneration.	Educational and cultural functions exist but are less dominant than mixed-use and community-centered redevelopment.	Yazd leverages post-industrial sites for innovation-led regeneration, while Łódź emphasizes mixed-use urban living.
Urban form and architectural adaptability	Large-scale, open-form factories with flexible layouts support multiple contemporary uses with minimal intervention.	Factory complexes support compact, mixed-use environments aligned with the "15-minute city" concept.	Both cities value adaptability, but Yazd focuses on architectural flexibility, while Łódź emphasises urban accessibility and integration.
Governance and planning challenges	Industrial heritage is insufficiently addressed in the master plan; UNESCO-listed heritage overshadows textile factories in urban priorities.	Heritage regeneration is shaped by political and economic contexts; misalignment of priorities can marginalise heritage concerns.	Planning challenges in Yazd are heritage hierarchy-driven, while in Łódź they are governance and transition-driven.

Table 5 (cont.)

Comparative dimension	Yazd	Łódź	Key comparative insight
Public engagement and stakeholder involvement	Collaboration between heritage advocates and municipalities has enabled successful reuse, though broader stakeholder integration remains limited.	Public engagement and stakeholder participation, particularly former workers, are viewed as essential to equitable urban regeneration.	Stakeholder involvement is project-based in Yazd but normative and equity-oriented in Łódź.
Contribution to urban sustainability	Post-industrial reuse supports sustainable tourism development and mitigates pressure on suburban expansion.	Reuse addresses population decline, urban shrinkage, and long-term sustainability by enhancing liveability and retention of residents.	Yazd frames sustainability in spatial and economic terms, while Łódź frames it in demographic and social resilience terms.

Source: own work.

3.3. Determinants of urban regeneration in the context of industrial heritage

In Yazd, urban regeneration within industrial heritage spaces is influenced by a complex interplay of physical, economic, socio-cultural, and planning determinants, which arise from the city's distinctive historical and political context. Physically, the former textile factories are primarily situated within the historical city limits, albeit outside the urban core, and are generally evenly distributed across various socio-economic areas. This distribution presents diverse regeneration opportunities and facilitates potential connections with existing tourism infrastructure, while concurrently avoiding direct conflicts with heritage conservation policies. Although the strategic location and accessibility near major thoroughfares are critical and flexible factors, numerous textile factories encounter challenges such as traffic congestion, and many sites remain underutilised within a cohesive network. Economically, regeneration is driven by the necessity for adaptive reuse or demolition; however, projects are constrained by significant ownership and investment challenges, particularly when factories are under multiple ownership by private entities and government, which discourages substantial financial commitments. The tensions between economic interests and heritage preservation are significant, resulting in a potential loss of authenticity when immediate economic returns or excessive commercialisation are prioritised over the long-term potential of cultural and industrial heritage tourism. In this context, mixed-use developments have demonstrated greater efficacy. Socio-culturally, religious values exert a significant influence on urban regeneration, emphasising administrative

and economic activities rather than fostering a vibrant public atmosphere. This underscores the necessity for regeneration efforts to harmonise with both tangible and intangible values. Furthermore, there is a limited involvement of local communities in the decision-making processes pertaining to industrial heritage. Finally, there is a notable absence of comprehensive planning and a deficiency in feasibility studies, further exacerbated by political constraints on new uses within the revitalisation process, as well as the missed opportunities that have arisen following Yazd's designation as a UNESCO World Heritage Site in 2017. For regeneration to be effective, it must strike a balance between heritage preservation, urban integration, and contemporary needs, thereby achieving socio-economic outcomes. This can be accomplished by prioritising initiatives that enhance accessibility and infrastructure, promote adaptive reuse, generate financial income, yield social benefits, and preserve cultural heritage values.

The strategic positioning of numerous textile factories represents a significant positive physical and spatial determinant in Łódź. Many of these factories are located within the urban area, particularly in central or well-connected locations, thereby enhancing their potential for revitalisation and facilitating greater accessibility to the city's industrial sector. Significant sites, such as Izrael Poznański's factory (Manufaktura), Fuzja (a revitalisation of Scheibler's Factory), and Księży Młyn, exert considerable influence on the overall urban regeneration of Łódź. The compact distribution of facilities, access to key amenities, and proximity to primary roadways and urban centres contribute positively to the revitalisation process. Moreover, the virtual accessibility of industrial heritage sites, facilitated by 3D projections, is recognised as commendable. Conversely, adverse physical factors such as insufficient pedestrian infrastructure and inadequate public transportation contribute to diminished walkability and a heightened reliance on private vehicles. Furthermore, the limited spatial availability within the urban context exacerbates the challenges associated with gentrification in revitalised districts. Regarding economic and investment drivers, a critical determinant was the availability of external funding following Poland's entry into the European Union, which catalysed substantial public investments in post-industrial sites, thereby enabling municipalities to transform areas such as abandoned textile factories. Private investors also participate effectively in Piotrkowska Street; however, local authorities encounter a dilemma in balancing financial feasibility with public-private partnerships. The elevated preservation costs, constrained municipal resources, and inconsistent investment patterns represent significant challenges that hinder large-scale initiatives. As a result of these constraints, the selective revitalisation prioritises profitability, aligning with the predominance of retail and service functions in Łódź's industrial heritage facilities, rather than fostering social integration. Consequently, to ensure favourable socio-economic outcomes and effective urban regeneration, it is imperative to mitigate the undue or excessive influence of private investments. The socio-cultural aspect plays a critical role, particularly through the recognition of cultural values derived from industrial heritage. The transformation of

historical textile factories into cultural institutions and social spaces that address the contemporary community's needs reflects a positive socio-cultural outcome. A strategic shift from privately led investments toward collaborative efforts involving the public, private, and NGO sectors underscores the development of urban spaces that are more socially integrated and community-driven. However, in the revitalisation process, there are instances in which tourism and large-scale events have been prioritised over the needs of the local community, a situation that arises from uneven community engagement. Furthermore, demographic issues, including challenges related to youth retention and population decline, significantly influence the revitalisation agenda, which necessitates the creation of spaces that balance functional urban living with heritage preservation. Finally, functional evolution serves as a determinant characterised by a transition towards a multifunctional urban vision, particularly in the context of large-scale commercial revitalisation projects, which often exemplify collaboration between municipal authorities and private enterprises. Contemporary strategies incorporate holistic urban planning, green spaces, and city zoning, influenced by concepts such as "the 15-minute city", as exemplified by Fuzja. The primary strategic challenge involves ensuring the integration of historical and contemporary elements to preserve historical identity while promoting economic and social sustainability. Adverse strategic outcomes may arise from unsuccessful attempts at heritage imitation, insufficient integration with surrounding areas, or excessive commercialization that undermines historical value. Table 6 shows the comparative analysis of Yazd and Łódź.

Table 6. Comparative summary of the determinants of urban regeneration in the context of industrial heritage in Yazd and Łódź

Comparative dimension	Yazd	Łódź	Key comparative insight
Physical and spatial determinants	Textile factories are mostly located within historical city limits but outside the urban core; their even distribution offers regeneration opportunities while avoiding direct conflicts with core heritage conservation zones.	Many factories are centrally located or well-connected within the urban fabric, with landmark sites (e.g., Manufaktura, Fuzja, Księży Młyn) acting as anchors for city-wide regeneration.	Yazd's spatial context offers latent connectivity and low conflict, whereas Łódź benefits from high centrality and strong spatial leverage.
Accessibility and infrastructure	Proximity to major roads is a strength, but traffic congestion and lack of integrated networks limit accessibility and coordinated regeneration.	Good overall connectivity is offset by weak pedestrian infrastructure and public transport gaps, increasing car dependency.	Both cities face accessibility challenges, though Yazd struggles with network integration, while Łódź struggles with walkability and mobility balance.

Comparative dimension	Yazd	Łódź	Key comparative insight
Economic and investment determinants	Regeneration is constrained by fragmented ownership, limited investment capacity, and tensions between economic return and heritage preservation.	EU funding after Poland's accession enabled large-scale revitalisation, supplemented by private investment, though financial feasibility remains challenging.	Yazd faces investment scarcity and ownership complexity, while Łódź faces investment selectivity and funding prioritisation.
Commercialisation versus heritage preservation	Excessive commercialisation risks authenticity loss when short-term economic gains override long-term cultural and tourism potential.	Profit-driven revitalisation often prioritises retail and services, sometimes at the expense of social integration and heritage depth.	In both cities, regeneration is shaped by a delicate balance between economic viability and heritage integrity.
Socio-cultural determinants	Religious and cultural norms influence acceptable uses, often favouring administrative and economic activities over vibrant public life; community participation is limited.	Strong recognition of cultural value supports reuse as cultural and social spaces, though community engagement remains uneven in some projects.	Yazd is shaped by normative cultural constraints, while Łódź is shaped by negotiated socio-cultural priorities.
Community involvement	Local communities have minimal involvement in decision-making processes related to industrial heritage regeneration.	Increasing emphasis on collaborative models involving public authorities, private investors, NGOs, and local communities.	Community participation is structurally weak in Yazd but strategically emerging in Łódź.
Planning and governance framework	Lack of comprehensive planning, feasibility studies, and political constraints on new uses limit regeneration outcomes; UNESCO inscription has not been fully leveraged.	Regeneration is guided by holistic planning concepts, zoning strategies, and contemporary urban models such as "the 15-minute city".	Yazd reflects planning fragmentation and missed opportunities, while Łódź reflects strategic but uneven planning integration.
Demographic and social sustainability factors	Regeneration aims to balance heritage preservation with socio-economic benefits but lacks mechanisms to fully activate social outcomes.	Population decline and youth outmigration strongly influence regeneration priorities, emphasising liveability and multifunctional urban spaces.	Social sustainability is aspirational in Yazd and demographically driven in Łódź.

Table 6 (cont.)

Comparative dimension	Yazd	Łódź	Key comparative insight
Strategic vision and functional evolution	Mixed-use development is identified as the most effective strategy to reconcile economic, social, and heritage objectives.	A shift toward multifunctional urban visions integrates heritage, commerce, green spaces, and daily urban life.	Both cities converge on mixed-use strategies, though Yazd is in a conceptual phase, while Łódź is in an implementation phase.
Key regeneration risks	Political restrictions, limited planning capacity, and inadequate integration with urban systems risk underperformance.	Gentrification, excessive commercialisation, and superficial heritage imitation risk undermining historical identity.	Regeneration risks in Yazd are institutional and political, while in Łódź they are market- and scale-driven.

Source: own work.

4. DISCUSSION, CONCLUSION, AND IMPLICATIONS

This study provided a comprehensive exploration of urban regeneration within industrial heritage sites in two parts of the world. Through a comparative study of Poland and Iran, which possess distinct socio-economic, socio-cultural, and physical conditions, the experience of urban regeneration has been examined in the context of industrial heritage sites. These two cases exhibit specifications that are grounded in the overarching principles of urban regeneration within cities characterised by industrial heritage. Several of these findings corroborate previous research (Alba Dorado, 2023; Lee *et al.*, 2022; Mo *et al.*, 2022). Although the revitalisation of industrial heritage sites emerged as an effective strategy for urban regeneration in Britain and Western Europe in the late 20th century (Couch *et al.*, 2008; Zhang *et al.*, 2022), such initiatives commenced in the early 21st century in Iran and Poland. Based on the HUL approach, the significance of industrial heritage extends beyond its physical attributes, serving as a foundational element for urban regeneration initiatives in cities characterised by industrial heritage. Research indicates that the values associated with heritage, particularly industrial heritage, are not universally applicable. In Yazd, material and architectural values predominate, while in Łódź, intangible, symbolic, and memory-based values are of central importance. This perspective is closely linked to the concepts of CHS and the collective memory that local communities construct and interpret in relation to industrial heritage values (Assmann, 2011; Wertsch, 2021).

According to findings from both cases, the significance of industrial heritage value emerges as the primary factor influencing revitalisation and tourism devel-

opment, ultimately contributing to urban regeneration. This confirmed the multi-layered nature of industrial heritage value, which, consequently, necessitates the incorporation of all relevant values in the process of urban regeneration to transform these sites into liveable spaces (Dehghan Pour Farashah, 2024). However, in the case of Yazd, tangible values such as architecture are more heavily considered during urban regeneration, contributing to sustainable construction by reducing material consumption. In Łódź, the process of identifying heritage values has been undertaken by various groups for approximately 25 to 30 years. Moreover, the intangible values of industrial heritage in Łódź, including cultural, historical, and symbolic dimensions, contribute significantly to local pride and collective memory. The risk associated with the commodification of heritage at specific sites may result in dilemmas concerning the efficacy of regeneration projects. Consequently, the revitalisation of industrial heritage is inherently connected to urban and regional planning initiatives. This supports the findings of Soyer and Tunca (2025), which indicate that urban spaces encapsulate intricate layers of societal memory and cultural narratives. Furthermore, urban regeneration can enhance the landscape of collective memory among local populations and engage various stakeholders (Sacco *et al.*, 2013). In the case of Yazd, state-dominated governance structures in regeneration frequently exclude local socio-cultural values, thereby undermining the social effectiveness of regeneration. Furthermore, in Yazd, although the social and economic significance of industrial heritage is acknowledged, the non-material dimensions of memory and identity remain less institutionalised. Consequently, the resulting conflict may be less visible, yet it is equally important.

Textile factories in both cities played a pivotal role prior to 1990 and were acknowledged as significant economic centres. However, at the beginning of 2000, attention to these heritages began in both cities, albeit to different degrees. Regarding the role of industrial heritage in urban management, the new uses have focused on the Science and Technology Center established in two factories in Yazd. Eghbal and Dorakhshan factories contribute to the regeneration of their surrounding neighbourhoods, particularly the area formerly known as the Dorakhshan factory neighbourhood, which was previously classified as a slum district. This finding suggests that the revitalisation of industrial heritage sites has the potential to catalyse urban regeneration through an integrated development framework, such as HUL, which encompasses physical, economic, social, and cultural dimensions (Sun and Chen, 2023). Furthermore, the findings underscore the importance of emphasising tourism and diverse utilisations as critical factors in engaging various target demographics in visiting these textile heritage sites. However, in practice, the potential of industrial heritage has not been adequately considered by the authorities in Yazd, particularly regarding the insufficient attention given to these factories in the master plan of the city. One reason for the comparative neglect of Yazd is the presence of numerous historical buildings

designated as UNESCO World Heritage Sites, which has led to the underutilisation of its industrial heritage for tourism purposes. Regarding Łódź, industrial heritage sites have received heightened attention from society following the revitalisation of textile factories. The results indicate that the revitalisation of Łódź's industrial heritage entails a complex interplay among the preservation of cultural heritage, the development of tourism, and socio-economic transformation. These findings affirm that the transformation of industrial heritage possesses substantial potential for the facilitation of cultural events, leisure activities, and tourism (Lee *et al.*, 2022; Murzyn, 2016; Navratil *et al.*, 2018). Nevertheless, public engagement and stakeholder contributions during the revitalisation process could represent a best practice for urban management, particularly among individuals with prior connections to the textile manufacturing industry in Łódź. This point indicates that the HUL framework could be operationalised through public engagement (Dehghan Pour Farashah, 2024). Furthermore, according to CHS, the foundational relationship between the community and the continuity of heritage is of greater significance during the process of urban regeneration (Poulios, 2014).

In the case of Yazd, the spatial layout contrasts with that of Łódź. While numerous industrial sites are strategically situated near the historic core in Yazd, these facilities are generally evenly distributed across diverse socio-economic areas. This distribution is essential for the planning of urban regeneration. There are also disparities in accessibility regarding proximity to primary thoroughfares and urban centres; however, certain areas experience traffic congestion and inadequate infrastructure (Dehghan Pour Farashah *et al.*, 2025). Regarding Łódź, the factories are situated in well-connected areas, characterised by a compact distribution of facilities and initiatives aimed at enhancing access to essential amenities. However, certain determinants exert a negative influence, including inadequate pedestrian infrastructure and restricted spaces, which result in limited accessibility and contribute to the issue of gentrification. Accordingly, physical factors can significantly influence the feasibility of revitalising industrial heritage sites, particularly within post-industrial urban contexts. Socio-economic factors demonstrate considerable variation between Yazd and Łódź. Poland possesses the opportunity to access European Union funds for financing urban regeneration projects that encompass industrial heritage. However, negative factors such as elevated maintenance costs, uneven investment patterns, and constrained municipal resources adversely impact the revitalisation processes. In the context of Yazd, the tensions between economic necessity and heritage preservation significantly impact urban regeneration when assessed from a purely economic perspective. Thus, the initial phase of regeneration within industrial heritage sites is frequently motivated by economic considerations that necessitate the commencement of the project; however, the efficacy of these endeavours is often significantly shaped by social factors. The positive social and cultural factors encompass the recognition of cultural values originating from industrial heritage as a vital social dimension. In

the case of Łódź, the shift from privately-led investments to collaborative efforts among diverse stakeholders may foster a community-driven vision for the urban future. Similarly, in the case of Yazd, there is considerable evidence highlighting the influence of cultural values on urban management, which in turn shapes the types of activities considered appropriate for revitalised spaces. These elements are essential to revitalisation processes, as they must integrate a socio-cultural dimension that reflects the social and cultural values inherent to a specific area and its context. In both cities, a deficiency in such engagement was apparent. Effective urban regeneration in the case of Łódź is characterised by a transition from a demolition-centric strategy to more integrated regeneration initiatives. This transformation includes the incorporation of green spaces, cultural hubs, and multifunctional urban planning. In both instances, the perception of industrial heritage value can significantly enhance the efficacy of urban regeneration endeavours. It can be argued that effective urban regeneration in districts marked by industrial heritage necessitates the attainment of socio-economic outcomes through a balanced approach to public-private financing, while also mitigating the excessive influence of private investments (Dehghan Pour Farashah *et al.*, 2025).

4.1. Theoretical contribution

This empirical study offers substantial theoretical contributions by advancing our understanding of urban regeneration in industrial heritage cities. The HUL framework for industrial heritage regeneration enhances the understanding and articulation of heritage value from the perspectives of various stakeholders, providing new insights into urban planning. Furthermore, in the context of value identification within Łódź's textile manufacturing legacy, the CHS framework is employed, emphasising economic and aesthetic narratives at the expense of socio-cultural dimensions. The research further underscores the importance of bottom-up heritage practices and the generational shifts in perceptions of collective memory and heritage that are often overlooked in urban regeneration strategies. Finally, participatory planning, cultural sensitivity, and collaboration among public, private, and non-governmental organisations generate innovative concepts for community-driven regeneration within the context of industrial heritage cities.

4.2. Practical implications

This study delineates substantial practical implications for urban regeneration, particularly within the context of post-industrial cities. The findings indicate that community engagement and equity are intrinsically intertwined with economic and social sustainability. The effectiveness of heritage revitalisation initiatives is contingent upon their capacity to provide advantages to both tourists and local residents,

especially those historically marginalised communities associated with these industrial sites. Urban regeneration and functional diversity represent tangible expressions of these overarching objectives. The conversion of industrial heritage sites into mixed-use spaces that accommodate cultural, commercial, residential, and recreational activities exemplifies the ways in which historic preservation can enhance contemporary urban development. The significance of feasibility studies in the revitalisation of industrial heritage, particularly concerning the interrelated impacts of factory revitalisation, contributes to the enhancement of effective urban regeneration.

4.3. Research limitations and directions for future research

This study presents several limitations that warrant acknowledgment. First, the research predominantly relies on qualitative data obtained through stakeholder interviews and participant observations. While this methodological approach facilitates an in-depth exploration of stakeholder perspectives, it constrains the generalisability of the findings to other contexts. Future research could benefit from the incorporation of quantitative methods, such as surveys, econometric analyses, and spatial data, to investigate broader trends and validate the findings across diverse industrial heritage sites and urban environments. Second, while this research offers a thorough analysis of urban regeneration in Iran and Poland, future studies could engage in comparative analyses utilising data from cities across diverse country groups, considering their socio-economic and socio-cultural contexts. Finally, the temporal scope of the research, which was conducted over two years, may not comprehensively capture the long-term impacts of industrial heritage revitalisation projects. Longitudinal studies could facilitate the tracking of changes in stakeholder perceptions, tourism patterns, and socio-economic outcomes over time, thereby providing a more nuanced understanding of the urban regeneration processes in industrial heritage cities.

REFERENCES

ALBA DORADO, M. I. (2023), ‘The industrial heritage of the city of Malaga: analysis of its current situation and support for its activation as a resource for urban development’, *Heritage*, 6 (1), pp. 132–163. https://doi.org/10.3390/heritage6010007

ASSMANN, J. (2011), ‘Communicative and cultural memory’, [in:] MEUSBURGER, P., HEFFERNAN, M. and WUNDER, E. (eds), *Cultural Memories: The Geographical Point of View*, Dordrecht, Springer Netherlands, pp. 15–27. https://doi.org/10.1007/978-90-481-8945-8_2

BABUTSALI ALPLER, Z., ŞAHİN, N. P. and DAĞLI, U. U. (2020), ‘A critical discussion of industrial heritage buildings adaptive re-use as film spaces, case study: industrial heritage buildings at Istanbul’, *Journal of Architectural Conservation*, 26 (3), pp. 215–234. https://doi.org/10.1080/13556207.2020.1782105

BANDARIN, F. (2019), 'Reshaping urban conservation', [in:] PEREIRA RODERS, A. and BANDARIN, F. (eds), *Reshaping Urban Conservation: The Historic Urban Landscape Approach in Action*, Singapore, Springer Nature, pp. 3–20. https://doi.org/10.1007/978-981-10-8887-2_1

BECCHIO, C., BOTTERO, M. C., CORGNATI, S. P. and DELL'ANNA, F. (2018), 'Evaluating health benefits of urban energy retrofitting: an application for the city of Turin', *Smart and Sustainable Planning for Cities and Regions*, Cham.

BULLEN, P. A. and LOVE, P. E. D. (2011), 'Adaptive reuse of heritage buildings', *Structural Survey*, 29 (5), pp. 411–421. https://doi.org/10.1108/02630801111182439

COUCH, C., FRASER, C. and PERCY, S. (2008), *Urban Regeneration in Europe*, Chichester, John Wiley & Sons.

DEHGHAN POUR FARASHAH, M. (2023), 'Evaluation of social and economic values in textile manufacturing heritage sites: the case of Yazd', *Ge-conservacion*, 24 (1), pp. 228–237. https://doi.org/10.37558/gec.v24i1.1266

DEHGHAN POUR FARASHAH, M. (2024), 'A conceptual planning framework to integration of industrial heritage regeneration with Historic Urban Landscape approach', *Geographia Polonica*, 97 (4), pp. 425–446. https://doi.org/10.7163/GPol.0286

DEHGHAN POUR FARASHAH, M., ASLANI, E. and HOSSEINI, M. (2019), 'Strategic planning of industrial heritage conservation in Yazd with tourism approach (case study: textile factories)', Proceedings of the International Conference on Conservation of 20th Century Heritage from Architecture to Landscape, Tehran, Iran.

DEHGHAN POUR FARASHAH, M., GHADERI, Z. and KAYA, E. (2025), 'Unraveling the industrial heritage values: a stakeholder-driven heritage tourism model for Łódź, Poland', *Journal of Heritage Tourism*, pp. 1–26. https://doi.org/10.1080/1743873X.2025.2591394

DEHGHAN POUR FARASHAH, M., GHADERI, Z. and KAYA, E. (2026), 'Identity construction and collective memory: a critical heritage study of Łódź's post-industrial legacy', *Cities*, 170, 106743. https://doi.org/10.1016/j.cities.2025.106743

DEHGHAN POUR FARASHAH, M., NIEMCZEWSKA, Z. E. and PORFÍRIO COUTINHO GUIMARÃES, P. (2025), 'Exploring the effectiveness of urban regeneration: the comparative study of the industrial heritage sites of Łódź (Poland) and Yazd (Iran)', *European Journal of Geography*, 16 (2), pp. 314–334. https://doi.org/10.48088/ejg.m.far.16.2.314.334

DEHGHAN POUR FARASHAH, M. and POURZAKARYA, M. (2025), 'Reviving the past: unveiling urban industrial heritage in Yazd, Iran', [in:] TRUONG, V. D., and KNIGHT, D. W. (eds), *Heritage Tourism: Vietnam and Asia*, Singapore, Springer Nature, pp. 165–186. https://doi.org/10.1007/978-981-96-5427-7_9

DOUET, J. (2016), *Industrial Heritage Re-tooled: The TICCIH Guide to Industrial Heritage Conservation*, London, Routledge. https://doi.org/10.4324/9781315426532

ESFAHANI, H. S. and PESARAN, M. H. (2009), 'The Iranian economy in the twentieth century: a global perspective', *Iranian Studies*, 42 (2), pp. 177–211.

GALUSZKA, J. (2022), 'Beyond the decay? Positive patterns in the development of a large housing estate: the case of Olechów-Janów district in Łódź, Poland', *Urban Research & Practice*, 15 (2), pp. 169–193. https://doi.org/10.1080/17535069.2020.1782459

GENTRY, K. and SMITH, L. (2019), 'Critical heritage studies and the legacies of the late-twentieth century heritage canon', *International Journal of Heritage Studies*, 25 (11), pp. 1148–1168. https://doi.org/10.1080/13527258.2019.1570964

GHADERI, Z., ASLANI, E., BEAL, L., DEHGHAN POUR FARASHAH, M. and GHASEMI, M. (2024), 'Crisis-resilience of small-scale tourism businesses in the pandemic era: the case of Yazd World Heritage Site, Iran', *Tourism Recreation Research*, 49 (5), pp. 1197–1203. https://doi.org/10.1080/02508281.2022.2119519

GHADERI, Z., DEHGHAN POUR FARASHAH, M. H., ASLANI, E. and HEMATI, B. (2020), 'Managers' perceptions of the adaptive reuse of heritage buildings as boutique hotels: insights from Iran', *Journal of Heritage Tourism*, 15 (6), pp. 696–708. https://doi.org/10.1080/1743873X.2020.1756834

ICOMOS AUSTRALIA (2013), The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance, Burwood, Australia ICOMOS Incorporated.

LAMBERT, R. D. (2001), 'Area and international studies in the United States: institutional arrangements', [in:] SMELSER, N. J. and BALTES, P. B. (eds), *International Encyclopedia of the Social & Behavioral Sciences*, Oxford, Pergamon, pp. 686–692. https://doi.org/10.1016/B0-08-043076-7/03211-3

LEE, W.-Y., SHIN, S.-H. and JANG, S.-H. (2022), 'Sustainable urban regeneration strategies in Korea's abandoned mine area using industrial heritage', *Advances in Civil Engineering*, 2022, 7401027. https://doi.org/10.1155/2022/7401027

LIXINSKI, L., RICO, T., STEFANO, M. L. and ZHU, Y. (2024), 'Advancing critical heritage studies: the next 10 years', *International Journal of Heritage Studies*, pp. 1–3. https://doi.org/10.1080/13527258.2024.2342282

LU, N., LIU, M. and WANG, R. (2020), 'Reproducing the discourse on industrial heritage in China: reflections on the evolution of values, policies and practices', *International Journal of Heritage Studies*, 26 (5), pp. 498–518. https://doi.org/10.1080/13527258.2019.1666293

MO, C., WANG, L. and RAO, F. (2022), 'Typology, preservation, and regeneration of the post-1949 industrial heritage in China: a case study of Shanghai', *Land*, 11 (9), 1527. https://doi.org/10.3390/land11091527

MOKRAS-GRABOWSKA, J. and MROCZEK-ŻULICKA, A. (2024), 'Creative use of post-industrial space in Lodz – tour guides' perspectives', *Journal of Tourism and Cultural Change*, 22 (4), pp. 438–455. https://doi.org/10.1080/14766825.2024.2402853

MURZYN, M. A. (2016), 'Heritage transformation in central and eastern Europe', [in:] GRAHAM, B. and HOWARD, P. (eds), *The Routledge Research Companion to Heritage and Identity*, London: Routledge, pp. 315–346.

NAVRATIL, J., KREJCI, T., MARTINAT, S., PASQUALETTI, M. J., KLUSACEK, P., FRANTAL, B. and TOCHACKOVA, K. (2018), 'Brownfields do not "only live twice": the possibilities for heritage preservation and the enlargement of leisure time activities in Brno, the Czech Republic', *Cities*, 74, pp. 52–63. https://doi.org/10.1016/j.cities.2017.11.003

OEVERMANN, H. and MIEG, H. A. (2014a), 'Studying transformations of industrial heritage sites: synchronic discourse analysis of heritage conservation, urban development, and architectural production', [in:] OEVERMANN, H. and MIEG, H. A. (eds), *Industrial Heritage Sites in Transformation*, London, Routledge, pp. 12–25. https://doi.org/10.4324/9781315797991

OEVERMANN, H. and MIEG, H. A. (2014b), 'Transformations of industrial heritage sites: heritage and planning', [in:] OEVERMANN, H. and MIEG, H. A. (eds), *Industrial Heritage Sites in Transformation*, London, Routledge, pp. 3–11. https://doi.org/10.4324/9781315797991

PENDLEBURY, J. (2008), *Conservation in the Age of Consensus*, London: Routledge.

PICKARD, R. (2018), 'The Council of Europe and the industrial heritage: a UK exemplar of the rehabilitated industrial heritage as a resource for society', [in:] IFKO, S. and STOKIN, M. (eds), *Protection and Reuse of Industrial Heritage: Dilemmas, Problems, Examples*, Ljubljana, ICOMOS Slovenia, pp. 8–24.

POULIOS, I. (2014), 'Discussing strategy in heritage conservation', *Journal of Cultural Heritage Management and Sustainable Development*, 4 (1), pp. 16–34. https://doi.org/10.1108/JCHMSD-10-2012-0048

RAMAZANKHANI, M. R. (2016), 'Regeneration of industrial heritage with emphasis on maintaining cultural values, case study: spinning and wrapping factory of Nasadjan Yazd', Master thesis, Teheran: University of Tehran.

SACCO, P., FERILLI, G. and BLESSI, G. T. (2013), 'Understanding culture-led local development: a critique of alternative theoretical explanations', *Urban Studies*, 51 (13), pp. 2806–2821. https://doi.org/10.1177/0042098013512876

SAMADZADEHYAZDI, S., ANSARI, M., MAHDAVINEJAD, M. and BEMANINAN, M. (2020), 'Significance of authenticity: learning from best practice of adaptive reuse in the industrial heritage of Iran', *International Journal of Architectural Heritage*, 14 (3), pp. 329–344. https://doi.org/10.1080/15583058.2018.1542466

SMITH, L. (2006), *Uses of Heritage*, London: Routledge.

SMITH, L. and CAMPBELL, G. (2017), '"Nostalgia for the future": memory, nostalgia and the politics of class', *International Journal of Heritage Studies*, 23 (7), pp. 612–627. https://doi.org/10.1080/13527258.2017.1321034

SOYER, F. and TUNCA, E. A. (2025), 'Political and cultural memory in urban space: public naming practices in Northern Cyprus', *Cities*, 160, 105851. https://doi.org/10.1016/j.cities.2025.105851

SUN, M. and CHEN, C. (2023), 'Renovation of industrial heritage sites and sustainable urban regeneration in post-industrial Shanghai', *Journal of Urban Affairs*, 45 (4), pp. 729–752. https://doi.org/10.1080/07352166.2021.1881404

TAYLOR, K. (2016), 'The historic urban landscape paradigm and cities as cultural landscapes: challenging orthodoxy in urban conservation', *Landscape Research*, 41 (4), pp. 471–480. https://doi.org/10.1080/01426397.2016.1156066

UNESCO (2011), Recommendation on the Historic Urban Landscape (HUL), Including a Glossary of Definitions, Paris: UNESCO.

VENICE CHARTER (1964), International Charter for the Conservation and Restoration of Monuments and Sites, Paris: ICOMOS.

WALCZAK, B. (2015), 'The image of industrial heritage: the case of Łódź', *Envisioning Architecture: Image, Perception and Communication of Heritage*, pp. 17–26.

WALCZAK, B. M. and KĘPCZYŃSKA-WALCZAK, A. (2024), 'Adaptive re-use of industrial heritage in Lodz, Poland', *International Journal of Conservation Science*, 15 (2), pp. 955–966. https://doi.org/10.36868/IJCS.2024.02.13

WERTSCH, J. V. (2021), *How Nations Remember: A Narrative Approach*, Oxford: Oxford University Press.

WITCOMB, A. and BUCKLEY AM, K. (2013), 'Engaging with the future of "critical heritage studies": looking back in order to look forward', *International Journal of Heritage Studies*, 19 (6), pp. 562–578. https://doi.org/10.1080/13527258.2013.818570

YANG, X., HONGGANG, X. and WALL, G. (2019), 'Creative destruction: the commodification of industrial heritage in Nanfeng Kiln District, China', *Tourism Geographies*, 21 (1), pp. 54–77. https://doi.org/10.1080/14616688.2017.1388436

ZHANG, J., CENCI, J., BECUE, V., KOUTRA, S. and LIAO, C. (2022), 'Stewardship of industrial heritage protection in typical Western European and Chinese regions: values and dilemmas', *Land*, 11 (6), 772. https://doi.org/10.3390/land11060772

COPE
Member since 2018
JM13710

EUROPEAN SPATIAL RESEARCH AND POLICY

Volume 33 2026 Number 1

https://doi.org/10.18778/1231-1952.33.1.02

Edyta MASIEREK [*], **Marta BOROWSKA-STEFAŃSKA** [*], **Dorota SIKORA-FERNANDEZ** [**], **Magdalena ŚLEBOCKA** [***]

REVITALISATION COMMITTEE AS A PARTICIPATION TOOL IN URBAN REGENERATION PROCESSES IN POLAND: CASE STUDY OF THE ŁÓDZKIE VOIVODESHIP

Abstract. The article analyses one of the tools for public participation in urban regeneration processes in Poland, specifically the Revitalisation Committee. The study evaluates the practical implementation of this tool based on an analysis of 20 municipalities in the Łódzkie Voivodeship. The results indicate that this tool is often used in a largely symbolic or superficial manner, with considerable arbitrariness in the selection of committee members and limited influence on actual revitalisation activities at the municipal level. They can be a valuable basis for further research in this field. The conclusions may be useful for municipalities implementing revitalisation, where community involvement is considered crucial.

Key words: urban regeneration, Revitalisation Committee, public participation.

[*] Edyta MASIEREK, Marta BOROWSKA-STEFAŃSKA, University of Lodz, Faculty of Geographical Sciences, Institute of the Built Environment and Spatial Policy, Kopcińskiego 31, 90-142 Łódź, Poland; e-mails: edyta.masierek@geo.uni.lodz.pl, marta.borowska@geo.uni.lodz.pl, ORCIDs: https://orcid.org/0000-0002-3148-2503, https://orcid.org/0000-0003-2448-4778

[**] Dorota SIKORA-FERNANDEZ, University of Lodz, Faculty of Management, Department of City and Regional Management, Matejki 22/26, 90-237 Łódź, Poland; e-mail: dorota.sikora@uni.lodz.pl, ORCID: https://orcid.org/0000-0002-4425-0437

[***] Magdalena ŚLEBOCKA, University of Lodz, Faculty of Economics and Sociology, Institute of Finance, Department of Central Banking and Financial Intermediation, Rewolucji 1905 r. 39, 90-214 Łódź, Poland; e-mail: magdalena.slebocka@uni.lodz.pl, ORCID: https://orcid.org/0000-0003-1957-3717

Received: 12.08.2025, Revised: 21.11.2025, Accepted: 04.12.2025

Funding information: The project received funding from internal research competitions of the University of Lodz funded by a grant increased by 2% for universities that entered the Excellence Initiative – Research University competition. **Conflicts of interests:** None. **Ethical considerations:** The Authors assure no violations of publication ethics and take full responsibility for the content of the publication. **The percentage share of the Author in the preparation of the work is:** E.M. 60%, M.B.-S. 20%, D.S.-F. 10%, M.Ś. 10%. **Declaration regarding the use of GAI tools:** Used only for proofreading and language editing.

1. INTRODUCTION

In Poland, approximately 20% of urbanised areas are classified as degraded, meaning they concentrate adverse phenomena across social, economic, functional-spatial, and environmental dimensions (Jarczewski and Kuryło, 2010). These areas are inhabited by a significant share of the population, who should be meaningfully involved in shaping the changes affecting their living environment. For local governments, such areas pose a complex challenge, both financially and institutionally. Among the statutory responsibilities of municipalities is the formulation of effective intervention policies that address the multi-dimensional problems concentrated in these zones. The process of city creation is burdened with two opposing approaches, i.e., the top-down and bottom-up dichotomy, related to profit-oriented logic in relation to the urban environment and urban goods. The management of degraded areas involves a balance between two visions. On the one hand, these areas are intended to serve the creation of common goods for the local community. On the other, they can be places that generate income for public budgets (Camerin, 2021). Currently, there is growing interest in more sustainable forms of urban planning involving local communities. When stakeholders participate in transforming spaces according to their own experiences, they create places tailored to their needs (Hunziker *et al.*, 2007). The term 'placemaking' is used to refer to the creation of attractive physical locations as part of the backdrop to a successful social space and, more importantly, as a synonym for place branding (Pendlebury and Porfyriou, 2017). Although active stakeholder participation is legally required at every stage of the regeneration process, an obligation that may appear self-evident, it often proves difficult to implement in practice (Masierek, 2021).

Contemporary discourse on urban regeneration increasingly underscores that the effectiveness of revitalisation efforts largely hinges on the degree of community engagement and the extent to which these initiatives are integrated with broader urban policy frameworks. Chahardowli and Sajadzadeh (2022) argue that successful revitalisation requires an integrated management approach, multi-stakeholder collaboration, and the adoption of contemporary urban strategies. Conversely, insufficient involvement of local communities often results in interventions that fail to address residents' actual needs. A lack of participatory mechanisms may even lead to community resistance toward the changes being implemented (Navas-Carrillo and Rodriguez-Lola, 2024).

Grabkowska and Frankowski (2016) have argued that the active involvement of diverse stakeholder groups in decision-making processes enhances both the sustainability of implemented changes and their acceptance by the local community. Moreover, adopting an integrated approach that aligns revitalisation efforts with broader urban policy agendas contributes to more coherent and effective urban development. By creating resilient cities (Ige-Elegbede *et al*., 2020; Camerin and Longato, 2024)

able to cope not only with the COVID-19 pandemic but also with other disruptions, considering innovative solutions in urban planning and management introducing comprehensive and transformative change (Camerin, 2023). A change in which the main emphasis should be placed on the integration of the environment, economy, and society because each vision of a sustainable future for cities, including revitalisation, must focus directly on nature and on the presence and preservation of existing greenery elements and natural lifestyles, as well as residents' preferences (Córdoba Hernández and Camerin, 2023). Absence of robust cooperation mechanisms and organisational capacity can undermine participatory processes, ultimately leading to the failure to achieve the intended goals of revitalisation.

To ensure the effectiveness and long-term impact of these initiatives, it is, therefore, essential to develop institutional mechanisms that facilitate stakeholder collaboration and to strengthen the organisational capacity of all actors involved. Public participation is a cornerstone of successful urban regeneration; without it, even the most well-intentioned interventions in the social, economic, or spatial realms are unlikely to be sustainable or respected by residents. Meaningful engagement of local communities throughout the entire regeneration process fosters a sense of ownership, encourages stewardship of outcomes, and supports the longevity of positive change (Arbab *et al.*, 2020; Schroeter *et al.*, 2016).

Since 2015, the Revitalisation Act (RA) has been in force in Poland. Under its provisions, municipalities intending to undertake revitalisation efforts must first identify degraded and revitalisation areas based on objective criteria. For the designated revitalisation area, which may not exceed 20% of the municipality's total area nor be inhabited by more than 30% of its population, a long-term strategic policy must be developed in the form of a Communal Revitalisation Program (CRP). However, in order for the CRP to serve as the basis for obtaining European Union funding, it must be included in the *List of Positively Verified Municipal Revitalisation Programs, maintained by the Managing Authority of the regional operational program European Funds for Lodz 2021–2027*[1] (List).

The entire second chapter of the RA is dedicated to public participation, underscoring its fundamental role in the coordination of revitalisation processes by municipal authorities. The act obliges municipalities to design, implement, and evaluate revitalisation efforts in a manner that ensures the active involvement of a broad range of stakeholders.

The legislator emphasises that activities undertaken by municipalities in the field of public participation should include the following (Article 5 of the Revitalisation Act, 2015):

– identifying the needs and expectations of stakeholders in order to plan actions that align with them,

– conducting educational and informational activities,

[1] https://funduszeue.lodzkie.pl/rewitalizacja/wykaz-gpr [accessed on: 20.02.2025].

– initiating and supporting efforts aimed at increasing stakeholder involvement in the preparation and implementation of the CRP,

– enabling stakeholders to express their views at every stage of the revitalisation process, including planning, implementation, and monitoring.

Prior to the adoption of the CRP, municipalities are required to establish the rules governing the appointment and operation of the Revitalisation Committee (RC). As stipulated in Article 7 of the RA (2015), the RC is a mandatory instrument of public participation, serving as an advisory and consultative body composed of representatives from diverse stakeholder groups. Its primary function is to support municipal decision-making processes and to facilitate the systematic consultation of revitalisation initiatives with representatives of various social sectors, including residents, entrepreneurs, NGOs, and subject-matter experts.

While the legislation mandates the establishment of the RC, its actual functioning and influence on local government decision-making often vary considerably. These differences are largely shaped by local conditions and the extent of engagement from individual stakeholders (Sagan and Grabkowska, 2012). This article seeks to assess whether RCs function as an effective tool for public participation. It examines the practices of 20 municipalities located in Poland's Łódzkie Voivodeship in three key areas: the formulation of the RC rules, the recruitment process for RC members, and the operational functioning of the committees. In the article, the authors analyse specific case studies in detail to address the following research questions:

1. When were the rules for the establishment and operation of the RC adopted, and when were the committees appointed in the analysed municipalities?
2. What are the key principles governing the appointment and functioning of the RC in the studied cases?
3. Which stakeholder groups are represented within the RC?
4. How frequently do RC members meet, what topics are addressed, and what issues are subject to their review or opinion?
5. How are decisions made within the RC?
6. What procedures are in place for the dismissal or removal of an RC member?

Based on the analysis of official documents and in-depth interviews with active members of the RC, the study evaluates how the principles of public participation are implemented through this participatory mechanism. Examining the functioning of RCs across various municipalities in the Łódzkie Voivodeship allowed for the identification of both enabling factors and barriers affecting their effective operation.

The conclusions presented in this article contribute to ongoing scholarly discussions on public participation, with particular emphasis on its role in revitalising degraded urban areas. They serve as a point of departure for further exploration and the deepening of research on participatory governance in urban regeneration. The study's findings are relevant not only to academics investigating revitalisation pro-

cesses, but also to practitioners and decision-makers responsible for their design and implementation. The background for the analyses presented in this study includes a review of the relevant literature and current research on the subject, the statutory procedure for establishing RCs, as well as a description of the specific characteristics of the studied municipalities and their designated revitalisation areas.

2. THEORETICAL BACKGROUND

One key objective of sustainable development is the creation of safe, inclusive, and resilient cities and human settlements. This goal reflects the evolution of civil society, the decentralisation of state structures, and the growing influence of participatory planning approaches, an idea that began gaining traction in Western Europe in the 1960s (McClendon, 1993; Hajduk, 2021; Długosz and Wygnański, 2005).

To meet the *sine qua non* conditions of effective revitalisation, comprehensiveness, appropriateness, and integration, interventions should be implemented through coordinated efforts involving local partners and stakeholders across the public, private, and non-governmental sectors. This approach facilitates the development of strategies that are responsive to local conditions, thereby increasing the likelihood of long-term success in revitalisation processes. Cross-sectoral collaboration enables more effective resource allocation, streamlines interventions, and enhances the flexibility of projects in addressing the evolving needs of the community. A participatory framework should foster continuous information and knowledge exchange, promote decentralised decision-making, and support dialogue among the various institutions operating in degraded urban areas (Woolrych and Sixsmith, 2013).

Public participation serves both as a mechanism for engaging citizens in public life and as a means of redistributing power across various levels of governance. It enhances the sustainability and social acceptance of the actions undertaken. Involving residents in decision-making processes not only strengthens the legitimacy of revitalisation efforts, but also promotes the more effective utilisation of local resources. Research indicates that programs with active resident participation are more likely to succeed, as they tend to be more closely aligned with the actual needs of the community (Bobbio, 2019). Steering democracy towards participation largely consists in giving citizens equal power exclusively within adversarial institutions (Mansbridge, 1983). The main reason for involving citizens in decision-making processes, regardless of their form, should be to properly problematise the issues submitted for public discussion (Huk, 2024). Public participation is often equated with civic power (Wójcicki, 2013), and thus with assuming responsibility for decision-making. In S. Arstein's (1969) ladder of participation, the

highest levels are delegation of power and resident control. Social participation is also a procedural mechanism through which decision-makers can involve new actors – namely citizens – in policy-making processes and assign them specific roles (e.g., Bobbio, 2019; Chan *et al*., 2022; Miśkowiec and Masierek, 2023). It is, therefore, not a one-sided process; it requires active engagement from both public administration and citizens. The theoretical expectations surrounding public participation can only be met if both parties are genuinely committed to collaboration and prepared to engage meaningfully (Masierek and Pazder, 2024).

As Creighton (2005) argued, participation should not be viewed merely as a procedural requirement, but rather as a fundamental element of social dialogue. Accordingly, the organisation of participatory activities should not be treated as an end in itself or simply as a formal compliance exercise.

Effective public participation requires the application of diverse and context-sensitive engagement methods. These may range from traditional forms such as public consultations to modern digital platforms, which have the potential to engage social groups that are often excluded from mainstream public discourse. Social participation is considered a fundamental pillar of contemporary democracy (Siemiński, 2007), reflecting citizens' voluntary involvement in shaping and managing public affairs (Noworól *et al.*, 2012). Crucially, the more inclusive and well-designed the participatory mechanisms, the greater the potential for achieving durable and impactful transformation (Fors *et al.*, 2021). Participation is intended to initiate meaningful interaction between public authorities and citizens, establishing a platform for potential collaboration between the two sides (Creighton, 2005). It not only reinforces democratic governance, but also enhances the effectiveness of public policies, including urban revitalisation, by incorporating diverse perspectives and local knowledge into the decision-making process (Yadav, 2024). Participation is widely recognised as a critical component across all stages of the revitalisation cycle, from needs assessment and planning, through implementation, to monitoring and evaluation (Roberts, 2016). In Poland, this approach has been shaped by European Union guidelines on the use of European Funds for revitalisation, which came into force in 2004, as well as by national legislation requiring local authorities to implement participatory mechanisms, including the establishment of RCs (Ciesiółka, 2018). Polish scholarly literature highlights the important role of RCs in promoting the social dimension of revitalisation (e.g., Przywojska, 2019; Legutko-Kobus and Nowak, 2020). Within the revitalisation process, the RC is expected to help manage revitalisation activities in a socially responsive direction, embedding participatory values into both planning and implementation. As an advisory and integrative body, the RC serves as a key link in both the design and monitoring of revitalisation processes. It acts as a platform for constructive dialogue among stakeholders, often representing divergent perspectives and interests, helping to reconcile competing visions in the pursuit of more inclusive and effective urban transformation (Hajdys and Ślebocka, 2021). A review of the activities of selected RCs in the Greater Poland Voivodeship (*Wielkopolskie*

Voivodeship) was conducted by Kaczmarek (2021). This research was further expanded by Dziarmakowska (2023), who conducted a survey among municipalities whose CRPs were included in the official List in the Greater Poland region. Public participation should be a continuous and integral component of revitalisation processes, rather than a set of isolated or incidental activities. The scope and forms of engagement must be carefully selected to ensure that participatory objectives are fulfilled to the greatest possible extent (Hołuj and Legutko-Kobus, 2018). Despite the widely acknowledged importance of participation, research consistently shows that the involvement of local communities in revitalisation processes remains insufficient, a finding also confirmed by the 2021 report of the Supreme Audit Office (Ciesiółka *et al.*, 2016; Hołuj and Legutko-Kobus, 2018). In this context, the study of public participation and the effective use of statutory participatory tools, such as the RC, represents both a relevant research direction and a meaningful contribution to the broader discourse on the development of civil society.

3. METHODOLOGY

3.1. Research Procedure and Data Sources

This article focuses on analysing the functioning of the RC as a tool of public participation within revitalisation processes implemented in municipalities across the Łódzkie Voivodeship in central Poland. The research was designed using a methodological triangulation model, allowing for a comprehensive analysis and evaluation of both the formal and practical dimensions of RC operations. Methodological triangulation is particularly valuable in studies that require the validation of findings through both qualitative and quantitative methods, as it helps minimise potential biases and enhances the reliability and robustness of the results (e.g., Vivek *et al.*, 2023; Arias, 2022; Dźwigoł and Dźwigoł-Barosz, 2020). To evaluate the functioning of the mandatory participatory instrument (the RC) in the Lodz Voivodeship, a six-stage research process was conducted between March 2024 and February 2025. The process is presented in Fig. 1.

In the first stage (1), 20 municipalities located in the Łódzkie Voivodeship were selected based on the following criteria:

– they designated revitalisation areas in accordance with the Revitalisation Act;

– they adopted a communal revitalisation program (CRP), which was subsequently positively verified by the managing authority of the regional program European Funds for Łódzkie 2021–2027 and included in the official List;

– they adopted a municipal council resolution defining the rules for the recruitment and operation of the RC.

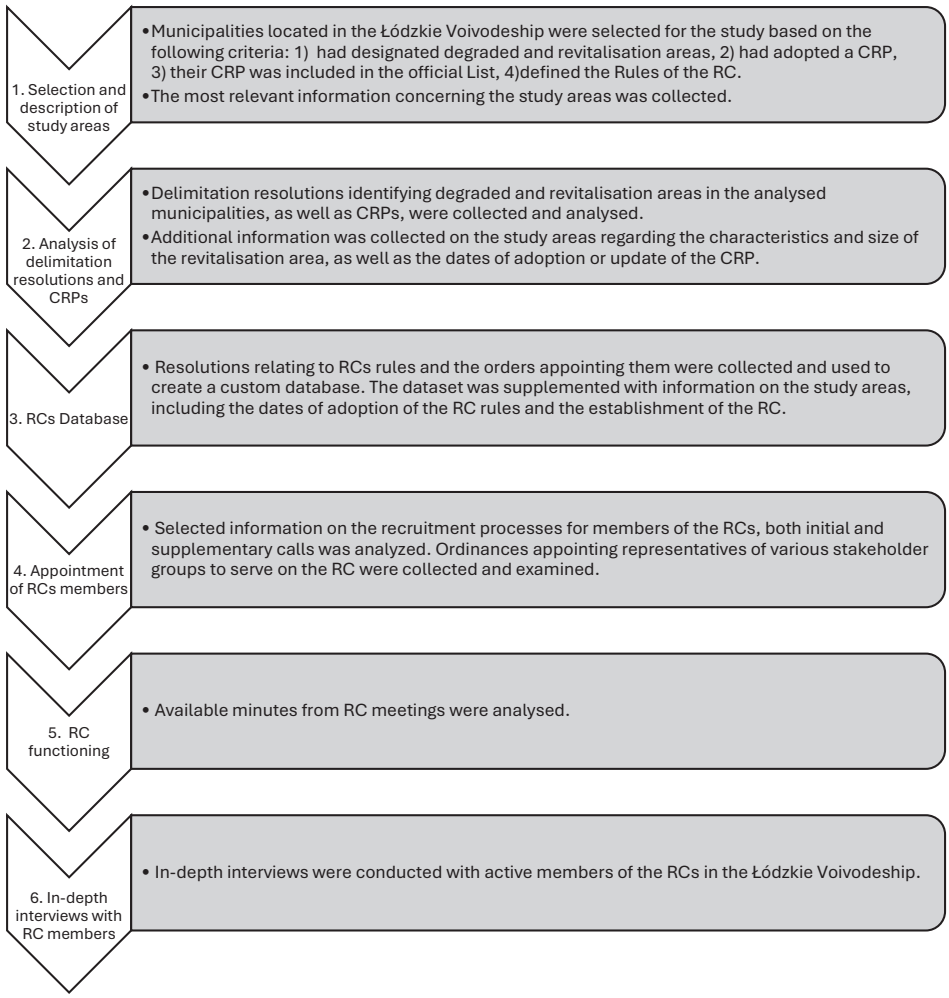


Fig. 1. Next steps in the research procedure

Source: own work.

Basic information on the study areas was also collected, including the administrative status of each municipality, population size, and land area. The selected municipalities represent various types of administrative units – urban, urban-rural, and rural (Fig. 2), which allows for an analysis of RC functioning under diverse socio-economic conditions.

In the second stage (2), legal and planning documents were analysed (60 resolutions) using the desk research method. This included:

– delimitation resolutions (designating degraded and revitalisation areas);
– resolutions adopting the CRP.

As a result, data on the characteristics, size, and spatial extent of the revitalisation areas in the analysed municipalities, as well as the dates of CRP adoption, were completed. In the next stage (3), resolutions concerning RCs rules and the orders establishing them were collected (20 resolutions, 11 orders). Based on these documents, a custom database was created, and information on the dates of adoption of the principles and the establishment of the revitalisation committees (RCs) was supplemented.

Subsequently (4), information was gathered on the recruitment processes for RC members, including both initial and supplementary recruitment rounds. Ordinances appointing representatives of various stakeholder groups to serve on the RC were collected and analysed, along with available minutes from RC meetings (5). At this stage, data was also verified or obtained, among other means, directly from staff at municipal offices. All of the above research steps (1–5) enabled the systematisation of data and the development of a scenario for individual in-depth interviews (IDIs) with persons appointed to serve on the RC. The interview guide consisted of three thematic sections: (1) background information on the RC member, (2) information about the functioning of the RC, and (3) general opinions, including views on the Revitalisation Act, residents' interest in revitalisation, and the perceived future of the RC. The insights gathered during the interviews (6) helped further explore selected issues, providing a deeper understanding of how the RC operates in practice, the challenges and barriers it faces, the level of engagement among various stakeholder groups, and its overall impact on the quality of revitalisation processes.

The desk research method and foundational data analysis employed in this study covered both the local legal frameworks governing revitalisation in municipalities and a review of reports and studies on revitalisation processes implemented across Poland. This included information available on municipal websites as well as statistical data on the study areas. The analysis of documents enabled an assessment of the extent to which statutory provisions have been implemented and translated into practical actions by local authorities (Ciesiółka, 2018). This approach aligns with the methodology of exploratory qualitative research, allowing for the identification of challenges and barriers in the functioning of RCs. Additional data was obtained directly from municipal staff responsible for revitalisation policy. Additionally, three in-depth interviews were conducted with active members of RCs from the Łódzkie Voivodeship. However, due to their small number, they are only exploratory in character. The methodology adopted in this article applies a multidimensional approach to analysing the functioning of RCs, combining both qualitative methods (document analysis, in-depth interviews) and quantitative methods (statistical data analysis). This mixed-methods design made it possible to gain a more comprehensive understanding of how RCs operate and to assess their role in urban revitalisation processes.

3.2. Characteristics of the study areas

The study included 20 municipalities from the Łódzkie Voivodeship, selected based on the criteria outlined in section 3.1. The group consists of five urban municipalities, eight urban-rural municipalities, and seven rural municipalities (Fig. 2, Table 1). As of 31 December 2023, the population of these municipalities ranged from 3652 in the rural municipality of Inowłódz to 652015 in Łódź, the regional capital (GUS 2023). Łódź is also the largest municipality in terms of area (293 sq. km), while the smallest are rural municipalities: Inowłódz (36.52 sq. km), Dalików (40.18 sq. km), and Osjaków (46.37 sq. km). All of the analysed municipalities designated degraded and revitalisation areas within their territories. The percentage of residents living in the revitalisation areas, relative to the total population of the municipality, ranges from approximately 10.94% to 29.86% across the study areas[2].

In the analysed municipalities, the designated revitalisation areas cover between 0.67% and 19% of the total municipal area[3]. Half of the study areas identified a single, continuous revitalisation zone with a unified boundary. Forty percent designated two separate revitalisation sub-areas (not sharing a common border); for example, the municipality of Poddębice designated one sub-area in a rural part of the municipality and another in the urban part. The municipality of Zapolice identified as many as five separate revitalisation sub-areas.

Łódź has had a CRP in force the longest, since 2016, with the most recent update in January 2024. The majority (60%) of the analysed municipalities adopted their CRPs in 2024, while the remaining ones did so in 2025. Three of the municipalities developed only draft versions of the rules for appointing and operating their RCs – two in 2024 and one in 2025, which were subject to public consultation (Inowłódz, Gidle, and Dalików).

In most of the municipalities, the adoption of the rules for appointing and operating the RC was processed on the same day or up to one month before the adoption of the CRP (Skierniewice, Ujazd, Osjaków, Tomaszów Mazowiecki, Sulejów, Zapolice, and Parzęczew). This suggests that RC members were unlikely to have been involved in the development of the CRP.

The Revitalisation Act stipulates that the RC should be established without undue delay following the adoption of the RC rules. However, this requirement of "without delay" is interpreted inconsistently by municipalities. As a result, some have yet to announce recruitment procedures, for example, Piotrków Try-

[2] According to the Revitalisation Act (2015), the population living in the revitalisation area may not exceed 30% of the total population of the municipality.

[3] According to the Revitalisation Act (2015), the area of the revitalisation zone may not exceed 20% of the total area of the municipality.

bunalski, despite more than a year having passed since the adoption of the RC rules. RC members are appointed through open calls for candidates, based on previously defined rules. In many cases, however, supplementary recruitment is necessary, as the initial call does not result in a sufficiently representative pool of candidates. This often extends the overall timeline of the procedure. As of 31 March 2025, 11 out of the 20 study areas had successfully established their RCs (Table 1).

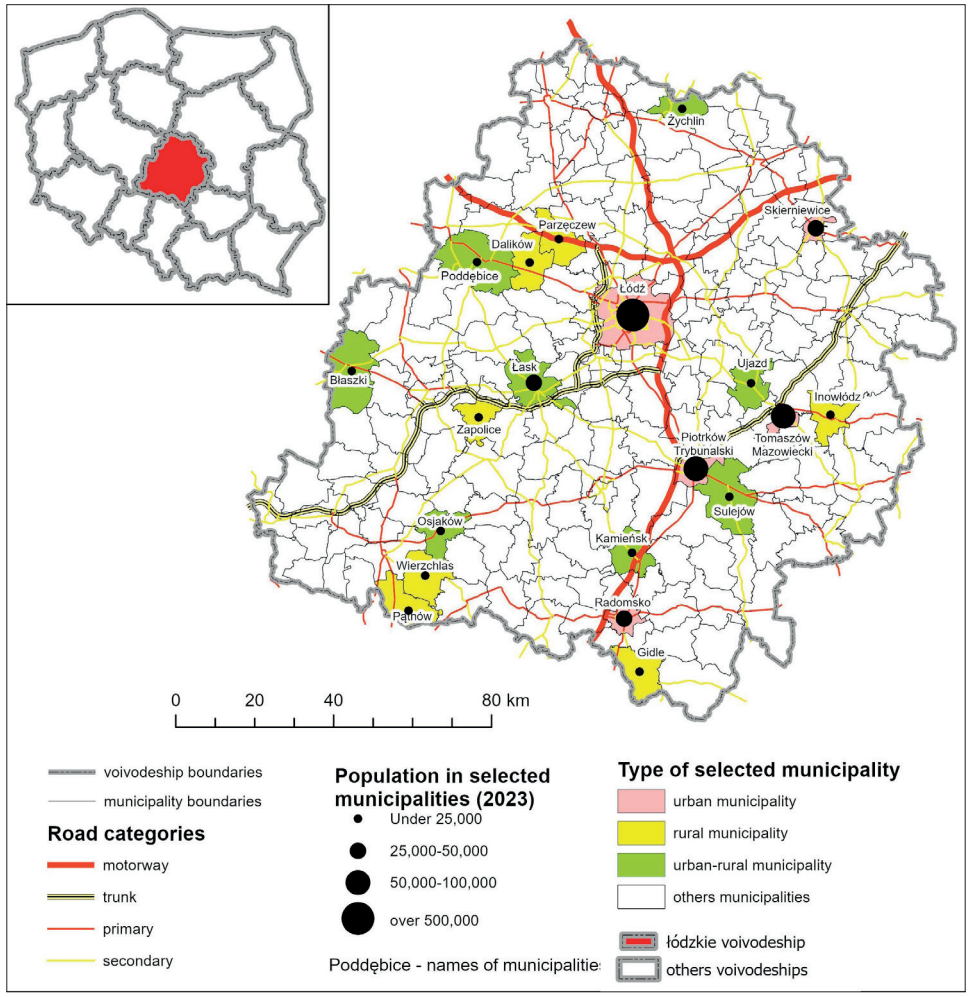


Fig. 2. Location of the selected municipalities within the transport and settlement network of the Łódzkie Voivodeship

Source: own work.

Table 1. Selected information on the study areas

No.	Commune	Commune type	Population (GUS 2023)	Commune area (sq. km)	Revitalisation area [% of commune population]	Revitalisation area [% commune area]	Number of revitalisation sub-areas	Date of CRP adoption/ update	Rules for appointing the RC	Appointing the RC
1.	Łódź	urban	652 015	292.85	17.87	4.53	1	28.09.2016/ 17.01.2024	2.06.2021	31.12.2021
2.	Skierniewice	urban	45,184	34.56	29	19	1	21.03.2024	21.03.2024	23.12.2024
3.	Pątnów	rural	6,191	114.47	12.1	19.2	1	27.03.2024	27.06.2024	23.08.2024
4.	Ujazd	urban-rural	7,349	96.61	28.5	3.8	2	30.04.2024	28.03.2024	10.01.2025
5.	Osjaków	urban-rural	4,637	100.96	26.6	13.9	2	28.05.2024	28.05.2024	-
6.	Piotrków Trybunalski	urban	66,519	67.15	27.83	18.83	3	27.06.2024	24.01.2024	-
7.	Radomsko	urban	42,973	51.36	16.66	6.28	1	24.11.2023/ 28.06.2024	23.02.2024	19.11.2024
8.	Inowłódz	rural	3,652	97.41	20.3	2.3	2	29.08.2024	14.05.2024 project	-
9.	Tomaszów Mazowiecki	urban	57,438	41.24	29.8	7.6	1	26.09.2024	26.09.2024	13.09.2023
10.	Gidle	rural	5,737	115.85	17.3 19.8	1.48 1.73	2	29.10.2024	16.01.2025 project	-
11.	Błaszki	urban-rural	13,938	201.1	13.6	0.8	1	21.11.2024	24.10.2024	25.11.2024
12.	Łask	urban-rural	26,898	145.14	29.47	3.44	2	27.11.2024	28.06.2024	-
13.	Dalików	rural	4,018	114.47	<10.94	1.38	1	30.12.2024	20.08.2024 project	-
14.	Sulejów	urban-rural	16,582	188.25	29.82	13.96	1	15.01.2025	27.01.2025	-
15.	Parzęczew	rural	5,284	103.74	28.4	8.22	2	20.01.2025	30.12.2024	-
16.	Żychlin	urban-rural	10,876	76.54	21.45	0.67	1	22.01.2025	10.10.2024	4.11.2024
17.	Kamieńsk	urban-rural	5,539	96.3	less than 29%	12.44	1	22.01.2025	17.10.2024	28.01.2025
18.	Wierzchlas	rural	6,403	118.71	24.04	18.58	2	27.01.2025	29.11.2024	30.12.2024
19.	Zapolice	rural	5,508	81.37	29.86	4.41	5	28.01.2025	28.01.2025	10.02.2025
20.	Poddębice	urban-rural	14,524	224.22	29.09	4.09	2	29.01.2025	20.01.2025	-

Source: own work on the basis of delimitation resolutions, resolutions adopting CRP, resolutions adopting principles for the appointment and operation of RCs, orders of communal authorities appointing the composition of the RC (as of 31.03.2025).

4. THE REVITALISATION COMMITTEE AS A OBLIGATORY TOOL FOR PUBLIC PARTICIPATION

Local governments in Poland develop and implement CRPs for designated revitalisation areas. In order to ensure public participation at every stage of the revitalisation process, municipalities are legally required to establish a RC, an advisory and consultative body to local authorities. Its purpose is to serve as "a forum for cooperation and dialogue between stakeholders and municipal bodies on matters related to the preparation, implementation, and evaluation of revitalisation" (Article 7(1) of the Revitalisation Act, 2015).

The RC is composed of representatives of various stakeholder groups who are expected to support local authorities in decision-making processes related to revitalisation. If a municipality has designated multiple revitalisation sub-areas, it may establish separate RCs for each of them, considering the specific local context. The process of forming an RC begins with the development of the RC rules (Fig. 3), which are subject to public consultation. The RC rules should be adopted by a resolution of the municipal council prior to the adoption of the communal revitalisation program (CRP). These rules typically specify:

- the term length of RC members;
- the recruitment procedure and required documents for candidates;
- the stakeholder groups to be represented in the recruitment process;
- the composition and responsibilities of the selection committee recommending candidates for RC membership;
- the conditions under which RC membership expires;
- how to organise the first meeting and elect the presidium;
- the duties and responsibilities of the presidium;
- procedures for voting;
- procedures for convening and organising meetings;
- how the RC's opinions and positions are developed and adopted;
- which municipal unit is responsible for the administrative support of the RC.

Subsequently, an open call for members of the RC is announced based on the adopted RC rules. Some members are appointed by institutions due to their official roles, such as municipal councilpeople, staff from departments responsible for revitalisation, employees of social welfare centres, or representatives of academic institutions. Others apply as representatives of specific stakeholder groups. These candidates must provide proof of affiliation with the group they represent, for example, by indicating their place of residence, business activity, or involvement in local social initiatives. In some cases, applicants representing groups such as residents of the revitalisation area are also required to submit a list of supporting signatures from a specified number of individuals, as defined in the RC rules. Candidates are often also expected to have prior experience with revitalisation, which must be

described in their application. In practice, it is almost always necessary to conduct a supplementary recruitment process following the initial call. This results from the lack of representation or an insufficient number of candidates from the stakeholder groups outlined in the RC rules. A selection board is typically appointed to review the applications and recommend the composition of the RC to the mayor. If the number of candidates in a given category exceeds the number of available seats, the final selection is made by drawing lots. The procedure for this draw is defined in the previously adopted RC rules. The composition of the RC is formally appointed by ordinance of the mayor, town mayor, or commune head, for the term specified in the RC rules. If vacancies arise during the RC's term, for example, due to resignation or withdrawal, the committee may request that a supplementary recruitment process be conducted. Participation in the RC is voluntary and unpaid. Members are not entitled to remuneration, per diem allowances, reimbursement of travel expenses, or compensation for lost income resulting from their involvement in RC meetings and activities.

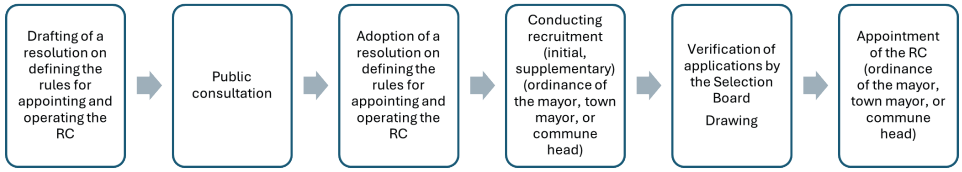


Fig. 3. Procedure for appointing the RC

Source: own work based on the Revitalisation Act (2015).

5. RULES FOR APPOINTING AND OPERATING REVITALISATION COMMITTEES IN THE LODZ VOIVODESHIP

The rules of the RC define the maximum number of members to be appointed. In the analysed municipalities, the planned composition of the RCs varies significantly, from 8 to 43 members. In three-quarters of the cases, the maximum number of members planned ranges from 8 to 15. Four municipalities (Pątnów, Piotrków Trybunalski, Radomsko, and Tomaszów Mazowiecki) have aimed to appoint between 21 and 26 members. The largest number was proposed in Łódź, with a range from 15 to 43 members (Fig. 4). This is understandable, given the city's size, importance, and the scale of its ongoing revitalisation efforts. Similar flexibility and differentiation in the size and structure of revitalisation committees have been observed in Polish municipalities of the Wielkopolskie Voivodeship and is linked to the absence of detailed statutory guidelines on optimal committee size (Kaczmarek, 2021).

In practice, however, following supplementary recruitment for the RC's second term in 2021, the minimum threshold was exceeded, and ultimately only 18 members were appointed to the committee (Ordinance No. 9204/VIII/21 of the Mayor of Łódź, dated December 30, 2021, on the appointment of the Revitalisation Committee). Clearly, the size of the municipality influences the proposed number of RC members. The recruitment process itself is generally assessed positively and is not considered particularly complicated (according to in-depth interview data). Nonetheless, despite both initial and supplementary recruitment efforts, municipalities often struggle to fill the composition of the RC as defined in the official rules. This confirms earlier findings that, although the legal framework encourages participatory bodies, practical implementation frequently encounters limits of interest, capacity and mobilisation (Masierek, 2021; Kaczmarek, 2021). The difficulties in attracting and maintaining members also resonate with international research stressing that participatory structures remain fragile when they are not clearly empowered and when their influence on decision-making is uncertain (Arbab *et al.*, 2020; Chan *et al.*, 2022).

Municipalities often fail to introduce the RC tool early enough and rarely conduct intensive information and promotional activities to raise awareness about its role. In most cases, stakeholders only learn about the existence of the RC when calls for membership are announced. Among the analysed municipalities, only Ujazd appointed exactly the number of RC members specified in its rules. Żychlin appointed 10 out of 11 planned members, and Radomsko appointed 19 out of 21. Several municipalities have set numerical limits in their RC rules but are still in the process of recruitment (Piotrków Trybunalski and the municipalities of Osjaków, Inowłódz, Gidle, Łask, Dalików, Parzęczew, and Poddębice). As a result, the exact number of appointed RC members cannot yet be determined. This suggests that municipalities are experiencing difficulties in recruiting members for their Revitalisation Committees. These difficulties result from a low level of interest in this tool among stakeholders, which may be due, among other things, to the symbolic nature of their participation in it. This dynamic can be interpreted through Arnstein's classic insight that participation limited to consultative or advisory roles, without visible impact on decisions, is easily perceived as tokenistic (Arnstein, 1969). The empirical pattern observed here thus supports concerns that, despite formal openness, RCs may in practice operate on the middle rungs of the participation ladder. Data from in-depth interviews indicates that the number of appointed RC members often does not correspond to actual attendance at meetings. Unfortunately, member participation tends to decline over time, with only a few individuals regularly and actively taking part in the committee's work. Similar problems of maintaining long-term engagement and preventing formal bodies from becoming passive or symbolic are reported in studies of revitalisation committees in the Greater Poland Voivodeship (Kaczmarek, 2021) and in international evaluations of

participatory arrangements (Arbab *et al.*, 2020; Chan *et al.*, 2022). These findings underline the fact that the existence of an RC as such is insufficient and that sustaining participation requires continuity and responsiveness of authorities and a clear sense of purpose.

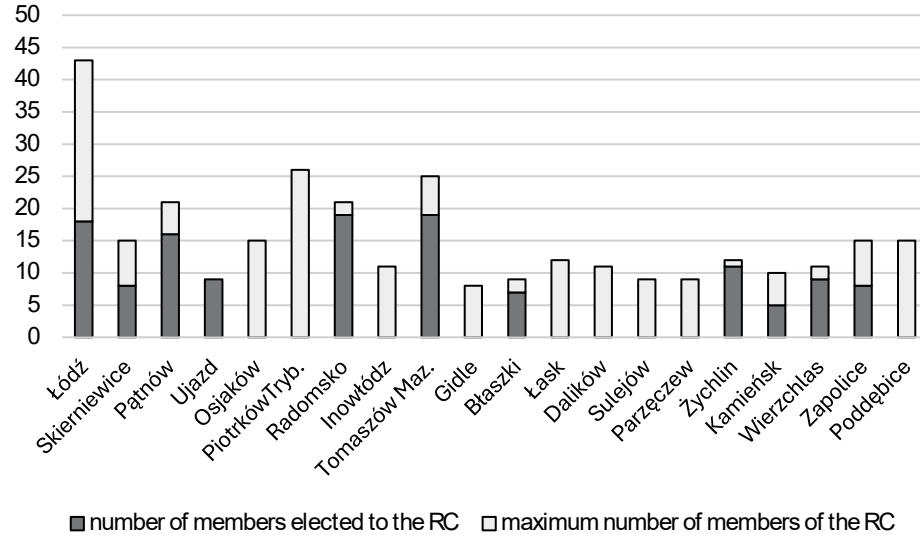


Fig. 4. Number of allowed and appointed RC members in the study areas
Source: own work.

The majority of the analysed areas (45%) stipulated that the term of the RC should correspond to the duration of the CRP. In 30% of the cases, the RC term was set at five years, while 15% adopted a four-year term (Fig. 5). Typically, the start of the term is counted from the date of the RC's first meeting. The shortest term was set by Łódź (three years), which has resulted in the need for frequent recruitment of new RC members. The most recent term in Łódź expired on 30 December 2024, and as of 31 March 2025, a new RC had not yet been appointed. This reflects a lack of continuity and suggests a rather symbolic approach to the use of this participatory tool by local authorities. By contrast, the municipality of Gidle opted for a seven-year term. In two of the study areas, Łódź and Tomaszów Mazowiecki, rules specify that members may serve a maximum of two terms. Linking the RC's mandate to the CRP cycle is in line with the integrated, long-term approach to regeneration promoted in the Polish framework (Masierek, 2021), yet the case of Łódź illustrates that short mandates and gaps between terms weaken institutional memory and reduce the committee's ability to influence strategic decisions in a sustained way.

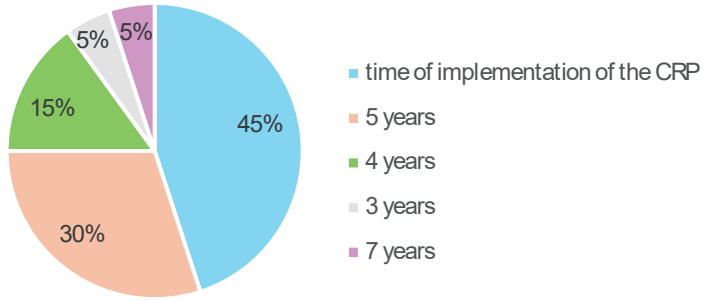


Fig. 5. Duration of tenure
Source: own work.

Each of the analysed municipalities developed rules for appointing and operating the Revitalisation Committee. Unfortunately, only half of the municipalities successfully completed the recruitment process and formally appointed an RC. Deficiencies in recruitment may result from stakeholders' unwillingness to engage in social activities, their lack of knowledge about the functioning of the Revitalisation Committee or the recruitment process, i.e., poor promotion of this tool in the municipality. They may also be due to negative experiences with social participation to date. Evidence from other Polish RCs shows that incomplete staffing, infrequent meetings and limited visibility are common and linked to the weak positioning of RCs within local power structures (Kaczmarek, 2021). These observations converge with broader critiques that advisory bodies risk remaining marginal unless they are clearly embedded in governance arrangements and their outputs are systematically used (Chan *et al.*, 2022; Bartoletti and Faccioli, 2020). The individuals selected to serve on the RCs represent a variety of stakeholder groups (Fig. 6). For the purpose of the analysis, stakeholders were categorised into the following groups:

– residents of the revitalisation area (including property owners and managers, and neighbourhood council representatives),
– residents of the municipality from outside the revitalisation area,
– entrepreneurs (including business associations),
– organisations engaged in social activities in the revitalisation area (e.g., NGOs, social welfare centres),
– educational and cultural institutions (e.g., representatives of schools, universities, and cultural organisations),
– municipal officials (appointed by city or municipal leaders, representing various departments),
– councilpeople (selected by the local community or appointed by the chairperson of the municipal council),
– representatives of entities exercising the rights of the National Treasury in the revitalisation area.

An additional category labelled "others" was created to include cases not covered by the main stakeholder groups, such as utility network managers, independent experts, and consultants. In all analysed cases, municipal staff and their organisational units, as well as council people, submitted applications to join the RC. The involvement of administrative institutions as key stakeholders in the process is unquestionable, and their participation in RC meetings is essential. However, it is equally important to ensure a proper balance between representatives of public institutions and those from the private sector and local communities. The core idea behind establishing the RC is to enable stakeholders "from outside the administration" to actively participate in all stages of the revitalisation process and contribute to decision-making related to its planning and implementation.

In the case of Łódź (a regional capital), the composition of the RC included two university representatives and one independent expert, reflecting the city's institutional capacity and specificity. However, the representation of residents from the revitalisation area was limited to just one member of a neighbourhood council, an underwhelming figure for a city of this size and with such an extensive history of revitalisation efforts. In Skierniewice, five out of the eight RC members are representatives of the municipal office, indicating a dominance of the administrative sector. By contrast, in the municipality of Pątnów, a more balanced composition was achieved, with 11 out of 16 members representing the "non-institutional" side. These differences mirror broader dilemmas highlighted in the literature: whether participatory bodies function as spaces for co-production and urban commons (Bartoletti and Faccioli, 2020; Camerin, 2021), or remain dominated by institutional actors reproducing existing power relations.

In Radomsko, where the revitalisation area is composed of three adjoining sub-areas, each sub-area is represented by two individuals, residents and property owners, ensuring more geographically distributed representation within the RC. In the case of Tomaszów Mazowiecki, a representative of a higher education institution was appointed to the RC, as was also the case in Łódź. This reflects the presence of a branch of the University of Lodz operating within the municipality. Notably, although the CRP focuses on the downtown area, a representative from the surrounding rural municipality was also invited to join the RC. Unusually, the committee included two city council representatives appointed by the mayor, as well as two additional members designated directly by the city council. In the municipality of Błaszki, the ordinance appointing RC members listed individuals by name only, without indicating the stakeholder group they represent, an approach that limits transparency. In the municipality of Kamińsk, only five RC members were appointed, including three council people, which indicates a strong dominance of political representation. In the rural municipality of Zapolice, a total of eight members were appointed to the RC. These included three representatives of residents from the revitalisation area and one entrepreneur; the remaining members were councilpeople and municipal officials. These examples show that, while the formal framework allows for pluralistic representation, the actual

composition of RCs often leans towards administrative and political elites. This echoes concerns from studies of citizen advisory bodies that insufficiently diverse membership and ambiguous selection criteria reduce perceived legitimacy and limit the breadth of perspectives included (Chan *et al.*, 2022).

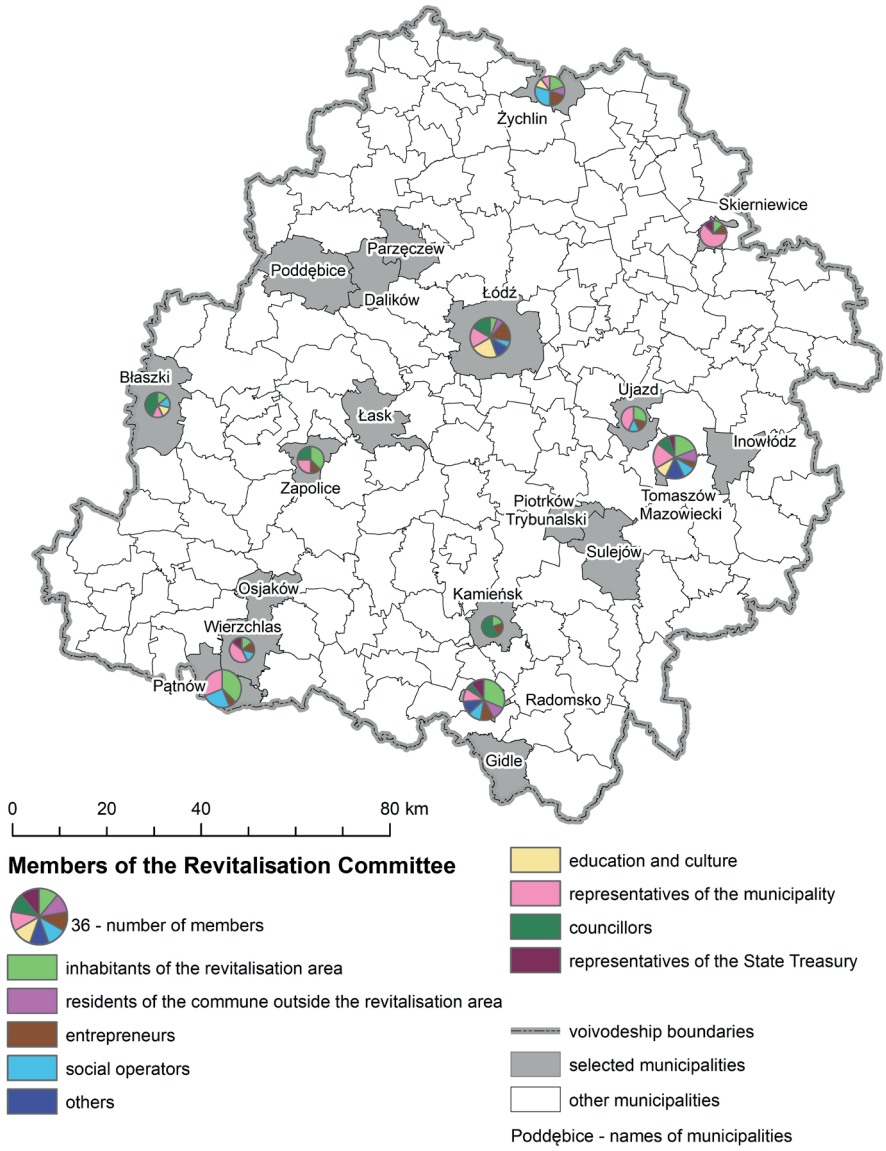


Fig. 6. Participation of representatives of each stakeholder group in the RCs appointed in the study areas analysed

Source: own work.

In all the analysed municipalities, the RC rules require the election of a chairperson and a deputy chairperson from among the committee members. In three cases Łódź, the municipality of Osjaków, and Tomaszów Mazowiecki two deputy chairpersons were appointed, and in the case of Łódź, a secretary was also designated. These roles are typically filled by members who receive the highest number of votes during internal elections. An exception was observed in the municipality of Łask, where the chairperson of the RC was appointed directly by the mayor, while the deputy was elected by vote. RC opinions are generally adopted through open voting, by a simple majority. In some cases, a quorum of at least 50% of the members is required for the vote to be valid. In the event of a tie, the chairperson's vote is decisive. Such internal procedures are consistent with the advisory nature of these bodies but also underline their dependence on political leadership, which may constrain autonomy and reinforces the risk of operating at consultative rather than co-decisional levels (Arnstein, 1969; Chan *et al.*, 2022).

In addition, many RC rules include a provision requiring the exclusion of municipal office representatives from voting when the subject concerns documents they have authored or co-developed. This clarification is important in practice, as it facilitates smoother proceedings and the fair adoption of positions during meetings. The topics discussed during RC meetings largely depend on the current stage of revitalisation efforts in the municipality, as well as the level of engagement of RC members. It is mandatory for the RC to issue opinions on key matters such as updates to the CRP and its monitoring report. Other topics commonly addressed include ongoing investments and programs within the municipality, heritage preservation, and community-based initiatives (based on meeting minutes and in-depth interviews). These functions correspond to the role of revitalisation committees described in previous Polish research (Kaczmarek, 2021) and show that, at least formally, RCs are designed as platforms for continuous dialogue throughout the regeneration cycle rather than one-off consultations.

More than half of the analysed municipalities included in their RC rules the requirement to hold committee meetings at least once a year, while 20% stipulated a minimum frequency of once per quarter. Others specified that meetings should take place every six months or only "when important matters arise." One municipality did not mention the frequency of RC meetings in its adopted rules at all. Insights from in-depth interviews highlight that meeting frequency plays a key role in maintaining the activity and engagement of RC members. Respondents emphasized that regular meetings are essential for ensuring the committee's effectiveness. A frequency of "once a month" or "every two months" was most often indicated as optimal. This is in line with comparative findings that stable, periodic interactions are crucial for building trust, continuity and shared responsibility in participatory governance (Bartoletti and Faccioli, 2020; Arbab *et al.*, 2020). Municipalities that choose minimal or undefined meeting frequencies therefore risk reinforcing a purely symbolic function of the RC.

The RC rules also define the conditions under which an RC member may be dismissed. These typically include situations such as the:

– individual ceases to hold the position on the basis of which they were appointed to the RC (e.g., a council person) or their employment relationship ends (e.g., an official),

– individual is convicted by a final court judgment, nominating entity submits a written request for the member's dismissal,

– member is removed following a motion submitted by two-thirds of the RC members,

– member engages in activities that conflict with the scope of the RC's responsibilities,

– member voluntarily resigns from the position.

More than half of the study areas include provisions in their RC rules allowing for the removal of a committee member due to repeated unexcused absences. Typically, if a member fails to attend three consecutive RC meetings without justification, the remaining members may request their dismissal and initiate a supplementary recruitment process to fill the vacancy.

Attendance tends to be higher at the beginning of the RC's term but often declines over time. Some members attend the first few meetings and then gradually disengage from participation altogether. Several factors contribute to this pattern. One key issue is the perceived tokenistic treatment of the RC by the municipality particularly the lack of interest shown by local authorities in the positions developed by the committee, as well as their limited presence at RC meetings. According to in-depth interviews, this leads to frustration among members and a sense that their involvement lacks meaningful impact on the revitalisation efforts, which ultimately discourages continued engagement. This trajectory is consistent with Arnstein's critique of symbolic participation (Arnstein, 1969) and with empirical evidence showing that citizen bodies remain active where their recommendations are visibly considered and where cooperation resembles genuine co-governance rather than a procedural requirement (Bartoletti and Faccioli, 2020; Chan *et al.*, 2022; Kaczmarek, 2021). In this light, the findings indicate that, despite the formal diffusion of revitalisation committees as a tool promoted in Polish regeneration policy (Masierek, 2021), their practical functioning in the studied municipalities still oscillates between meaningful engagement and a largely formalised and symbolic approach to participation.

6. CONCLUSION AND RECOMMENDATIONS

In local governments where broader forms of participation are implemented, residents tend to be more engaged in community affairs and demonstrate a stronger sense of responsibility for their surroundings (Kreusslein and Günther, 2024;

Bartoletti and Faccioli, 2020). Public participation is crucial not only for public authorities involved in the reconstruction of degraded urban spaces, but especially for the stakeholders directly affected by these processes. Their involvement should be integrated at every stage from planning, through implementation, to monitoring the changes introduced (Masierek, 2021). Revitalisation Committees in Poland represent a legally mandated public participation tool designed to ensure the continuous involvement of stakeholders in the revitalisation process, particularly as it progresses into the phases of developing and implementing the CRP.

Although the statutory framework appears well-designed, in practice, this tool is often not adequately utilised by municipalities. The principles for establishing and operating Revitalisation Committees were adopted by most of the surveyed municipalities within a few months before or simultaneously with the adoption of the CRPs, and the regulations were established even before the formal adoption of the main revitalisation documents, this proves their key role as tools supporting the process of rebuilding the degraded urban fabric. This detailed analysis reveals that none of the surveyed RCs were involved in the development of the foundational document for revitalisation, the CRP. Yet this initial stage is crucial for meaningful engagement, as it offers various stakeholder groups the opportunity to gain a deep understanding of the problems and potential of the designated revitalisation area, contribute to solutions for identified deficits, and develop a sense of ownership over the proposed intervention strategy. Early involvement of the RC would also facilitate the appointment of its full composition in accordance with the provisions set out in the RC rules. Recruitment processes could then be conducted by individuals who had already contributed to the development of the CRP and had a solid understanding of the revitalisation context. However, municipalities generally fail to undertake information and promotion activities concerning the RC early enough. In most cases, stakeholders only become aware of the committee's existence when recruitment announcements are published. For this reason, it is essential that the RC be established at the very beginning of the CRP development process and that this is preceded by targeted informational and educational efforts aimed at building awareness and legitimacy around the role of the RC as a participatory governance tool.

The composition of the RC is crucial and should reflect a balance of stakeholder groups, including public institutions, the private sector, and residents. In the surveyed municipalities, the RC, as defined in the Revitalisation Act, is composed primarily of representatives of residents of revitalisation areas (including property owners and representatives of neighbourhood councils), city officials, council people, representatives of the business sector, non-governmental organisations, cultural and educational institutions, and representatives of entities exercising State Treasury authority. In some municipalities, additional experts from outside the public sector, such as independent consultants or academics, were appointed. Involving universities can also add valuable expertise. Equally important are regular meetings, participation by municipal authorities (whom the RC advises), and

the meaningful use of the committee's input in decision-making. This helps ensure that members, who work on a voluntary basis, feel effective and see the outcomes of their engagement reflected in revitalisation efforts. In most municipalities, the frequency of meetings ranges from monthly to quarterly, although meetings are sometimes scheduled every six months. Topics discussed at these meetings focus on updating and assessing the implementation of the CRP, analysing the progress of revitalisation investments, social issues, heritage protection, and local initiatives. The RC reviews key documents such as monitoring reports, proposed changes, and investment projects, and decision-making is typically based on voting with direct participation of members. Decisions in the RC are usually made by a majority vote in open ballots. In most municipalities, voting is unanimous, although in some cases a quorum is required (e.g., at least 50% of members), and in the event of a tie, the chairperson decides. In practice, recommendations, opinions, and positions are primarily adopted, which then serve as guidelines for the municipal authorities for further revitalisation work.

Consistent interaction between public authorities and stakeholders through the RC should promote greater social ownership of the process and lead to projects better aligned with actual community needs. Finally, municipalities would benefit from targeted educational activities to better understand the purpose of the RC and fully harness its potential in practice.

The analysis presented in this article enables an assessment of how this tool works in practice and indicates areas for improvement in order to better exploit its potential. It focuses on a specific participatory tool used in revitalisation activities in Poland, which may serve as a basis for further research and comparisons with other regions in the country. It can also serve as a starting point for comparative analyses of social participation tools used in different countries, particularly in degraded areas. The conclusions may be valuable for municipalities engaged in complex, long-term revitalisation processes, where active involvement of the local community at every stage, though widely advocated, is often difficult to implement effectively.

Acknowledgment. The project received funding from internal research competitions of the University of Lodz funded by a grant increased by 2% for universities that entered the Excellence Initiative – Research University competition.

REFERENCES

ARBAB, P., TAGHIZADEH, K. and FADAEI NEZHAD, S. (2020), 'Toward participation-based urban planning and development: evaluating participatory revitalization in middle Oudlajan neighborhood of Tehran', *Journal of Urban Planning and Development*, 146 (4), 05020022. https://doi.org/10.1061/(ASCE)UP.1943-5444.0000611

ARIAS VALENCIA, M. M. (2022), 'Principles, Scope, and Limitations of the Methodological Triangulation', *The Journal Investigación y Educación en Enfermería*, 40 (2). https://doi.org/10.17533/udea.iee.v40n2e03

ARNSTEIN, S. R. (1969), 'A ladder of citizen participation', *Journal of the American planning association Institute of planners*, 35 (4), pp. 216–224. https://doi.org/10.1080/01944363.2018.1559388

BARTOLETTI, R. and FACCIOLI, F. (2020), 'Civic Collaboration and Urban Commons. Citizen's Voices on a Public Engagement Experience in an Italian City', *Partecipazione e conflitto*, 13 (2), pp. 1132–1152. https://dx.doi.org/10.1285/i20356609v13i2p1132

BOBBIO, L. (2019), 'Designing effective public participation', *Policy and Society*, 38 (1), pp. 41–57. https://doi.org/10.1080/14494035.2018.1511193

CAMERIN, F. (2021), 'Regenerating Former Military Sites in Italy. The Dichotomy between «Profit-Driven Spaces» and «Urban Commons»', *Global Jurist*, 21 (3), pp. 497–523. https://doi.org/10.1515/gj-2021-0075

CAMERIN, F. (2023), 'Urban Governance in Post-pandemic Barcelona: A Superblock-Based New Normal?', [in:] LISSANDRELLO, E., SØRENSEN, J., OLESEN, K. and STEFFANSEN, R. N. (eds), *The 'New Normal' in Planning, Governance and Participation. The Urban Book Series*, Cham: Springer. https://doi.org/10.1007/978-3-031-32664-6_22

CAMERIN, F. (2024), 'Former military barracks as places for informal placemaking in Italy. An inventory for new insights', *Journal of Urbanism: International Research on Placemaking and Urban Sustainability*, 17 (2), pp. 190–213. https://doi.org/10.1080/17549175.2024.2327588

CAMERIN, F. and LONGATO, D. (2024), 'Designing healthier cities to improve quality of life: An analysis of challenges and outcomes in two Spanish cases', *Journal of Urban Design*, 30 (1), pp. 1–30. https://doi.org/10.1080/13574809.2024.2351925

CHAHARDOWLI, M. and SAJADZADEH, H. (2022), 'A strategic development model for regeneration of urban historical cores: A case study of the historical fabric of Hamedan City', *Land Use Policy*, 114. https://doi.org/10.1016/j.landusepol.2022.105993

CHAN, Y. E., KRISHNAMURTHY, R., MANN, J. and SABHERWAL, R. (2022), 'Public Participation in Policy Making: Evidence from a Citizen Advisory Panel', *Public Performance & Management Review*, 45 (6), pp. 1308–1345. https://doi.org/10.1080/15309576.2022.2062398

CIESIÓŁKA, P. (2018), 'Urban Regeneration as a New Trend in the Development Policy in Poland', *Quaestiones Geographicae*, 37 (2), pp. 109–123. https://doi.org/10.2478/quageo-2018-0015

CIESIÓŁKA, P., KUDŁAK, R. and KOSŁUT, B. (2016), 'Programowanie rewitalizacji w miastach województwa wielkopolskiego w latach 1999–2015', *Rozwój Regionalny i Polityka Regionalna*, 36, pp. 57–71.

CÓRDOBA HERNÁNDEZ, R. and CAMERIN, F. (2023), 'Assessment of ecological capacity for urban planning and improving resilience in the European framework: An approach based on the Spanish case', *Cuadernos de Investigación Geográfica*, 49 (2), pp. 119–142, https://publicaciones.unirioja.es/ojs/index.php/cig/article/view/5638 [accessed on: 5.04.2025].

CREIGHTON, J. L. (2005), *The Public Participation Handbook. Making Better Decisions Through Citizen Involvement*, San Francisco: Jossey-Bass A Wiley Imprint.

DŁUGOSZ, D. and WYGNAŃSKI, J. J. (2005), *Obywatele współdecydują. Przewodnik po partycypacji społecznej*, Warszawa: Stowarzyszenie na rzecz Forum Inicjatyw Pozarządowych.

DŹWIGOŁ, H. and DŹWIGOŁ-BAROSZ, M. (2020), 'Research process and methodological triangulation, Scientific Papers of Silesian University of Technology', *Organization and Management Series*, 148. http://dx.doi.org/10.29119/1641-3466.2020.148.12

DZIARMAKOWSKA, N. (2023), 'Rola komitetów rewitalizacji w procesie rewitalizacji na przykładzie województwa wielkopolskiego', *Rozwój Regionalny i Polityka Regionalna*, 66, pp. 129–148. https://doi.org/10.14746/rrpr.2023.66.09

FORS, H., HAGEMANN, F., SANG, A. and RANDRUP, T. (2021), 'Striving for Inclusion—A Systematic Review of Long-Term Participation in Strategic Management of Urban Green Spaces', *Frontiers in Sustainable Cities*, 3, 572423. https://doi.org/10.3389/frsc.2021.572423

GRABOWSKA, M. and FRANKOWSKI, J. (2016), 'Close to the city centre, close to the university'. Are there symptoms of studentification in Gdańsk, Poland?', *Bulletin of Geography. Socio--economic Series*, 32, pp. 73–83. http://dx.doi.org/10.1515/bog-2016-0016

HAJDUK, S. (2021), *Partycypacja społeczna w zarządzaniu przestrzennym w kontekście planistycznym*, Białystok: Oficyna Wydawnicza Politechniki Białostockiej.

HAJDYS, D. and ŚLEBOCKA, M. (2021), *Rewitalizacja miast we współpracy z podmiotem prywatnym w formule partnerstwa publiczno-prywatnego*, Kraków-Legionowo: edu-Libri.

HOŁUJ, D. and LEGUTKO-KOBUS, P. (2018), 'A participatory model of creating revitalisation programmes in Poland–challenges and barriers', *Mazowsze Studia Regionalne*, 26, pp. 33–59. https://doi.org/10.21858/msr.26.02

HUNZIKER, M., BUCHECKER, M. and HARTIG, T. (2007), 'Space and Place - Two Aspects of the Human-landscape Relationship', [in]: KIENAST, F., WILDI, O. and GOSH, S. (eds), *A Changing World - Challenges for Landscape Research*, pp. 47–62, Dordrecht: Springer Netherlands. https://doi.org/10.1007/978-1-4020-4436-6

HUK, M. Z. (2024), *Teoria demokracji deliberatywnej Jane Mansbridge*, doctoral thesis, Uniwersytet im. Adama Mickiewicza w Poznaniu, Poznań, https://bip.amu.edu.pl/__data/assets/pdf_file/0023/583061/Huk-Marta-Z._rozprawa-doktorska.pdf [accessed on: 10.04.2025].

IGE-ELEGBEDE, J., PILKINGTON, P., ORME, J., WILLIAMS, B., PRESTWOOD, E., BLACK, D. and CARMICHAEL, L. (2020), 'Designing healthier neighborhoods: a systematic review of the impact of the neighborhood design on health and well-being', *Cities & Health*, 6 (5), pp. 1004–1019. https://doi.org/10.1080/23748834.2020.1799173

JARCZEWSKI, W. and KURYŁO, M. (2010), 'Rewitalizacja w liczbach', [in:] ZIOBROWSKI, Z. and JARCZEWSKI, W. (eds), *Rewitalizacja miast polskich – diagnoza, Rewitalizacja miast polskich*, tom 8, Instytut Rozwoju Miast, Kraków, pp. 253–266.

KACZMAREK, P. (2021), 'Przegląd działalności wybranych komitetów rewitalizacji w województwie wielkopolskim', *Rozwój Regionalny i Polityka Regionalna*, (53), pp. 65–76. https://doi.org/10.14746/rrpr.2021.53.05

KREUSSLEIN, M. and GÜNTER, M. (2024), 'Power to the citizens: Factors fostering satisfaction with citizen participation in urban planning', [in:] MACIEJKO, A. (ed.), *Human Factors in Architecture, Sustainable Urban Planning and Infrastructure*, AHFE (2024) International Conference. AHFE Open Access, 153, AHFE International, USA. http://doi.org/10.54941/ahfe1005342

LEGUTKO-KOBUS, P. and NOWAK, M. J. (2020), 'Niesprawność władz publicznych w świetle prawno-przestrzennych i partycypacyjnych narzędzi rewitalizacji', *Studia z Polityki Publicznej*, 3 (27), pp. 117–135.

The List of Positively Verified Municipal Revitalisation Programs, maintained by the Managing Authority of the regional operational program European Funds for Lodz 2021–2027, https://funduszeue.lodzkie.pl/rewitalizacja/wykaz-gpr [accessed on: 20.02.2025].

MASIEREK, E. (2021), 'Urban regeneration programming in Poland in the years 2014-2020', *European Spatial Research and Policy*, 28 (1), pp. 225–247. https://doi.org/10.18778/1231-1952.28.1.12

MASIEREK, E. and PAZDER, D. (2024), 'Partycypacja w rewitalizacji–przykład ulicy św. Marcin w Poznaniu', *Rozwój Regionalny i Polityka Regionalna*, (72), pp. 111–129. https://doi.org/10.14746/rrpr.2024.72.07

MANSBRIDGE, J. (1983). *Beyond Adversary Democracy*, Chicago: University of Chicago Press.

McCLENDON, B. W. (1993), 'The paradigm of empowerment', *Journal of the American Planning Association*, 59 (2), pp. 145–147. https://doi.org/10.1080/01944369308975861

MIŚKOWIEC, M. and MASIEREK, E. (2023). 'Factors and levels of community participation using the example of small-scale regeneration interventions in selected neighbourhood spaces in Polish cities.' *Urban Research and Practice*, 16, pp. 797–821. https://doi.org/10.1080/17535069.2022.2099758

NAVAS-CARRILLO, P. and RODRIGUEZ-LORA, J. (2024), 'Perspectivas innovadoras sobre el patrimonio urbano. Hacia la regeneración integral de los barrios de vivienda colectiva', *European Public & Social Innovation Review*, 9. https://doi.org/10.31637/epsir-2024-647

ORDINANCE No. 9204/VIII/21 of the Mayor of Lodz, dated 30 December 2021, ZARZĄDZENIE Nr 9204/VIII/2021 PREZYDENTA MIASTA ŁODZI z dnia 30 grudnia 2021 r. w sprawie powołania Komitetu Rewitalizacji.

NOWORÓL, A., NOWORÓL, K. and HAŁAT, P. (2012), 'Partycypacja społeczna w zarządzaniu procesami rewitalizacji', *Problemy Rozwoju Miast*, 1, pp. 26–39.

PASIKOWSKI, S. (2015), 'The Triangulation. From Geodesy to Attempt at Overcoming of Conceptual Limitations in Social Research Methodology', *Transdyscyplinarne Studia o Kulturze (i) Edukacji,* 10, pp. 224–246.

PENDLEBURY, J. and PORFYRIOU, H. (2017), 'Heritage, urban regeneration and place-making', *Journal of Urban Design*, 22 (4), pp. 429–432. https://doi.org/10.1080/13574809.2017.1326712

PRZYWOJSKA, J. (2019), 'Współzarządzanie i partycypacja społeczna w rewitalizacji', Rocznik Lubuski, 45 (2), pp. 21–34. https://doi.org/10.34768/rl.2019.v452.02

The Revitalisation Act, Ustawa o rewitalizacji z dnia 9 października 2015 r. o rewitalizacji (J. of L. of 2015 Item1777) as amended (J. of L. of 2024 Item 278).

ROBERTS, P. (2016), 'The evolution, definition, and purpose of urban regeneration', [in]: ROBERTS, P., SYKES, H. and GRANGER, R. (eds), *Urban regeneration*, pp. 9–43, London.

SAGAN, I. and GRABKOWSKA, M. (2012), 'Urban Regeneration in Gdańsk, Poland: Local Regimes and Tensions Between Top-Down Strategies and Endogenous Renewal', *European Planning Studies*, 20 (7), pp. 1135–1154. https://doi.org/10.1080/09654313.2012.674347

SCHROETER, R., SCHEEL, O., RENN, O. and SCHWEIZER, P.-J. (2016), 'Testing the value of public participation in Germany: Theory, operationalization and a case study on the evaluation of participation', *Energy Research & Social Science*, 13, (March 2016), pp. 116–125. https://doi.org/10.1016/j.erss.2015.12.01

SIEMIŃSKI, W. (2007), 'Cele i zasady partycypacji społecznej w planowaniu przestrzennym - przegląd literatury', *Człowiek i Środowisko*, 31 (1–2), pp. 37–59.

SMITH, N. (2006), *The New Urban Frontier: Gentrification and the Revanchist City*, London – New York: Routledge.

VIVEK, R., NANTHAGOPAN, Y. and PIRIYATHARSHAN, S. (2023), 'Beyond methodology: Theoretical foundations of triangulation in qualitative and multi-method research: A literature review', *Scientific Studios on Social and Political Psychology*, 29 (2), pp. 53–62. https://doi.org/10.61727/sssppj/2.2023.53

WOOLRYCH, R. and SIXSMITH, J. (2013), 'Placing well-being and participation within processes of urban regeneration', *International Journal of Public Sector Management*, 26 (3), pp. 216–231. https://doi.org/10.1108/IJPSM-09-2011-0119

WÓJCICKI, M. (2013), 'Pojęcie, istota i formy partycypacji społecznej w procesie planowania przestrzennego', *Rozwój Regionalny i Polityka Regionalna*, 24, pp. 170–183.

YADAV, B. (2024), 'Citizen Participation in Government Decision-Making', *Research Review International Journal of Multidisciplinary*, 9 (4), pp. 267–271. https://doi.org/10.31305/rrijm.2024.v09.n04.033

Member since 2018
JM13710

EUROPEAN SPATIAL RESEARCH AND POLICY

Volume 33 2026 Number 1

https://doi.org/10.18778/1231-1952.33.1.05

Haris GEKIĆ [*], **Aida BIDŽAN-GEKIĆ** [*], **Anisa BOSNO** [**], **Emina AJANOVIĆ** [*], **Péter REMÉNYI** [***]

STATIONARY TRAFFIC AS A CHALLENGE IN THE SPATIAL PLANNING OF THE CITY OF GORAŽDE

Abstract. Parking shortages increasingly constrain medium-sized post-socialist cities, yet empirical evidence on stationary traffic is scarce. This case study of Goražde (Bosnia and Herzegovina) inventories and GIS-maps parking supply measures weekday occupancy, surveys residents' perceptions, and proposes a three-zone parking management scheme. Methods combined a field inventory with GIS mapping, hourly manual counts on 1 June 2023 (8:00 a.m. – 5:00 p.m.) at 11 lots (349 spots), and an online household survey (1–17 June 2023; n=103). Peak network occupancy reached 86.2%, and hotspot sites exceeded nominal capacity (up to 110%). The study provides a replicable baseline for monitoring and policy design in similar medium-sized cities.

Key words: stationary traffic, parking lots, parking zoning, parking, Goražde.

[*] Haris GEKIĆ, Aida BIDŽAN-GEKIĆ, Emina AJANOVIĆ, University of Sarajevo, Faculty of Science, Department of Geography, Zmaja od Bosne 33-35, 71000 Sarajevo, Bosnia and Herzegovina; e-mails: hgekic@pmf.unsa.ba, abidzan@pmf.unsa.ba, emina.ajanovic@pmf.unsa.ba, ORCIDs: https://orcid.org/0000-0002-7055-6608, https://orcid.org/0000-0002-6822-7450, https://orcid.org/0009-0005-2196-863X

[**] Anisa BOSNO, City of Goražde, Sector for Urbanism, spatial planning, and communal affairs, Maršala Tita 2, 73000 Goražde, Bosnia and Herzegovina; e-mail: anisa.bosno18@hotmail.com, ORCID: https://orcid.org/0009-0004-3696-313X

[***] Péter REMÉNYI, University of Pécs, Institute of Geography and Earth Sciences, Ifjúság str. 6, H-7624 Pécs, Hungary; ELTE CERS Institute for Regional Studies; Papnövelde str. 22., H-7621 Pécs, Hungary; e-mail: remenyi.peter@pte.hu, ORCID: https://orcid.org/0000-0002-4777-2820

Received: 29.07.2025, Revised: 15.01.2026, Accepted: 21.01.2026

Funding information: University of Sarajevo, City of Goražde, University of Pécs, Péter Reményi's research for this publication has been supported by National Research, Development and Innovation Office (NKFIH) through the OTKA grant #146585 (Hungary and the Western Balkans). **Conflicts of interests:** None. **Ethical considerations:** The Authors assure no violations of publication ethics and take full responsibility for the content of the publication. **The percentage share of the Authors in the preparation of the work is:** H.G. 20%, A.B.-G. 20%, A.B. 20%, E.A. 20%, P.R. 20%. **Declaration regarding the use of GAI tools:** Not used.

1. INTRODUCTION

The concept of successful urban development depends largely on the proper planning and implementation of various traffic solutions. To the extent that the transport network and infrastructure develop, all other urban functions can develop proportionately (Bublin, 2007). The socio-economic development of Bosnia and Herzegovina has led to an excessive concentration of population in cities, resulting in demographic decline and almost complete depopulation of significant parts of the state territory, accompanied by a simultaneous degradation of demographic structures (Nurković and Gekić, 2011). With the increasing need for individual transport, there is a growing need for a more detailed look at the issue of stationary traffic, especially in urban areas with a growing population. The overall improvement in transport conditions also enhances the quality of life (Gekić *et al.*, 2015).

Automobiles require space to move around (roads) but also spend 98% of their existence stationary in parking spaces (Rodrigue, 2024). Many inner-city properties were built before automobile traffic and cannot conform to parking regulations (Kaplan *et al.*, 2014).

The process of planning stationary traffic capacities should be an integral part of the spatial and urban planning of cities and should represent one of the basic documentation bases of the final agreed plans. In the urban planning process, apart from the agreed needs and possibilities for all functional city facilities, stationary traffic exceeds the framework of the past treatment of overall traffic. In today's considerations of space requirements for any of the functions providing sufficient surfaces for stationary traffic, it is simply a necessity (Martinić *et al.*, 2005). Parking management includes various parking policies and actions that can be used to manage the supply and demand for parking (Meyer, 2016).

This implies the rational use of land for the construction of parking spaces and the necessary infrastructure, establishment of an efficient parking policy, establishment of a system of zoning of parking areas, and planned construction of parking areas with real capacities based on previously determined needs (Hukić, 2017). In addition, a substantial body of international literature treats parking not only as a technical capacity issue but also as an urban policy instrument that shapes mobility behaviour and the allocation of public space.

Parking policy is widely discussed as a core urban-transport and public-space tool rather than a purely technical 'storage' problem. Conventional supply-led approaches, especially minimum parking requirements, tend to embed the cost of car use into housing and development, increase construction costs, and lock-in car dependency by normalizing abundant, underpriced parking (Shoup, 2005; Marsden, 2006; Lehe, 2018; Litman, 2024). Empirical and policy-oriented literature links

rigid minimums with higher housing costs and constrained adaptive reuse or infill outcomes, particularly in older inner-city areas where retrofitting parking is difficult or prohibitively expensive (Lehe, 2018; Litman, 2024). More broadly, 'free' or underpriced parking functions as a subsidy that can shift travel behaviour toward solo driving, while reforms such as pricing and 'cash-out' of employer-paid parking can reduce car commuting and encourage mode shift (Willson and Shoup, 1990; Shoup, 1997).

A complementary stream of research frames parking as part of curb management and network governance: the curb is scarce, publicly owned infrastructure that cities allocate through prices, time limits, permits, and enforcement (ITF, 2018; Manville and Pinski, 2021). From this perspective, effective parking policy aims to manage demand, reduce cruising and its externalities (congestion and illegal parking), and support broader mobility and land-use goals. Modelling work shows how cruising for parking and congestion interact, implying that pricing and capacity management can reduce search time and traffic impacts (Arnott and Rowse, 1999; Arnott and Inci, 2006). Empirical studies also confirm that on-street parking demand responds to price, and that demand-responsive pricing can move occupancy toward target ranges – supporting performance-based approaches (Ottosson *et al.*, 2013; Pierce and Shoup, 2013). Large-scale pilots such as SFpark operationalised these ideas using parking data and periodic price adjustments to improve availability and reduce unnecessary circulation (SFMTA, 2014; Pierce and Shoup, 2013).

International guidance and best-practice syntheses therefore recommend integrated packages rather than single instruments: priced on-street parking with clear goals (e.g., target occupancy), permit systems that limit spillover, reforms of minimum parking requirements in well-served areas, improved information/payment systems, and reinvestment of revenues into streetscape and sustainable mobility (GIZSUTP, 2010; ITDP, 2021; ITDP, 2024; Litman, 2024). In the European context, parking management is also positioned as a practical lever within Sustainable Urban Mobility Plans (SUMPs), linking parking measures to safety, congestion, air quality, public space, and multimodal accessibility (PARKSUMP, 2022). Evidence reviews caution, however, that parking policies are context-sensitive: outcomes depend on urban form, transit supply, enforcement capacity, political legitimacy, and the presence (or absence) of complementary measures such as improved public transport or active-mobility infrastructure (Marsden, 2006; ITF, 2018).

A specific challenge concerns post-socialist cities, where rapid motorisation after systemic transition often collided with inherited street layouts, underdeveloped parking governance, and competing claims over public space. Post-socialist mobility scholarship emphasises how automobility became associated with modernity and freedom, while institutions and everyday practices adapted unevenly (Tuvikene, 2018). In this setting, parking conflicts

frequently surface through informal or semi-formal practices (e.g., sidewalk occupation), ambiguous enforcement, and contested legitimacy of pricing or regulation (Tuvikene, 2015; Popescu, 2022). Ethnographic work illustrates how tolerated sidewalk parking can marginalise pedestrians and normalise "hostile privatism" in residential public space, complicating the implementation of equitable curb policies (Popescu, 2022). Consequently, policy transfer from Western European/North American parking reforms must be adapted to local governance capacity, enforcement realities, and post-socialist sociopolitical meanings attached to car use and public space (Tuvikene, 2015; Tuvikene, 2018; PARKSUMP, 2022).

In Bosnia and Herzegovina, especially in medium-sized cities, systematic parking datasets and routine occupancy monitoring are extremely rarely available, which makes evidence-based parking management difficult to design and justify. Despite the growing global literature and guidance, there remains a gap in empirically grounded parking-policy analyses for medium-sized post-socialist and Western Balkan cities, especially studies that combine mapping of supply and regulation, occupancy observations, and user perceptions. This article contributes to that gap by using the City of Goražde as a case study and combining field occupancy observations with a household survey and spatial (GIS) representation to provide an empirical basis for discussing parking management directions in comparable post-socialist medium-sized cities.

According to the size of cities in Bosnia and Herzegovina, the city of Goražde belongs to the category of medium-sized cities (Gekić *et al.*, 2022). Considering the area of the city, number of inhabitants, topography and configuration of the terrain, availability of construction land, and construction coefficient, the narrower urban area of the city is densely built, and the remaining areas should be rationally planned for construction with an optimal interweaving of functions to the extent that standards allow it.

The main objectives of the research are set in such a way as to determine: the current situation of stationary traffic on the ground and the level of development of the parking areas; and the average daily occupancy of the existing parking areas in the investigated area.

This study is based on the hypothesis that the problem of a lack of parking spots in existing parking lots is expressed in the researched area. Traditional planning solutions imply the planning and construction of parking lots for a smaller number of users. However, as parking requirements are increasing, it is necessary to prepare planning solutions conceptually in a different way. The second hypothesis assumes that when planning and building new parking lots, it is necessary to focus on the gradual creation of prerequisites and conditions for the transition from traditional conceptual solutions to modern ones, including the planning and construction of underground garages or basement spaces that will be adapted to the needs of parking users.

2. METHODOLOGY

The City of Goražde (hereinafter also as: Goražde) is located in the southeastern part of Bosnia and Herzegovina along the upper course of the Drina River at an altitude of approximately 345 m. It covers an area of 253.8 sq. km. According to the 2013 census, Goražde had 20,897 inhabitants. Most of administrative territory of the City of Goražde is dominated by steep terrain with large differences in elevation, while the flat alluvial plateau of the Drina River represents the most important part of the urban area and the functional focus of daily activities. Goražde is currently not served by an operational railway. The city's former narrow-gauge rail connection (Sarajevo–Ustiprača–Goražde–Foča) was discontinued in 1978 (City of Goražde, 2017).

Goražde was selected as a case study because it is a medium-sized urban centre in Bosnia and Herzegovina where daily parking demand is concentrated in a compact inner core, while supply expansion is spatially constrained. As the administrative and service hub of the Bosnian-Podrinje Canton, the town attracts daily trips to public institutions, health services, education, and retail, which intensifies parking pressure in the central area. At the same time, the valley setting along the Drina River, steep surrounding terrain and limited developable flat land restrict the possibility of creating additional off-street parking capacity. This combination makes Goražde a relevant illustrative/typical case for examining stationary traffic as a spatial-planning challenge in medium-sized post-socialist cities. In addition, systematic local parking datasets are limited, so combining an inventory, occupancy observation and a household survey provides a practical evidence base for planning measures (City of Goražde, 2017; Bidžan-Gekić *et al*., 2020).

Therefore, the field research and analysis focus on the narrower urban area, where daily activities are concentrated and where the expansion of parking supply is most constrained due to dense built form and limited available land (Fig. 1).

The study applies a mixed-methods case-study design to examine stationary traffic (parking) as a spatial-planning challenge in a medium-sized post-socialist city. A combined approach was selected because parking pressures are expressed both objectively, through supply–demand mismatch and occupancy levels, and subjectively, through user experiences and perceived problems. Integrating a field inventory of parking supply, an occupancy survey, and a household survey enables triangulation and produces results directly usable for spatial and urban-planning recommendations.

The research was conducted in four stages. The first stage was inventory and spatial mapping of parking supply. Parking facilities in the narrower urban area of Goražde were identified and classified through a field survey. Parking lots were categorised as public or private and as on-street or off-street, and their capacities were recorded. Where parking spots were not delineated by markings, capacity (number of parking spots) was estimated in the field based on the usable paved area and standard parking-space dimensions. The inventory served as the basis for

GIS-based mapping and for the later interpretation of occupancy patterns and zoning proposals. Field records were then digitised and georeferenced in a desktop GIS environment to build the spatial dataset used for mapping and zoning analysis; mobile GIS tools (e.g., QField) may be adopted in future multi-day campaigns to streamline in-field data capture and quality control.

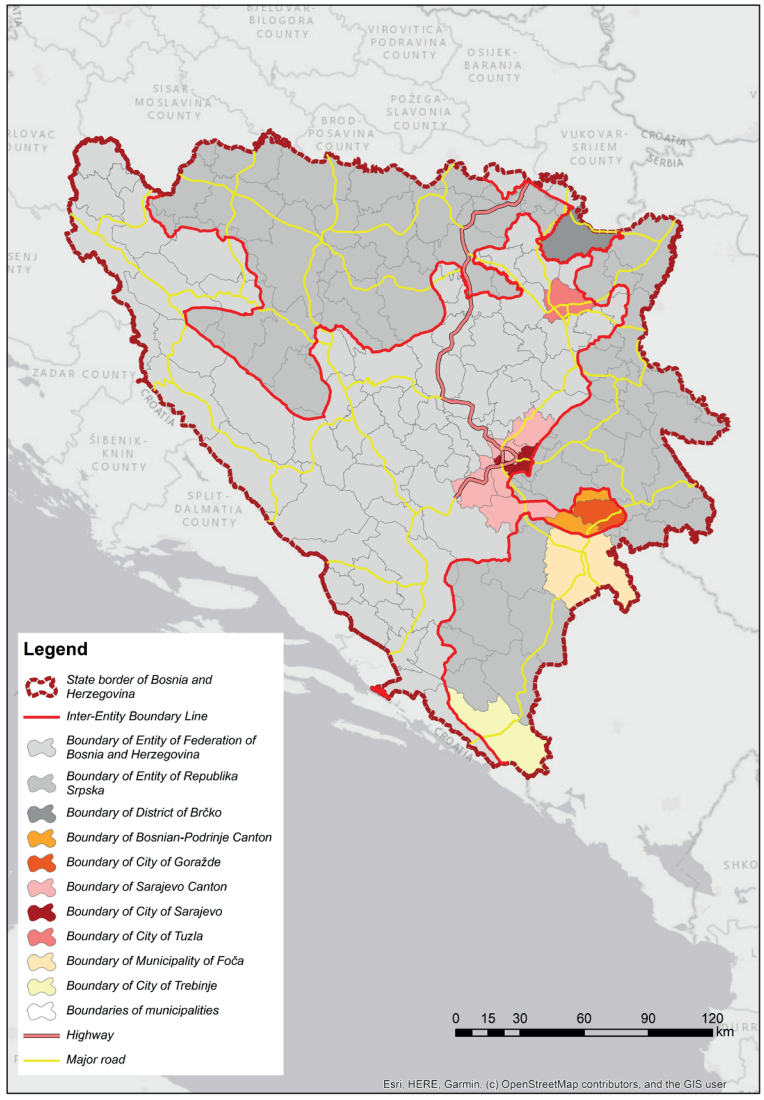


Fig. 1. Location of the City of Goražde within Bosnia and Herzegovina
Source: own work based on the GIS data.

The second stage was the parking-occupancy field survey. To quantify utilisation, we conducted an hourly vehicle-count survey on 1 June 2023 (Thursday) from 8:00 a.m. to 5:00 p.m. across a sample of 11 parking lots (349 parking spots). The parking-occupancy survey was conducted through manual vehicle counts at fixed time intervals using standardized tally sheets (no questionnaire instrument was used for the occupancy measurement). The surveyed sites were selected to capture the main functional corridors with the highest parking demand (central services/retail, public institutions, and adjacent residential blocks). The sample included two private on-street parking areas with a public character, two private off-street parking areas with a public character, and seven public off-street parking lots. Spatially, the surveyed locations are distributed along the principal streets of the urban core (Rabite Street, Zdravstvenih radnika Street, Ibrahima Čelika Street, and 43rd Drinske brigade Street), ensuring coverage of both central activity zones and nearby residential areas. This design enabled us to identify hourly occupancy patterns and to detect locations operating close to, or above, their nominal capacity. The one-day survey design follows established practice in comparable parking-occupancy studies (Razum, 2022) and was implemented as a resource-efficient 'typical weekday' snapshot. Thursday was chosen as a mid-week working day to avoid weekend-specific travel patterns and transitional effects often present on Mondays and Fridays. Multi-day and seasonal measurements could refine the estimates and are, therefore, noted as a direction for future research.

Because systematic local transport data are not collected at the city level, we conducted an online household survey to obtain indicative information on mobility and perceived parking problems. This was a third stage. The survey was administered from 1 to 17 June 2023 using a structured questionnaire with 27 items (closed and open questions). A total of 103 respondents participated. To ensure adequate coverage of the area most affected by parking pressure, the recruitment aimed for at least 100 responses and at least 50% of respondents residing in the urban local communities (Goražde I–IV). The achieved sample included both genders and covered a range of age groups and occupational statuses. Given the online, non-probability recruitment and the sample size relative to the city population, the survey results are reported as descriptive shares for the respondent group and used to complement the field inventory and occupancy measurements; they should not be interpreted as statistically representative population estimates.

The fourth stage was analysis and presentation. Quantitative indicators (capacities, hourly and daily occupancy rates) were analysed descriptively and presented in tables and graphs. GIS/cartographic methods were used to visualise the spatial distribution of parking facilities and to support zoning proposals. Survey results were summarised as percentages and interpreted alongside measured occupancy to provide an integrated assessment. The descriptive statistics and graphs were produced using spreadsheet software.

3. RESULTS AND DISCUSSION

3.1. Analysis and assessment of stationary traffic conditions

Areas intended for parking individual passenger cars can be classified into two basic categories: public and private parking lots (Razum, 2022). Most cities require off-street parking for all new constructions. Zoning rules for each possible type of land use have formulas to prescribe the number of parking spots that the developer must provide based on the size of the business or apartment (Krizek and King, 2021). In urban and suburban local communities, i.e., in the urban area of Goražde, there are 23 public parking lots with a total capacity of 602 parking spots and an additional 8 parking spots for people with disabilities. The total number of parking spots was determined by field research by counting them. Parking spots are located in marked places outside the street system as separate spots or along the street system as its primary and integral part.

The second type of parking lot includes private parking lots owned by public institutions and private companies. These parking lots are used for the needs of owners, as well as their employees and customers. However, some private parking lots can also have a public character, such as the parking lot of the Bingo shopping centre. Based on the field survey and land-use designation, we identified 35 private parking lots in the City of Goražde with a total capacity of 1,494 parking spots, including 1 designated spot for people with disabilities. These private lots constitute a substantial share of the mapped parking supply and, in the surveyed locations, show higher occupancy levels than public parking lots. In addition, private parking lots have the characteristics of both street and off-street separate spots.

The third type of parking lot includes private parking lots located within residential zones that are exclusively intended and available to the residents of these zones, and their use for any other purpose is prohibited.

Public off-street parking lots include areas separated from the street network system and are marked with appropriate traffic signs. A total of 16 public off-street parking lots with different capacities and numbers of parking spots are represented in the city area. The most important, and at the same time, the largest parking lot of the aforementioned characteristics is the parking lot of the Bingo shopping centre, whose capacities include a total of 188 parking spots. Public street parking lots include spots along streets, where one lane of traffic is usually reserved for parking, while the remaining lanes of the street carry traffic in one or both directions (Fig. 2).

The most important and the largest number of parking lots with the aforementioned characteristics are those on Maršala Tita Street and 1st Slavne višegradske brigade Street, which have the character of longitudinal parking and a capacity of a total of 60 parking spots each and an additional two parking spots for people with disabilities. The capacity of public parking lots in the urban area of Goražde is 481 parking spots.

Of the 23 public parking lots, 17 are located off the streets, i.e., they include separate lots intended for stationary traffic, while seven public parking lots include street lots. The condition and quality of public parking lots in the urban and, to a lesser extent, suburban areas of Goražde are low. A certain number of parking lots (37.5%) did not have marked parking spots. One of the shortcomings reported by users is the insufficient security of vehicles in parking lots. In the local context of Goražde, inclusion in the paid-parking regime is primarily a indicator for basic parking management and on-site presence during charging hours (ticket issuance/enforcement), while most free parking areas function as open-access spots with limited monitoring. Since 79% of the analysed parking lots are outside the paid system, a large share of the parking supply lacks even basic oversight, which is consistent with the household survey results in which 67% of respondents identified poor car safety in parking lots as a major problem. Additionally, the charging system includes five public parking lots, whose capacities do not exceed 30 parking spots each, where the parking spots are marked (Table 1). In Tables 1 and 2, "Condition and quality" refers to a qualitative field assessment of the physical condition and basic functional equipment of each parking facility (pavement surface, horizontal markings, vertical signage, and overall organisation of the lot), rather than to parking availability or utilisation.

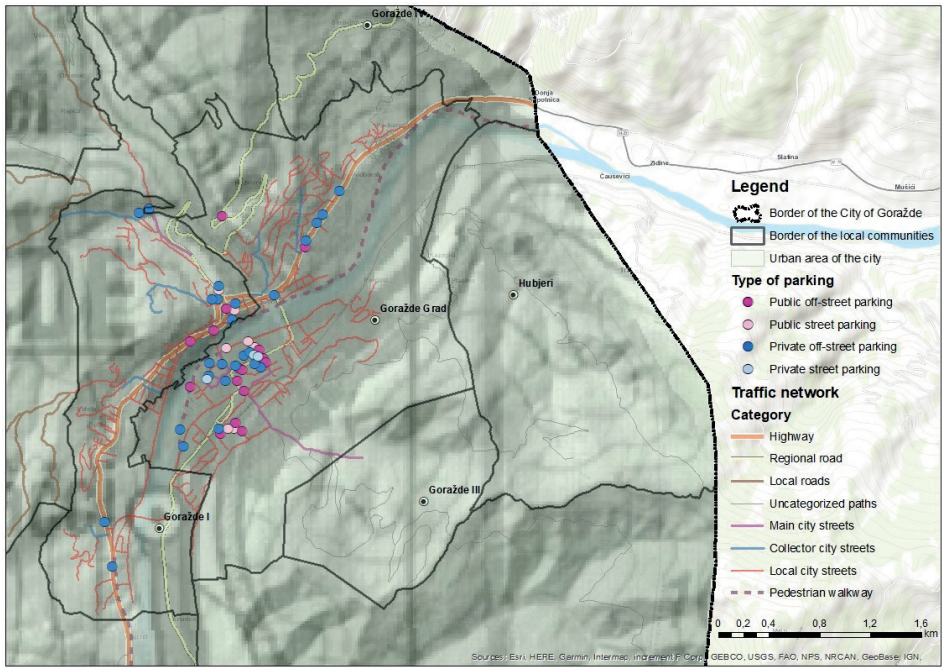


Fig. 2. Spatial distribution of inventoried parking facilities in the urban and suburban area of the City of Goražde. The map includes all identified public parking lots and their locations within the study area

Source: own work based on field research.

Table 1. List of public parking lots in the City of Goražde, 2023

No.	Location	Spots	Condition and quality	Parking type	Charging	Price
1	Bingo shopping centre	80+3*	Very good	Private off-street parking – public character	No	-
2	Bingo shopping centre	14	Very good	Private street parking – public character	No	-
3	Bingo shopping centre	12**	Good	Private off-street parking – public character	No	-
4	Bingo shopping centre	52	Very good	Private off-street parking – public character	No	-
5	Bingo shopping centre	30	Very good	Private off-street parking – public character	No	-
6	Zdravstvenih radnika str.	26	Good	Public off-street parking	Yes	1 KM/h***
7	Trg branilaca (square)	18	Very good	Public off-street parking	Yes	1 KM/h***
8	Maršala Tita str.	30+2*	Good	Public street parking	Yes	1 KM/h***
9	Seada Sofovića Sofe str.	3	Good	Public off-street parking	Yes	1 KM/h***
10	1. Slavne višegradske brigade str.	18	Parking spots are not marked	Public street parking	No	-
11	Zdravstvenih radnika str.	24*	Very good	Public street parking	No	-
12	Zdravstvenih radnika str.	25+2*	Parking spots are not marked	Public off-street parking	No	-
13	Ibrahima Čelika str.	22	Parking spots are not marked	Public street parking	No	-
14	Ibrahima Čelika str.	35**	Parking spots are not marked	Public street parking	No	-
15	Ruždije Islamagića str.	8	Parking spots are not marked	Public off-street parking	Yes	1 KM/h***
16	Panorama str.	7**	Parking spots are not marked	Public off-street parking	No	-
17	Zdravstvenih radnika str.	24	Very good	Public off-street parking	No	-

No.	Location	Spots	Condition and quality	Parking type	Charging	Price
18	43. drinske brigade str.	40**	Parking spots are not marked	Public off-street parking	No	-
19	Omladinska str.	42	Parking spots are not marked	Public off-street parking	No	-
20	Alije Hodžića str.	14+1	Very good	Public off-street parking	No	-
21	Muhidina Mašića Munje str. – City stadium	37	Parking spots are not marked	Public off-street parking	No	-
22	Sarajevska str. – Izletište Rorovi	14	Very good	Public off-street parking	No	-
23	Prve Drinske brigade str. – Stadium of NK Azot	27	Parking spots are not marked	Public off-street parking	No	-

* Total number of parking spots + additional parking spots for people with disabilities.

** Estimated number of parking spots based on the full occupancy of the parking lot capacity at the time of parking lot counting.

*** KM is the Bosnian convertible mark; 1 KM ≈ €0.51.

Source: own work.

Public parking lots are built in a way that applies traditional solutions, which means that a larger number of parking lots with smaller capacities of parking spots have been built, while the system of charging and limiting parking time is not regulated in most parking lots. This way, it is possible to keep parked vehicles longer in parking lots with a smaller number of parking spots, which consequently results in overloading public parking lots with smaller capacities and the inability to expand the existing and build new ones (Fig. 3).

Fig. 3. Examples of public parking lots in the urban area of the City of Goražde

Source: photos by Anisa Bosno.

The total capacity of private parking lots in the urban and suburban areas of Goražde is 1,494 parking spots. Of the 35 registered private parking lots, 31 are located outside the streets, i.e., they include separate areas intended for stationary traffic, while four private parking lots include street spots (Table 2). The condition and quality of registered private parking lots in urban and, to a lesser extent, suburban areas are low. The highest quality is characterised by parking lots located within the Bingo shopping centre in Rabite and Zdravstvenih radnika streets, followed by parking lots within the Cantonal Hospital in Zdravstvenih radnika street, and parking lots located within industrial zones. These parking lots are characterised by a larger number of available parking spots, and the parking spots are marked.

Table 2. List of private parking lots in the City of Goražde, 2023

No.	Location	Spots	Condition and quality	Parking type	Charging	Price
1	"Hasib Hadžović" secondary school	11	Parking spots are not marked	Private off-street parking	No	-
2	"DM" drugstore	3	Parking spots are not marked	Private off-street parking	No	-
3	"Mirsad Hurić" city sports hall	17	Parking spots are not marked	Private off-street parking	No	-
4	Zdravstvenih radnika str.	38	Good	Private off-street parking	No	-
5	"Mirsad Hurić" city sports hall	16	Parking spots are not marked	Private street parking	No	-
6	EMKA company	125	Good	Private off-street parking	No	-
7	EMKA company	130	Good	Private off-street parking	No	-
8	"HIFA PETROL"	10	Very good	Private off-street parking	No	-
9	Cantonal hospital Goražde	110	Good	Private off-street parking	No	-
10	Cantonal hospital Goražde	25	Good	Private off-street parking	No	-
11	Cantonal radio-television Goražde	10+1	Good	Private off-street parking	No	-
12	Cantonal radio-television Goražde	6	Parking spots are not marked	Private off-street parking	No	-
13	Škafa company	7	Parking spots are not marked	Private off-street parking	No	-
14	"MOTOREX PJ" Goražde	8	Parking spots are not marked	Private off-street parking	No	-

No.	Location	Spots	Condition and quality	Parking type	Charging	Price
15	"FA" furniture salon	8	Parking spots are not marked	Private off-street parking	No	-
16	"AS" shop	6	Parking spots are not marked	Private off-street parking	No	-
17	Employment service of the Canton	10	Good	Private off-street parking	No	-
18	"CM" cosmetic Market	6	Good	Private off-street parking	No	-
19	Čojo company	7	Good	Private off-street parking	No	-
20	Government of the Canton	124	Good	Private off-street parking	No	-
21	"Husein ef. Đozo" elementary school	34	Good	Private off-street parking	No	-
22	"Omega shop Goražde"	5	Good	Private off-street parking	No	-
23	"Drinski biser" restaurant	8	Good	Private off-street parking	No	-
24	"Dino Market" shop	14	Parking spots are not marked	Private off-street parking	No	-
25	EMKA company	124	Good	Private off-street parking	No	-
26	"Prevent Goražde" company	206	Good	Private off-street parking	No	-
27	"TVC" company	103	Good	Private off-street parking	No	-
28	Cantonal institute for public health	54	Good	Private off-street parking	No	-
29	"Pobjeda" company	205	Good	Private off-street parking	No	-
30	Elementary school "Mehmedalija Mak Dizdar"	11	Parking spots are not marked	Private off-street parking	No	-
31	"Casablanca" restaurant	16	Good	Private off-street parking	No	-
32	Zdravstvenih radnika str.	12	Good	Private off-street parking	No	-
33	Zdravstvenih radnika str.	5	Good	Private street parking	No	-
34	Zdravstvenih radnika str.	5	Good	Private street parking	No	-
35	Hotel "Behar"	14	Very good	Private off-street parking	Yes	1 KM/h*

* KM is the Bosnian convertible mark; 1 KM ≈ €0.51.

Source: own work based on field research.

It should also be emphasized that private parking lots in the urban area do not have a real private character but are mostly parking lots that are built on urban construction land owned by the City of Goražde, along with social infrastructure facilities. Parking spots in these parking lots are issued for use within the jurisdiction of the City of Goražde upon payment of a determined monthly fee for occupying public areas. The monthly fee in the form of an annuity is determined based on location, especially the distance from the centre. Private parking lots that are the subject of consideration in this study are not included in the system of hourly billing or daily ticket collection, except for the parking lot at the location next to the Behar hotel.

The level of security in public-private lots is reduced. Most private parking lots are marked with adequate traffic and supplementary signs indicating the prohibition of parking, except for users for whom the spots are intended to be used. However, there are also several parking lots occupied by the City of Goražde that are not adequately marked with traffic signs. There is no monitoring system in place to restrict or control access to private parking lots through the construction of ramps, toll booths, or other mechanisms. In this way, access is provided to all car drivers to park in parking lots with a private character. Parking congestion occurs in residential zones where, due to the lack of empty construction land, parking spots are built in significantly smaller numbers than the requirements and needs of users, especially when we consider that some housing units require the occupancy of two spots (Fig. 4).

Fig. 4. Examples of private parking lots in Goražde, 2023

Source: photos by Anisa Bosno.

3.2. Proposal for zoning of parking lots

To support spatial and urban-planning measures, we delineated a simple three-zone parking scheme for the urban and suburban area of the City of Goražde (Fig. 5), based on the evidence collected in this study. The zoning is operational

and relies on criteria that were available within the scope of our dataset: the existing regulatory framework of parking supply (presence/absence of charging and any posted time controls), spatial centrality and functional context (concentration of services, public institutions and retail in the inner urban core versus predominantly residential peripheral streets), and observed parking pressure reflected in the field inventory and the occupancy measurements.

Accordingly, Zone 3 represents the core high-demand area, in which charging is already present in practice (hourly payment regime) and where demand-management instruments are most justified. Zone 2 is defined as an intermediate transition area surrounding the core, where short-stay needs are evident (e.g., locations serving quick errands such as pharmacy use, where a 30-minute limit currently exists at specific sites) and where time-control measures can be used to protect turnover. Zone 1 covers the widest area outside the core where parking is predominantly unmanaged (no charging), and where the absence of time limitations is most likely to support long-stay parking and spillover. This zoning logic could help the city gradually align parking regulation with spatial structure and measured demand intensity, while prioritising the most constrained and functionally intensive parts of the urban area.

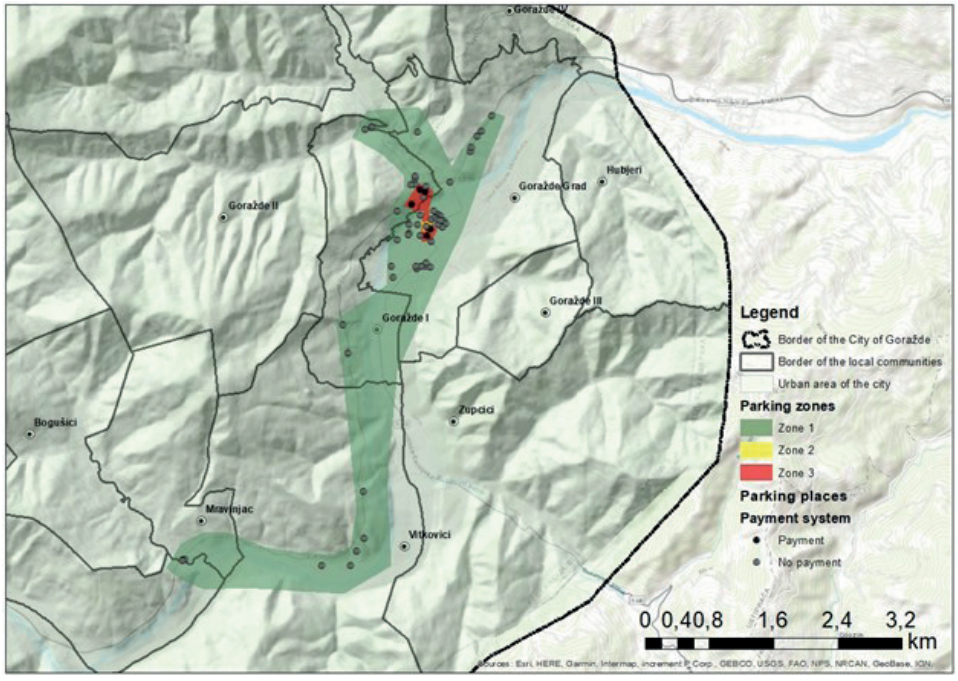


Fig. 5. Proposal for the zoning of parking lots in the urban and suburban area of the City of Goražde
Source: own work based on field research.

We note that this study did not directly measure individual parking duration, drivers' destinations, or detailed behavioural reasons for car use, nor did it quantify alternative transport options for specific journeys. Such behavioural evidence would be necessary for a more granular, performance-based design of pricing, time limits and permit rules. In line with this, the paper highlights the need for more detailed future research on who uses parking, for what purposes, and for how long. The study also did not systematically assess the availability and quality of alternative modes (public transport, walking and cycling) for specific journeys. However, in the study area there is no regular urban public transport service and there is no dedicated cycling infrastructure (e.g., cycling lanes), which likely contributes to a high reliance on private cars for many daily trips. These contextual constraints should be considered when interpreting the findings and when designing parking measures.

Such a conceptual solution enables the reduction of pressure on the parking lot in terms of limiting the retention of one parked vehicle for a longer period in the same parking space (Dadić *et al.*, 2014). In this way, the frequency of parked vehicles increases while at the same time reducing the possibility of oversaturation of the capacity of parking lots and the number of illegal parking (Hukić, 2019; Borovac, 2021).

3.3. Recording and analysis of parking lot occupancy in the urban area of the City of Goražde

For a more detailed analysis of the condition and occupancy of parking lots in the urban area of Goražde, as well as to determine their level of quality and efficiency, field research was conducted.

Table 3. List of parking lots included in the field research in the urban area of the City of Goražde, 2023

No.	Parking/Location	Number of parking spots	Parking type
1	Bingo shopping centre	14	Private street parking – public character
2	Bingo shopping centre	12	Private street parking – public character
3	Bingo shopping centre	80+3*	Private off-street parking – public character
4	Bingo shopping centre	30	Private off-street parking – public character
5	Zdravstvenih radnika str.	26	Private off-street parking
6	Zdravstvenih radnika str.	25+2*	Private off-street parking
7	Zdravstvenih radnika str.	24	Private off-street parking
8	Zdravstvenih radnika str.	24	Private off-street parking
9	Ibrahima Čelika str.	35	Private off-street parking

No.	Parking/Location	Number of parking spots	Parking type
10	Zdravstvenih radnika str.	34	Private off-street parking
11	43. Drinske brigade str.	40	Private off-street parking
Total		**349**	-

* Total number of parking spots + additional parking spots for people with disabilities

Source: own work based on field research.

During the field research, the focus was placed on counting the number of vehicles parked inside the parking lot, which is the subject of consideration in this paper. Vehicle counting was conducted every hour in the period from 8:00 a.m. to 5:00 p.m. in all 11 parking lots (Fig. 6). A total of nine observations were conducted during the day, based on which input data was obtained to calculate the average occupancy of parking lots by hour. The average occupancy rate is expressed as a percentage and is obtained by dividing the number of recorded vehicles during one hour by the total number of all parking lots that are the subject of the research.

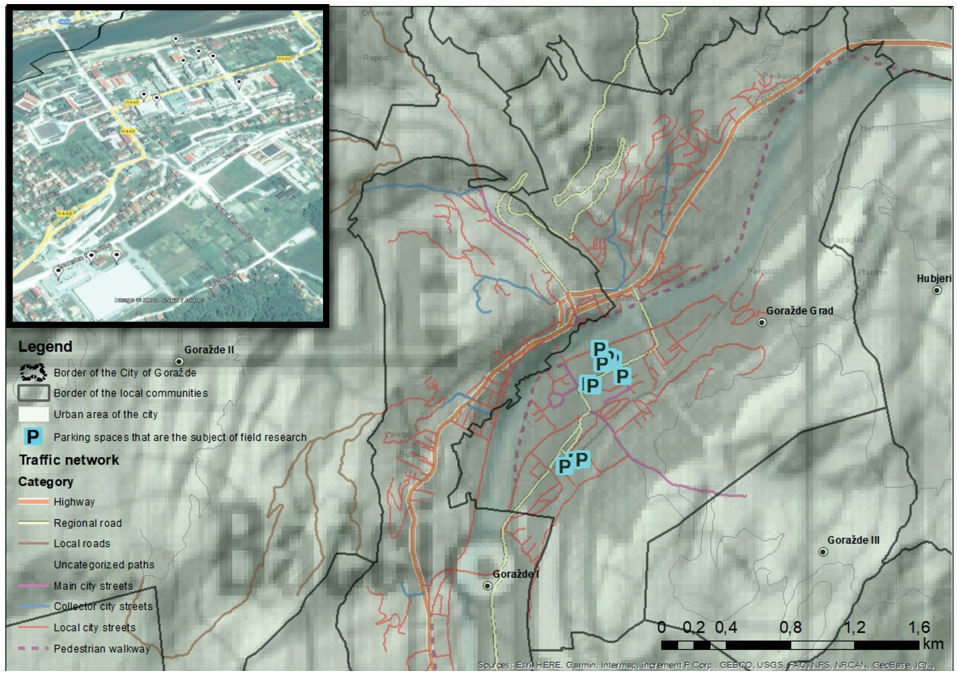


Fig. 6. Spatial distribution of selected parking lots for field research in the urban area of the City of Goražde

Source: own work based on field research.

The average occupancy of parking lots per hour during one working day is between 58.2% and 86.2%. Basically, it can be determined that the highest occupancy of parking lot capacity in the urban area of the city occurs during peak hours between 10:00 a.m. and 5:00 p.m.

If we analyse the average daily occupancy of the surveyed parking lots separately, the daily occupancy varies between 62.0% and 96.7% depending on the location. The highest average daily occupancy of capacity is recorded in the parking lot with a capacity of 40 parking spots on 43rd Drinske Brigade Street, which is 96.7%. At one of the observations, 26 illegally parked vehicles were recorded at this location during working hours, which means that 53% of illegal parking occurred at that location. The 43rd Drinske Brigade Street is almost full daily, and the modernisation of which would be necessary to access modern solutions and increase its capacity. The situation is similar in several other parking lots investigated as well, to which all the above can be applied (Table 4).

Table 4. Average occupancy by peak hours of parking lots included in the field research, 2023

No.	Parking/Location	Number of parking spots	Type of parking	Average daily occupancy (%)
1	Bingo shopping centre	14	Private street parking – public character	79.4
2	Bingo shopping centre	12	Private street parking – public character	62.0
3	Bingo shopping centre	80+3	Private off-street parking – public character	70.6
4	Bingo shopping centre	30	Private off-street parking – public character	83.0
5	Zdravstvenih radnika str.	26	Private off-street parking	78.5
6	Zdravstvenih radnika str.	25+2	Private off-street parking	78.7
7	Zdravstvenih radnika str.	24	Private off-street parking	84.3
8	Zdravstvenih radnika str.	24	Private off-street parking	91.2
9	Ibrahima Čelika str.	35	Private off-street parking	34.3
10	Zdravstvenih radnika str.	34	Private off-street parking	88.6
11	43. Drinske brigade str.	40	Private off-street parking	96.7
Total		**349**	-	72.9

Source: own work based on field research.

Based on the analysis of the surveyed parking lots by hours of each separately, the field research determined that in the morning there are two periods of the peak hour (10:00 a.m. – 11:00 a.m. and 11:00 a.m. – 12:00 p.m.), while in the after-

noon there are three periods of the peak hour (12:00 p.m. – 1:00 p.m.; 1:00 p.m. – 2:00 p.m., and 2:00 p.m. – 3:00 p.m.) (Fig. 7).

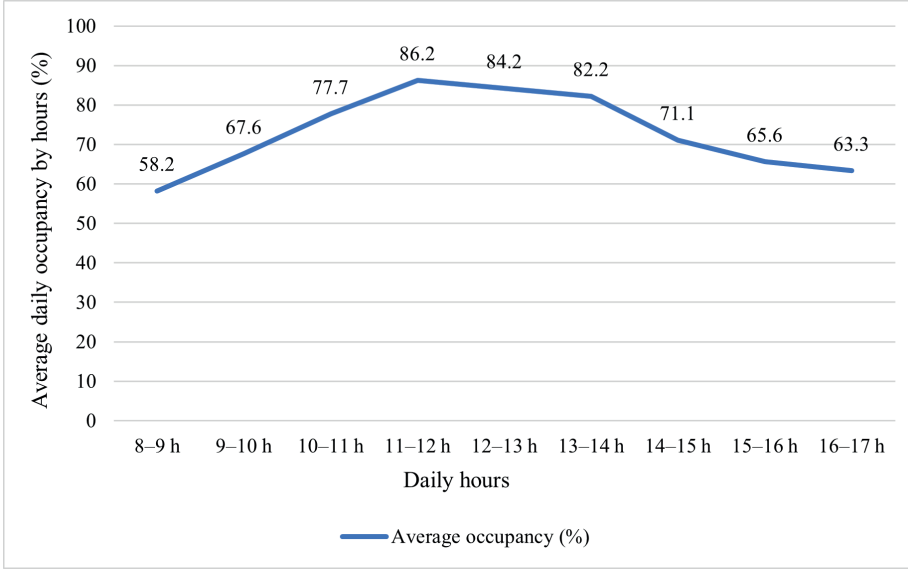


Fig. 7. Average daily occupancy of parking lots in the City of Goražde, 2023
Source: own work based on field research.

Based on the research, it was determined that the average occupancy of all surveyed parking lots in the peak hours in the morning was 92.8%, while in the peak hours in the afternoon, it slightly decreased to 90.0%. At the parking lots in Zdravstvenih radnika and 43. Drinske brigade streets in the peak hours the average occupancy was observed in the range of 102.5-110%. This means that these investigated parking lots are exposed to parking above their available nominal capacities. The main cause of such a phenomenon is improper parking of vehicles, as a result of which the throughput of the mentioned parking lots is reduced, and within them, there is very often a larger number of parked vehicles than the actual capacity they can sufficiently handle (Table 5).

Table 5. Average occupancy of parking lots by peak hours in the City of Goražde, 2023

No.	Parking/Location	In the morning		In the afternoon	
		Peak hour (h)	Occupancy (%)	Peak hour (h)	Occupancy (%)
1	Shopping center “Bingo”	11–12	92.9	12–1	100.0
2	Shopping center “Bingo”	11–12	100.0	2–3	91.7

Table 5 (cont.)

No.	Parking/Location	In the morning		In the afternoon	
		Peak hour (h)	Occupancy (%)	Peak hour (h)	Occupancy (%)
3	Shopping center "Bingo"	11–12	86.3	2–3	87.5
4	Shopping center "Bingo"	11–12	86.7	12–1	90.0
5	Zdravstvenih radnika str.	11–12	100.0	1–2	70.0
6	Zdravstvenih radnika str.	10–11	96.0	12–1	100.0
7	Zdravstvenih radnika str.	10–11	104.2	1–2	104.2
8	Zdravstvenih radnika str.	11–12	95.8	1–2	95.8
9	Ibrahima Čelika str.	11–12	48.6	1–2	51.4
10	Zdravstvenih radnika str.	11–12	100.0	1–2	97.1
11	43. Drinske brigade str.	11–12	110.0	1–2	102.5
Average occupancy over the time of the day		-	92.8	-	90.0
Network-wide peak hourly average occupancy (all 11 lots combined): 86.2%					

Source: own work based on field research.

During the research, a total of 2,290 parked vehicles were recorded at all investigated locations during one working day, of which 49 were not properly parked, which makes 2.1% of improperly parked vehicles of the total number of parked vehicles. Also, it was determined that illegally parked vehicles did not stay at the parking spot for more than 30 minutes. However, it is necessary to highlight and adequately treat this phenomenon, since it represents one of the key problems in the field of stationary traffic, although during the research, it could not be treated as a high-risk problem. However, due to the fact and data that the degree of motorisation and the number of registered motor vehicles are increasing every year, it can be expected that after a certain period, there will be a significant increase in the number of vehicles that will need to use the parking lots. If the current capacities of parking lots are not adequately and timely planned and developed in accordance with the requirements and needs, the number of illegally parked vehicles in parking lots will inevitably grow and pose increasing problems.

The analysis of parking occupancy at the surveyed locations shows an average daily occupancy of 72.9%, rising to 86.2% in the peak hour. These values provide a baseline for repeat monitoring at the same sites, but they should not be extrapolated to all parking lots in Goražde without additional coverage. Importantly, occupancy is highly uneven across locations: average daily values range from 34.3% to 96.7%, and several key sites exceed nominal capacity during peak periods

(up to 110%), which is consistent with observed manoeuvring constraints and illegal parking. From a management perspective, the objective is not to maximise occupancy, but to maintain a small buffer of available spots; therefore, a practical target is to keep peak occupancy around 80–85% in the core area, while recurrent near-full conditions indicate the need for the zoning-based package proposed below (time limits, pricing, enforcement, and selective upgrades).

A household survey on the state of the local transport system was conducted via an online questionnaire in the City of Goražde in the period 1–17 June 2023 (n=103). The survey targeted adult residents, with emphasis on respondents from the urban local communities (Goražde I–IV), in order to capture perceptions in the area where parking pressure is most pronounced. Respondents could select more than one option from a predefined list of parking-related problems (multiple-response item). To the survey question, "In your opinion, what problems do drivers encounter the most when parking their cars in Goražde?", the most frequently selected problem was the lack of parking spots (95.1%), followed by improper parking that prevents manoeuvring/exiting (80.6%) and concerns about vehicle safety in parking areas (67%). Given the sample size and non-probability recruitment, these percentages should be interpreted as descriptive results for the respondent group rather than population-representative estimates.

The survey responses are consistent with the field inventory and the occupancy observations, which together indicate that insufficient parking supply and limited demand-management measures are salient issues in the central urban area. These findings support the need to consider a phased package of measures (improved marking/signage, time limits, pricing, and where feasible off-street capacity solutions), while recognising that the survey results are descriptive and not population-representative.

3.4. Major problems which need to be tackled

The planning of parking locations and capacities, as well as the overall parking policy in the City of Goražde, is not addressed by the competent authorities in a sufficiently systematic manner. As a result, the parking subsystem shows low levels of functionality and service quality.

To date, there is no empirical evidence on who uses parking in Goražde, for how long, and when demand peaks by user group. We did not collect these behavioural dimensions because this study was designed as a baseline assessment of supply, regulation, and typical weekday occupancy. Reliable duration measurement would require vehicle re-identification over time (e.g., repeated plate matching or camera/sensor monitoring), while trip purpose typically requires intercept surveys or travel diaries. These approaches would have required a longer field campaign, additional staffing, and formal permissions with

privacy safeguards, and the study area currently lacks automated data sources that could support such analysis. Therefore, duration and user profiles are identified as priorities for future research to inform performance-based pricing and time-limit policies.

Only five parking lots (17%) are integrated into the paid-parking regime, while the majority of parking supply remains outside any charging system. In this context, the lack of clear time limits and turnover rules in most locations may contribute to longer stays and higher saturation in the central area. The city also does not currently operate a formal, city-wide zoning scheme with clearly defined time limits by zone; instead, time limits appear only at specific locations (e.g., a 30-minute limit used for short-stay purposes). At the existing paid sites, charging is implemented from 7 a.m. to 9 p.m. through staff who issue tickets and charge according to the recorded retention time.

The parking fee at locations where charging has been established is 1 KM/h (≈ €0.51/h). The physical condition and basic functional equipment of parking facilities are uneven. Recently built lots are generally in good condition (paved surface, marked spots and basic signage indicating parking use and/or charging). However, even at paid locations basic information on price, payment method and maximum time limit is often not clearly displayed.

A significant number of parking lots also lack marked spots, which encourages improper parking and effectively reduces usable capacity. Taken together, these findings suggest that parking management in Goražde still relies predominantly on supply-led solutions, with limited use of demand-management instruments. This reinforces the need for clearer information and signage, more consistent marking of spots, and a gradual introduction of time-limit and pricing measures aligned with the proposed zoning scheme.

4. CONCLUSION

Traffic is one of the most important functions in an urban area, as it has a dominant impact on the lives of residents. Traffic influences the planning and distribution of all other functions in the area, because the planning of other functions, such as housing, work, and many others, depends highly on the level of quality and development of traffic. Given the increasing trend of the need for individual transport by the inhabitants of the researched area, new needs and requirements arise in the domain of stationary traffic. First of all, these needs and requirements relate to the optimal planning and rational use of construction land for the occupation and construction of spacious parking areas with maximum capacities of parking lots based on demand.

From a management perspective, the first priority is to use the existing parking supply more efficiently through consistent marking of spots, clear signage/information, zoning-based time limits, pricing/permits (where justified), and enforcement to increase turnover in the core area. Only where these measures remain insufficient, and where planning conditions allow, should targeted off-street additions be considered as a complementary long-term option. In that case, the most space-efficient approach is to integrate parking into new developments (e.g., basement/underground garages within residential buildings or shopping centres), as already envisaged in local planning documents (City of Goražde, 2020), while noting implementation/compliance constraints highlighted by Hrelja *et al.* (2020).

Peak-period occupancy reaches up to 110.0% at hotspot sites (Table 5), while the hourly average across all surveyed facilities peaks at 86.2%. The resulting occupancy capacity proportionally causes an increased number of illegal parking lots, which further causes problems in the smooth running of other functions in the city, which are interconnected with the traffic function.

The parking policy and the parking space payment system are almost non-existent as a separate and detailed aspect through spatial planning, implementation, and strategic documentation that would conduct the strategic and planned development of the parking system, as well as the entire part of the traffic infrastructure from the technical aspect of parking lots. One of the main problems which needs to be tackled is to make a transition from a traditional to a modern approach in terms of rehabilitation, reconstruction, and modernisation of the arrangement and construction of parking areas that will meet all modern standards and needs of users in the most efficient way.

REFERENCES

ARNOTT, R. and INCI, E. (2006), 'An integrated model of downtown parking and traffic congestion', *Journal of Urban Economics*, 60 (3), pp. 418–442. https://doi.org/10.1016/j.jue.2006.04.004

ARNOTT, R. and ROWSE, J. (1999), 'Modeling parking', *Journal of Urban Economics*, 45 (1), pp. 97–124. https://doi.org/10.1006/juec.1998.2084

BIDŽAN-GEKIĆ, A., GEKIĆ H., ŽUNIĆ L. and NEZIROVIĆ S. (2020), 'Valorization of natural tourist potentials and their protection in the Podrinje tourist-geographical region', *Journal of Tourism and Hospitality Management*, 6, pp. 36–49. https://doi.org/10.35666/25662880.2020.6.36

BOROVAC, A. (2021), 'Analiza parkirališnih mjesta na području gradskog naselja Vrbik u Gradu Zagrebu', PhD thesis, Zagreb: Sveučilište u Zagrebu – Fakultet prometnih znanosti, https://urn.nsk.hr/urn:nbn:hr:119:209637 [accessed on: 13.08.2024].

BUBLIN, M. (2007), *Planiranje saobraćaja i saobraćajnica*, Sarajevo: Građevinski fakultet u Sarajevu.

CITY OF GORAŽDE (2017), 'Strategija razvoja Grada Goražda 2017–2026. godine', Grad Goražde, https://sogfbih.ba/sites/default/files/javni_dokument/2021-06/Gora%C5%BEde%20-%20Strategija%20razvoja%202017%20-%202026.pdf [accessed on: 11.08.2024].

CITY OF GORAŽDE (2020), 'Odluka o usvajanju i provođenju izmjena regulacionog plana Biserna u Goraždu', Grad Goražde, https://gorazde.ba/wp-content/uploads/2023/12/OdlukaoPROVODJENJUplana.pdf [accessed on: 10.07.2024].

DADIĆ, I., KOS, G. and ŠEVROVIĆ M. (2014), *Teorija prometnog toka*, Zagreb: Sveučilište u Zagrebu – Fakultet prometnih znanosti.

GEKIĆ, H., BIDŽAN, A. and AVDIĆ, B. (2015), 'The role of the Transport System in the Economic Development of Bosnia and Herzegovina*'*, *Geography and Environmental Planning Journal*, 57 (1), pp. 221−238.

GEKIĆ, H., BIDŽAN-GEKIĆ, A., DREŠKOVIĆ, N., MIRIĆ, R. and REMENYI, P. (2022), 'Urban and Rural Geography of Bosnia and Herzegovina', [in:] GEKIĆ, H. *et al.*, *The Geography of Bosnia and Herzegovina, World Regional Geography Book Series*, Cham: Springer, pp. 241−263. https://doi.org/10.1007/978-3-030-98523-3_12

GIZSUTP (2010), 'Parking Management (SUTP Module 2c)', Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, https://sutp.org/publications/parking-management/ [accessed on: 20.12.2025].

HRELJA, E., SIVAC, A., AVDIĆ, A. and DŽAFERAGIĆ, A. (2020), 'Analysis of land cover changes in the area of the City of Goražde', *Geografski pregled*, 43, pp. 37−46.

HUKIĆ, E. (2017), 'Analiza funkcije uličnih mjesta za parkiranje', Zagreb: Sveučilište u Zagrebu – Fakultet prometnih znanosti, https://urn.nsk.hr/urn:nbn:hr:119:311263 [accessed on: 20.12.2024].

HUKIĆ, E. (2019): 'Analiza parkirne politike u funkciji razvoja održive mobilnosti – Studija slučaja Grad Zagreb', Zagreb: Sveučilište u Zagrebu – Fakultet prometnih znanosti, https://urn.nsk.hr/urn:nbn:hr:119:467411 [accessed on: 21.12.2024].

ITF (2018), 'The Shared-Use City: Managing the Curb', OECD Publishing/International Transport Forum, https://www.itf-oecd.org/sites/default/files/docs/shared-use-city-managing-curb_5.pdf [accessed on: 23.12.2025].

ITDP (2021), 'On-Street Parking Pricing: A Guide to Management, Enforcement, and Evaluation', Institute for Transportation and Development Policy, https://itdp.org/publication/on-street-parking-pricing/ [accessed on: 23.12.2025].

ITDP (2024), 'The Opportunity of Reforming Parking: A Taming Traffic Deep Dive Report', Institute for Transportation and Development Policy, https://itdp.org/publication/the-opportunity-of-reforming-parking/ [accessed on: 23.12.2025].

KAPLAN, D., HOLLOWAY, S. and WHEELER, J. (2014), *Urban Geography*, 3rd edition, New York: Wiley.

KRIZEK, K. and KING, D. (2021), *Advanced Introduction to Urban Transport Planning*, Cheltenham: Edward Elgar Publishing Limited.

LEHE, L. (2018), 'Minimum parking requirements and housing affordability', *Journal of Transport and Land Use*, 11 (1), pp. 1309–1321. https://doi.org/10.5198/jtlu.2018.1340

LITMAN, T. (2024), 'Parking Management: Strategies, Evaluation and Planning', Victoria Transport Policy Institute, https://vtpi.org/park_man.pdf [accessed on: 03.01.2025].

MANVILLE, M. and PINSKI, M. (2021), 'The causes and consequences of curb parking management', *Transportation Research Part A: Policy and Practice*, 152, pp. 295–307. https://doi.org/10.1016/j.tra.2021.07.007

MARSDEN, G. (2006), 'The evidence base for parking policies – a review', *Transport Policy*, 13 (6), pp. 447–457. https://doi.org/10.1016/j.tranpol.2006.05.009

MARTINIĆ, I., DADIĆ, I. and PEKO, I. (2005), 'Stationary Traffic In The Urban Planning System', *Promet - Traffic & Transportation*, 17 (2), pp. 113−119.

MEYER, M. (2016), *Transportation planning handbook*, New Jersey: Wiley.

NURKOVIĆ, R. and GEKIĆ, H. (2011), 'New Spatial Development Processes of Urbanisation of Sarajevo'. *Journal of Settlements and Spatial Planning*, 2 (2), pp. 109−114.

OTTOSSON, D. B., CHEN, C., WANG, T. and LIN, H. (2013), 'The sensitivity of on-street parking demand in response to price changes: A case study in Seattle, WA', *Transport Policy*, 25, pp. 222–232. https://doi.org/10.1016/j.tranpol.2012.11.01

PARKSUMP (2022), 'Parking and SUMP: Using parking management to achieve your SUMP objectives effectively and sustainably (Topic Guide)', https://park4sump.eu/sites/default/files/2022-10/SUMP2.0%20Topic%20Guide%20on%20Parking%20management%20and%20SUMP_EN.pdf [accessed on: 03.01.2025].

PIERCE, G. and SHOUP, D. (2013), 'Getting the prices right: An evaluation of pricing parking by demand in San Francisco', *Journal of the American Planning Association*, 79 (1), pp. 67–81. https://doi.org/10.1080/01944363.2013.787307

POPESCU, R. (2022), 'The culture of parking on the sidewalks', *Cities*, 131, 103888. https://doi.org/10.1016/j.cities.2022.103888

RAZUM, D. (2022), 'Analiza uličnih parkirališnih mjesta u zoni Maksimirske ceste u Gradu Zagrebu', Zagreb: Sveučilište u Zagrebu – Fakultet prometnih znanosti, https://urn.nsk.hr/urn:nbn:hr:119:616444

RODRIGUE, J-P. (2024), *The Geography of Transport Systems*, 6th edition, New York: Routledge.

SFMTA (2014), 'SFpark: Pilot Project Evaluation Summary', San Francisco Municipal Transportation Agency, https://www.sfmta.com/getting-around/drive-park/demand-responsive-pricing/sfpark-evaluation [accessed on: 01.01.2025].

SHOUP, D. C. (1997), 'Evaluating the effects of cashing out employer-paid parking: Eight case studies', *Transport Policy*, 4 (4), pp. 201–216. https://doi.org/10.1016/S0967-070X(97)00019-X

SHOUP, D. C. (2005), *The High Cost of Free Parking*, Chicago: Planners Press, American Planning Association.

TUVIKENE, T. (2015), *Freedom to park: post-socialist automobility in Tallinn*, London: University College London, https://discovery.ucl.ac.uk/id/eprint/1463838/2/Tuvikene2015_Freedom-to-Park_PhD_3rd-party-content-removed%5B1%5D.pdf [accessed on: 23.12.2025].

TUVIKENE, T. (2018), 'Post-socialist (auto)mobilities: Modernity, freedom and citizenship', *Geography Compass*, 12 (3), e12362. https://doi.org/10.1111/gec3.12362

WILLSON, R. W. and SHOUP, D. C. (1990), 'Parking subsidies and travel choices: Assessing the evidence', *Transportation*, 17 (2), pp. 141–157. https://doi.org/10.1007/BF02125333

Review Articles

EUROPEAN SPATIAL RESEARCH AND POLICY

Volume 33 2026 Number 1

https://doi.org/10.18778/1231-1952.33.1.03

Abdelbaseer A. MOHAMED *

MAPPING THE GEOGRAPHICAL IMBALANCE IN SPACE SYNTAX RESEARCH

Abstract. Imagine a scientific world in which researchers everywhere have equal opportunities to publish and gain recognition. Far from being an exception, space syntax research is shaped by structural inequalities that privilege Northern institutions and epistemologies. While existing bibliometric reviews broadly map the field, they overlook how selective indexing structures global visibility. Drawing on 2,323 Web of Science–indexed space syntax articles, this review examines publication growth, citation impact, and journal landscapes across regions. The findings show that although research activity is expanding globally, particularly in Asia, citation impact remains concentrated in the United States and the United Kingdom. Elite Northern journals dominate the field, while Southern scholarship largely circulates in less visible venues, reinforcing enduring geographical imbalances in knowledge production.

Key words: space syntax, bibliometrics, geographical inequality, citation impact, structural invisibility.

1. INTRODUCTION

The study of urban form and spatial configuration is crucial for understanding human mobility, accessibility, and social interaction in cities. Space syntax has emerged as a widely adopted analytical framework in this domain,

* Abdelbaseer A. MOHAMED, University of Lodz, Faculty of Economics and Sociology, Social-Ecological Systems Analysis Lab, 3/5 Polskiej Organizacji Wojskowej, Łódź, Poland; e-mail: abdo121@windowsliv.com, abdelbaseer.elsayed@eksoc.uni.lodz.pl, ORCID: https://orcid.org/0000-0001-7619-2166

Received: 15.06.2025, Revised: 28.12.2025, Accepted: 21.01.2026

Funding information: University of Lodz. **Conflicts of interests:** None. **Ethical considerations:** The Author assures no violations of publication ethics and takes full responsibility for the content of the publication. **Declaration regarding the use of GAI tools:** Not used

with applications spanning urban planning, architecture, and transportation research (Hillier, 1996; van Nes and Yamu, 2021; Vaughan *et al.*, 2025). Over the past decades, the increasing availability of computational tools and large-scale spatial datasets has further strengthened its relevance, enabling researchers to explore complex patterns of urban connectivity and social dynamics (Yamu *et al.*, 2021).

Bibliometric analyses offer a systematic approach to mapping scientific knowledge, identifying influential authors and institutions, and uncovering patterns of collaboration and thematic development (Aria and Cuccurullo, 2017; Zupic and Čater, 2015). Prior bibliometric work in space syntax includes comprehensive reviews such as Mohamed and van der Laag Yamu (2023), which cover publication trends, productive authors and institutions, research fronts, and conceptual structures from 1976 to 2023. Additional studies have employed text mining approaches to analyse conference papers, examining the thematic evolution, development and relationships of concepts within the field of space syntax (Babbu, 2023; Krenz *et al.*, 2023; Meng and Zhang, 2025; Mohamed, 2025). While these reviews have shed light on the general growth and intellectual structure of space syntax research, they have not explicitly focused on regional disparities, structural citation imbalances, or the interplay between productivity and impact across geographic regions.

Understanding these regional differences is crucial because knowledge production and scientific recognition are often unequally distributed globally. Some regions, such as North America and Europe, dominate the field in terms of both publications and citations, whereas others remain underrepresented. Such disparities can have important implications for the diffusion of space syntax methods, access to research networks, and the global visibility of locally relevant studies.

To systematically evaluate these inequalities, this study focuses on journal publications indexed in the Web of Science (WoS). Unlike conference papers, which are unevenly indexed and vary in peer-review standards, WoS journals provide standardised bibliometric data – including author affiliations, citations, and metadata – allowing robust cross-regional comparisons. By relying on WoS, this study can effectively reveal structural imbalances in knowledge production and citation practices and evaluate the effects of collaboration networks.

Accordingly, this review article aims to fill a gap in the literature by examining regional differences, collaboration networks, and the relationship between productivity and impact in space syntax research. Specifically, we investigate the following research questions:

– What are the temporal trends in space syntax publications and citations across regions?

– How do productivity and citation impact vary between regions, and which regions are underrepresented?

– How do collaboration networks shape knowledge production and dissemination in the field?

By addressing these questions, this study contributes a novel, geographically sensitive perspective to the bibliometric analysis of space syntax research, complementing prior reviews and offering insights into inequalities in global knowledge production.

2. DATA AND METHODS

2.1. Data

The study is based on 2,415 documents retrieved from the Web of Science (WoS) Core Collection on 5 December 2025. WoS was selected as the primary data source due to its high-quality, standardised, and well-curated metadata, which are essential for reliable bibliometric analysis, particularly with regard to consistent affiliation information and cited references (Gandia *et al.*, 2019; Singh *et al.*, 2021). The dataset was compiled using search terms related to "space syntax" and "spatial syntax," applied to titles, abstracts, author keywords, and Keywords Plus, without restrictions on publication year, language, or document type. Of the total records, 2,315 publications (95.9%) are in English.

The dataset encompasses a diverse range of document types. Journal articles dominate with 1,790 publications, followed by conference proceedings papers (405), early access articles (58), review articles (36), and publications with multiple document-type labels (34). Smaller contributions include book chapters (32), editorial materials (18), book reviews (12), meeting abstracts (8), and books (5), while rare types (e.g., retracted publications, corrections, news items, letters, and data papers) represent a marginal share. For the analysis, only journal articles, conference proceedings, early access articles, review articles, and publications with multiple labels were included, reflecting substantive research outputs; other types were excluded due to their limited number and non-research focus. Duplicate records were removed, and bibliographic fields – particularly author names, country, and institutional affiliations – were standardised. The dataset provides a comprehensive overview of the space syntax literature, enabling bibliometric, thematic, and citation analyses. The final analysed dataset included 2,323 publications.

Bibliographic metadata for each record includes publication year, journal title, volume, author names, affiliations, corresponding author, country, abstract, keywords, cited references, and citation counts.

2.2. Methods

Bibliometric analysis was employed to investigate the global structure, temporal dynamics, and spatial inequalities in the field of space syntax research (Donthu *et al*., 2021). Publication output was aggregated by country, region, and year to analyse geographical concentration and long-term trends. Country-level publication counts were calculated using full counting, in which each publication is counted once for each country represented among the authors' affiliations. For example, if a paper has three authors – two from China and one from the USA – it is counted once under China and once under the USA. Consequently, the sum of country counts may exceed the total number of publications. Case study cities were identified through the systematic extraction of city names from titles, abstracts, and keywords, and then geocoded to map the spatial distribution of the empirical focus.

Inequality in knowledge production and academic recognition was assessed using Lorenz curves and Gini coefficients, calculated at the country level for both publication output and citation counts. These measures quantify the degree of concentration in scientific activity and impact.

To analyse the developmental trajectory of the field, annual publication counts were fitted to a logistic growth model, enabling the identification of the phases of emergence, rapid expansion, and maturation (Aria and Cuccurullo, 2017). Model performance was assessed using the coefficient of determination (R^2).

International collaboration patterns were examined through country-level co-authorship networks, where nodes represent countries and edges represent co-authored publications. Network visualisation was used to identify central actors and core–periphery structures.

Citation trends were analysed by aggregating annual citation counts by country and region. To assess the relationship between productivity and impact, total publications were plotted against total citations at the country level, and a linear regression model was used to evaluate their association.

Finally, journal-level analysis was conducted by examining publication output across the ten most productive journals in the field. A journal-by-region matrix was constructed to assess how publication venues contribute to the geographical stratification of space syntax research.

3. RESULTS

3.1. Global structure and inequality in space syntax knowledge production

The dataset contains 2,244 authors, with 1,042 unique first-author institutions. Figures 1–3 highlight a highly uneven global structure of knowledge production in space syntax research. The geographical distribution of publications re-

veals an extreme concentration of research activity in a small number of countries (Fig. 1). The United States (665 articles) and the United Kingdom (606 articles) form the historical core of the field, while China (1,917 publications) emerges as a dominant contemporary producer (country counts reflect full counting, as described in the Methods). In contrast, large parts of Africa and Latin America appear as extensive "data blank spots," indicating near-total absence from formal knowledge production. European and Chinese cities dominate the discourse (dot circles), with London alone mentioned 69 times, more than any other city. Other frequently mentioned cities include Nanjing (49), Beijing (35), Seoul (35), and Istanbul (26). While some cities from the Global South, such as Wuhan (7) and Baghdad (5), appear on the map, they are relatively underrepresented given their urban scale, complexity, and demographic importance.

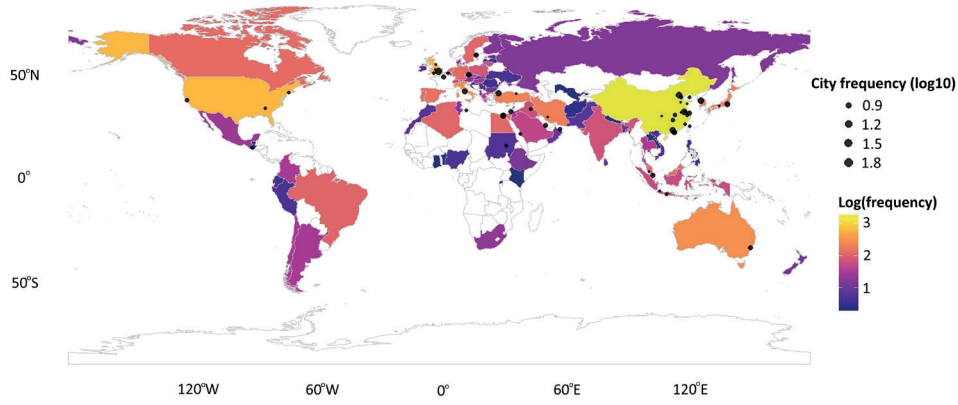


Fig. 1. Publication trends in space syntax literature: number of publications by country, with Geographical distribution of case study cities

Source: own work.

Temporal trends reinforce this finding. Historically, the United States and the United Kingdom accounted for a disproportionately large share of global output (Fig. 2). From around 2010 onward, China's share increased rapidly and now represents the single largest national contribution. However, this shift reflects a redistribution within the upper tier of producing countries rather than a broad-based global diffusion of research capacity. While North America and Europe dominated publication output for several decades, Asia has experienced an exponential surge in recent years, surpassing both regions in output volume (Fig. 3). However, this apparent diversification in production does not eliminate structural inequality, as contributions from Africa and South America remain marginal throughout the entire period of analysis.

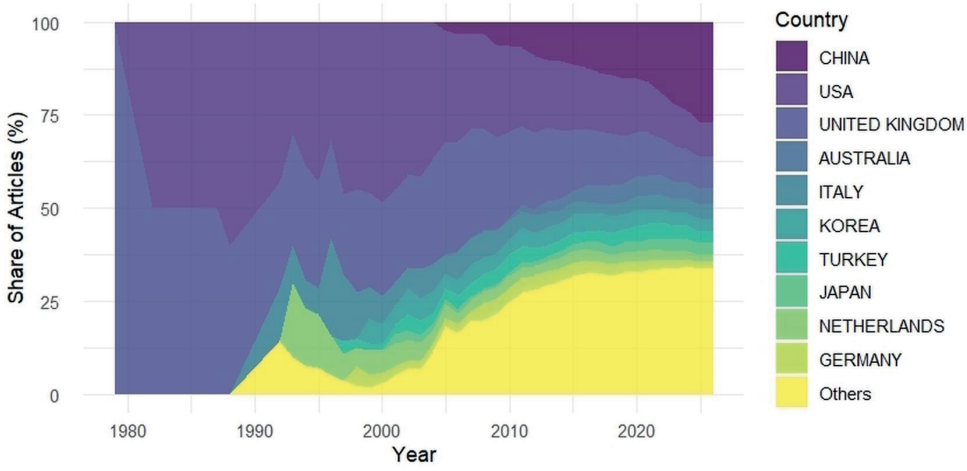


Fig. 2. Accumulative proportion of annual publications by country over time

Source: own work.

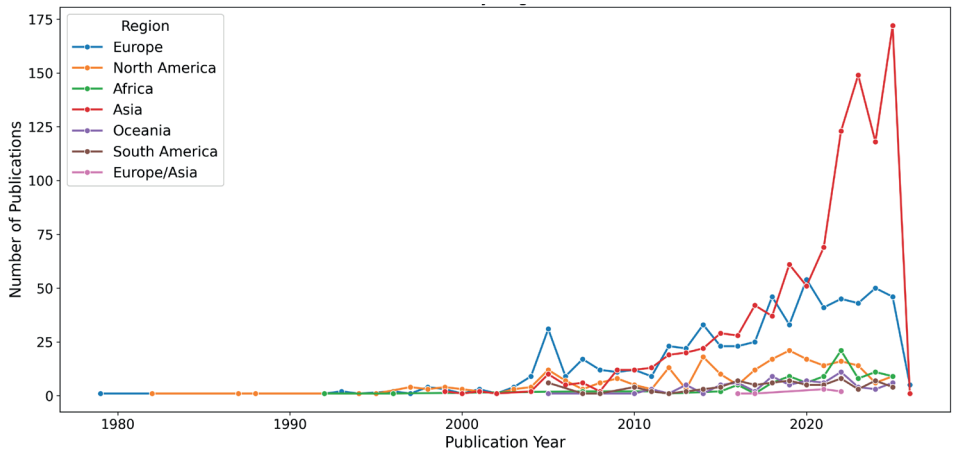


Fig. 3. Accumulative proportion of annual publications by region over time

Source: own work.

This pattern is quantified in Fig. 4, which presents the Lorenz curve of publications by country. The resulting Gini coefficient of 0.716 indicates extreme inequality, with a small hierarchical elite of countries responsible for the vast majority of published research. Rather than a broadly distributed global field, space syntax exhibits a sharply stratified structure in which participation is highly concentrated.

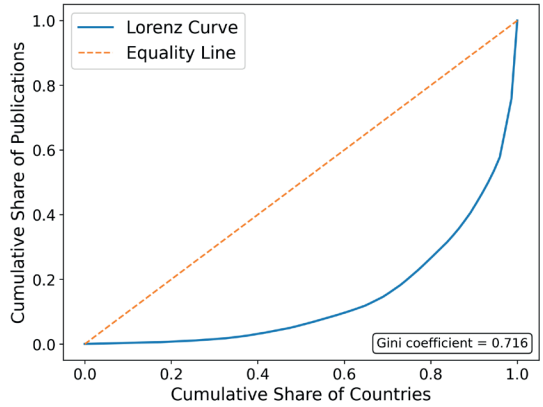


Fig. 4. Lorenz curve of publications by country

Source: own work.

3.2. Disciplinary growth and the consolidation of hierarchy

The life cycle of space syntax research traces how its growth trajectory has reinforced, rather than dissolved, existing hierarchies. Annual publication output fitted with a logistic growth model ($R^2 = 0.812$) is presented in Fig. 5 (left). Following a prolonged phase of slow expansion, the field entered a period of rapid exponential growth before reaching a peak of approximately 208 publications in 2022. Recent flattening of the curve suggests that space syntax has entered a mature stage of disciplinary development. The cumulative growth curve, with a saturation point (K) of 2,809 publications, is presented in Fig. 5 (right).

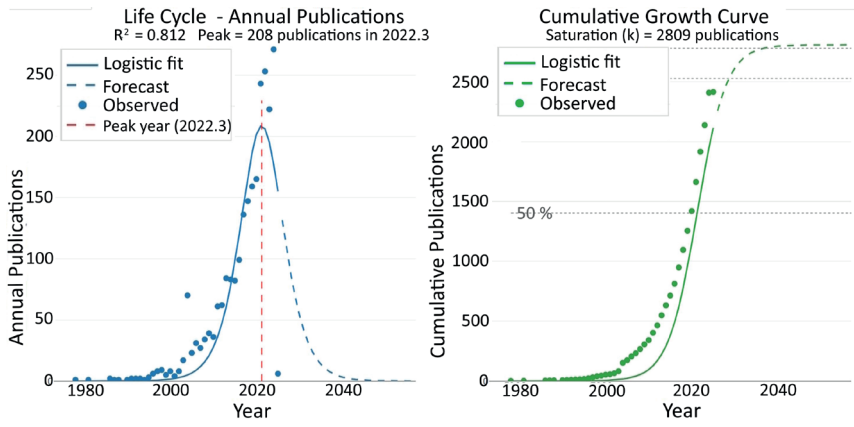


Fig. 5. Life cycle of scientific production in the field of space syntax

Source: own work.

The inflection point marks the transition from a niche methodological approach to an institutionalised research field embedded across architecture, planning, and urban studies. Importantly, this consolidation phase coincides with the entrenchment of dominant producing countries, indicating that early leadership translated into long-term structural advantage.

3.3. Global collaboration networks and core–periphery dynamics

The global collaboration network of space syntax research through international co-authorship links is visualised in Fig. 6. The map reveals a dense and highly centralised network dominated by a small number of countries, primarily China, North America, and Western Europe. For instance, China has 37 links with the USA and 31 with the United Kingdom. These regions form interconnected "power nodes" characterised by repeated and reciprocal collaborations.

In contrast, much of the Global South remains weakly connected – or entirely excluded – from these networks. For example, Iran exhibits only a single collaborative link with Germany and has no recorded connections with either the United States or the United Kingdom. The absence of strong collaborative ties constrains opportunities for knowledge exchange, co-authorship, and visibility, thereby reinforcing a persistent core–periphery structure. Consequently, the collaboration network operates as a mechanism through which existing hierarchies in knowledge production are reproduced and stabilised over time.

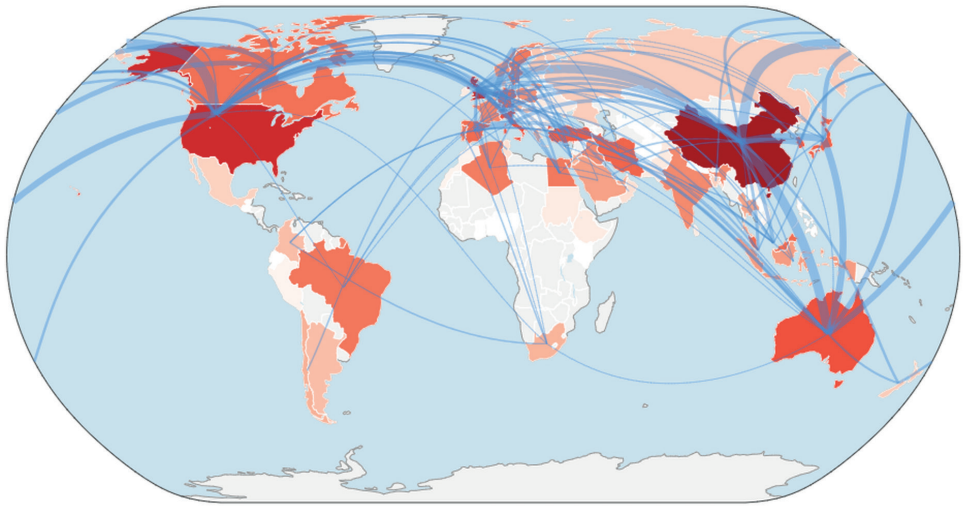


Fig. 6. The global collaboration network of space syntax research

Source: own work.

3.4. Citation trend

Inequalities in space syntax research are even more pronounced in citation patterns than in publication output. The annual citation count over time reveals a sharp increase after 2015, with a peak of nearly 3,500 citations around 2020 (Fig. 7). This growth substantially outpaces the expansion of publication output, indicating cumulative advantage effects whereby already visible and established research attracts disproportionate recognition. The most cited countries are the United States (7,314 citations), the United Kingdom (6,529), China (5,966), and Italy (1,777). By contrast, the least cited countries include Nigeria (zero citations), the Philippines (one citation), Morocco (one citation), and Pakistan (three citations).

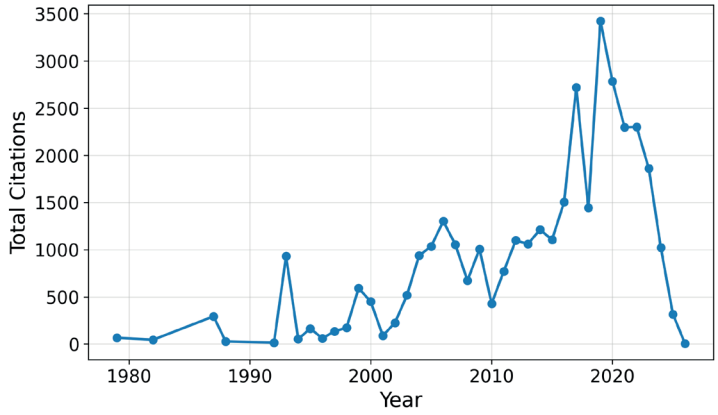


Fig. 7. Citation trends by country over time

Source: own work.

Regional citation trajectories further underscore this imbalance (Fig. 8). North America and Europe have dominated citation counts for decades, reflecting their early institutional leadership and central positioning within the field. Asia has seen a notable increase in citations in recent years, coinciding with its growing publication volume. In contrast, Africa and South America remain at near-zero citation levels throughout the entire period, indicating persistent marginalisation and exclusion from global circuits of academic recognition.

Compared with the Lorenz curve for publications by country, the Lorenz curve for total citations is more strongly bowed (Fig. 9), indicating higher inequality in citations (Gini = 0.825) than in publications (Gini = 0.716). This pattern shows that citations – and the symbolic capital they confer – are concentrated in fewer countries than scientific output. Such extreme concentration underscores how the global reward system in space syntax research disproportionately directs recognition toward a small set of countries, primarily located in the Global North.

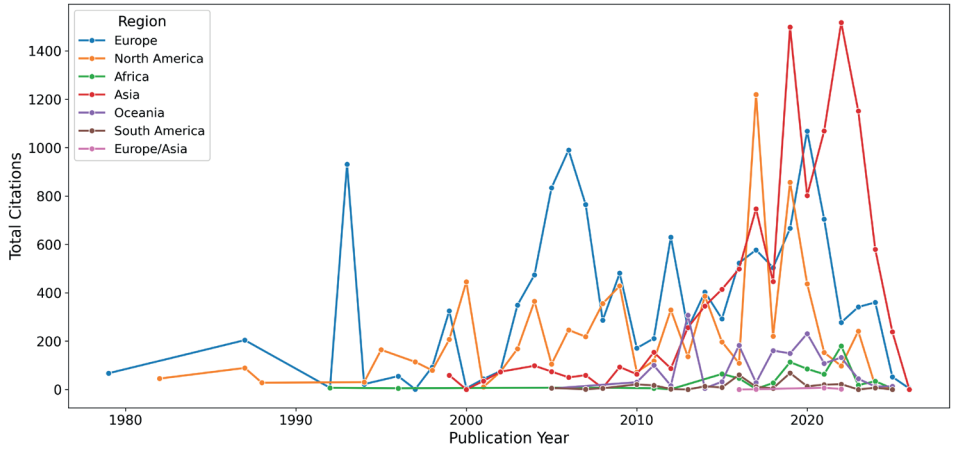


Fig. 8. Citation trends by region over time

Source: own work.

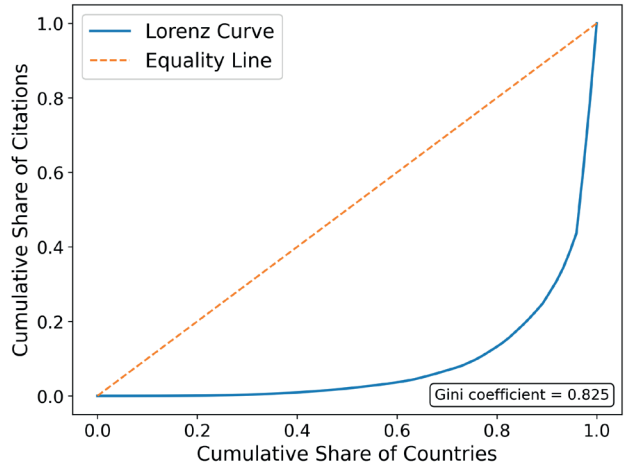


Fig. 9. Lorenz curve of citations by country

Source: own work.

3.5. Productivity versus impact: Unequal returns to knowledge production

Figure 10 plots total publications against total citations by country, with a linear fit explaining a substantial proportion of the variance ($R^2 = 0.70$). The United States and the United Kingdom lie significantly above the fitted line, indicating that they receive disproportionately high citation counts relative to their publication vol-

ume. These countries benefit from high impact density, reflecting entrenched visibility and centrality within the global knowledge network.

China, despite being the most prolific producer of space syntax research, lies below the fitted line. This indicates that its rapidly expanding output has not yet translated into equivalent citation impact. The decoupling of productivity and influence highlights structural asymmetries in how scientific contributions are evaluated and rewarded within the field.

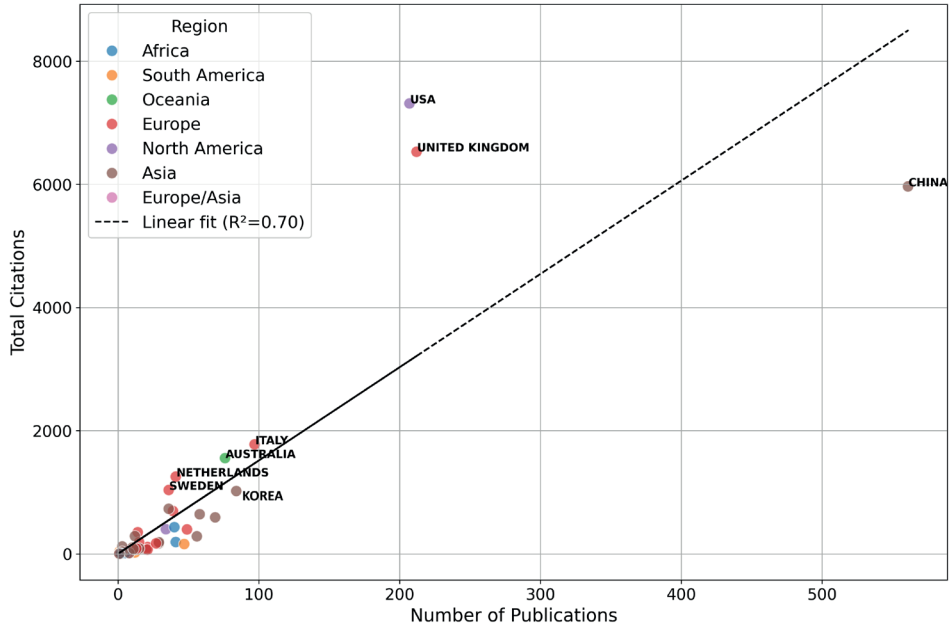


Fig. 10. Total publications versus total citations by country

Source: own work.

3.6. Journal gatekeeping and the institutionalisation of inequality

Figure 11 examines how journal landscapes contribute to the institutionalisation of geographical inequality. It presents a heatmap of publications by region across the top ten journals in the field. European scholars dominate long-established, high-prestige journals, such as Environment and Planning B: Urban Analytics and City Science, which serve as a key outlet for symbolic accumulation and disciplinary authority.

By contrast, Asian scholars are disproportionately represented in journals such as *Sustainability*, which has become a major outlet for space syntax research in recent years. While this diversification expands publication opportunities, it also

reflects a stratified journal ecosystem in which emerging regions are more likely to publish in newer or broader-scope journals that may carry different levels of prestige and citation potential.

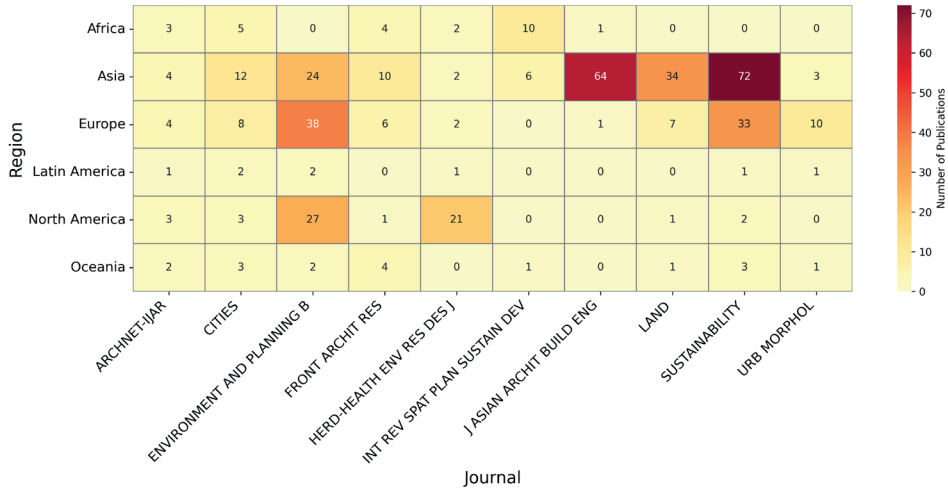


Fig. 11. Publications by region in the top 10 most productive journals in the field of space syntax

Source: own work.

4. DISCUSSION

This study employed bibliometric and network-based analyses to investigate the global structure of knowledge production and citation in space syntax research, with a particular focus on geographical imbalance and inequality. By combining growth models, collaboration networks, inequality metrics, and journal-level analysis, the study aimed to identify not only where space syntax research is produced but also how scientific recognition is distributed and what mechanisms may account for persistent disparities. Given the increasing global diffusion of space syntax methods, the analysis focused on the extent to which recent growth has been accompanied by convergence between regions of the Global North and Global South.

The findings situate these inequalities within the broader developmental trajectory of the field. Space syntax has followed a clear life-cycle pattern, evolving from a niche methodological approach into a mature research domain exhibiting signs of saturation. Comparable logistic growth trajectories have been observed in other specialised scientific domains, where early institutionalisation plays a decisive role in shaping long-term disciplinary hierarchy domains (Bettencourt *et al.*,

2008; Bornmann and Mutz, 2015). In the case of space syntax, the early dominance of the United States and the United Kingdom appears to have translated into durable advantages in publication output, citation impact, and journal presence. This pattern is consistent with prior bibliometric research demonstrating how early entry into a field generates cumulative advantages through editorial influence, training traditions, and network centrality (Merton, 1968; Wagner *et al.*, 2019).

While this historical perspective helps explain the emergence of hierarchical structures, their contemporary geographical expression is evident in publication patterns. Growth in space syntax research has not been spatially uniform. Asia – driven primarily by China – has experienced a rapid expansion in publication output since around 2010, whereas large parts of Africa and Latin America remain almost entirely absent from the literature. Similar forms of selective globalisation have been documented in urban studies and planning research, where methodological and theoretical frameworks circulate globally but are produced and validated in a limited number of locations (Parnell and Robinson, 2012; Watson, 2014). The persistence of "data blank spots" in space syntax research suggests that barriers to participation extend beyond methodological accessibility and are likely related to institutional capacity, language dominance, and unequal access to high-visibility publication venues.

These structural barriers are well documented in the broader literature on global knowledge production. Limited research funding, restricted access to academic journals, and the dominance of English continue to marginalise scholars from the Global South (Oztig, 2024). Language barriers are particularly acute, as publishing in international journals requires not only linguistic fluency but also mastery of specialised academic discourse and disciplinary conventions. Such constraints shape not only who can publish, but also whose work is recognised and cited (Mur-Dueñas, 2019).

The inequality metrics reported in this study provide quantitative confirmation of these dynamics. The Lorenz curve for publications by country reveals a level of concentration comparable to that found in other highly stratified scientific fields (Albarrán *et al.*, 2011). More importantly, the even higher concentration observed in citation distributions confirms that symbolic capital is more unevenly distributed than scientific output itself. Citation and authorship patterns, therefore, reflect not only scholarly activity, but also whose voices are heard and legitimised within academic discourse (Bassiouney, 2024; Bassiouney and Muehlhaeusler, 2017). This finding aligns with previous findings, which show that citation systems tend to amplify existing hierarchies rather than correct them (Hicks *et al.*, 2015; Leydesdorff and Wagner, 2009). In space syntax research, countries with modest output but long-standing institutional authority receive disproportionately high levels of recognition, while emerging producers face lower citation returns.

A comparison of productivity and impact further clarifies these dynamics. Although China now produces the largest number of space syntax publications, its

citation impact per paper remains lower than that of the United States and the United Kingdom. Similar mismatches between output and influence have been reported in other bibliometric studies focusing on rapidly expanding scientific systems (Chen and Leydesdorff, 2014; King, 2004; Leydesdorff and Wagner, 2009; Zhou and Leydesdorff, 2006). These studies suggest that citation impact depends not only on volume but also on factors such as journal placement, international visibility, and embeddedness within dominant epistemic communities. These findings indicate that increased productivity alone is insufficient to overcome historically entrenched hierarchies in recognition.

International collaboration is often regarded as a key mechanism for enhancing scientific impact, and the results confirm its importance in the field of space syntax research. Collaboration networks are densely structured around countries in North America, Western Europe, and East Asia, reflecting the highly centralised nature of global scientific cooperation (Gonzalez-Brambila *et al.*, 2013). Rather than serving as a compensatory mechanism for countries in the Global South, collaboration appears to reproduce existing inequalities. Its benefits are largely captured by actors already positioned within central networks, suggesting that collaboration alone is unlikely to reduce disparities unless its structure and terms are fundamentally reconfigured.

Journal-level analysis further illustrates how these inequalities are institutionalised. The concentration of European and North American authors in long-established, high-prestige journals mirrors patterns observed in other fields, where editorial boards and reviewer communities tend to reflect existing power structures (Peters and Ceci, 1982; Smith *et al.*, 2014). The prominence of Asian scholars in newer or broader-scope journals suggests a diversification of outlets, but also points to a stratified publishing landscape in which not all journals confer equal symbolic value. This finding supports arguments that journals function not merely as dissemination platforms, but as active gatekeepers in the construction of disciplinary authority.

Despite the persistence of these structural asymmetries, emerging initiatives point toward possible pathways for change. Multilingual publishing platforms and translation collectives have begun to challenge linguistic barriers and expand access to international scholarly communication (Langum and Sullivan, 2020; Tikly, 2024). Scaling up such efforts could help democratise knowledge production and foster greater epistemic diversity within space syntax research. Building a more inclusive field requires expanding the disciplinary canon, diversifying authorship, and rethinking how knowledge is cited, valued, and disseminated. This also entails recognising contributions from the Global South, even when methodologies or theoretical orientations diverge from dominant paradigms (Martins, 2020; Mohamed and van der Laag Yamu, 2023).

More equitable forms of international collaboration are equally crucial. Rather than reinforcing existing hierarchies, collaborative arrangements should prioritise meaningful co-authorship, multilingual engagement, and the recognition of

diverse epistemologies. Methodologically, integrating computational techniques with ethnographic and participatory approaches can enrich space syntax research by grounding formal analysis in lived experience and local context. Such pluralism has the potential not only to broaden empirical coverage but also to challenge prevailing assumptions about what constitutes valid and impactful knowledge.

Institutional actors play a central role in enabling these transformations. Funding bodies and journal publishers can contribute by waiving publication fees for authors from the Global South, supporting multilingual dissemination, and diversifying editorial boards and reviewer pools. Without sustained institutional commitment at these levels, efforts to address epistemic inequality are likely to remain fragmented and uneven.

Several limitations of this study must be acknowledged. First, bibliometric indicators may inadequately capture research that is locally oriented, practice-based, or published in non-indexed outlets. As has been widely discussed in the literature, such indicators tend to privilege English-language publications and internationally oriented research agendas (Hicks *et al*., 2015; Sarewitz and Pielke, 2007). These biases are likely to disproportionately affect countries in the Global South, where research may be more closely aligned with local planning challenges than with international academic debates. Second, the macro-level approach adopted here does not capture national or institution-specificities that may explain exceptional performance in certain contexts. Future research could benefit from combining bibliometric analysis with qualitative investigation of institutional strategies, editorial practices, and collaboration dynamics.

5. CONCLUSION

This study demonstrates that the globalisation of space syntax research has been accompanied by persistent, and in some cases intensifying, inequalities in knowledge production and scientific recognition. While publication output has expanded rapidly and new regions – particularly in Asia – have become major contributors, citation impact, collaboration networks, and journal hierarchies remain strongly concentrated in a small number of countries. These findings suggest that convergence in output does not necessarily imply convergence in influence.

The results underscore the significance of path dependency in shaping the development of scientific fields. Early institutional leadership in space syntax has yielded long-term benefits that continue to shape collaboration, visibility, and recognition. Overcoming these dynamics is likely to require sustained investment, the development of critical research masses, and greater inclusivity in editorial and collaborative practices.

From a policy perspective, the findings suggest that countries with relatively small scientific communities may benefit from focusing resources on building strong, coherent research clusters in specific fields, rather than dispersing efforts across multiple areas. At the same time, international collaboration remains an important strategy; however, its effectiveness depends on researchers' ability to access central networks and maintain strong links with domestic institutions. Finally, the distinction between academic impact and societal relevance should remain central to evaluations of research performance, particularly in regions where space syntax research may contribute more directly to addressing local urban challenges than to accumulating international citations.

REFERENCES

ALBARRAN, P., CRESPO, J. A., ORTUÑO, I. and RUIZ-CASTILLO, J. (2011), 'The skewness of science in 219 sub-fields and a number of aggregates', *Scientometrics*, 88 (2), pp. 385–397. https://doi.org/10.1007/s11192-011-0407-9

ARIA, M. and CUCCURULLO, C. (2017), 'Bibliometrix: An R-tool for comprehensive science mapping analysis', *Journal of Informetrics*, 11 (4), pp. 959–975. https://doi.org/10.1016/j.joi.2017.08.007

BABBU, A. H. (2023), 'Mapping space syntax as a computational tool: A bibliometric analysis', *Journal of Engineering Science and Technology Review*, 16 (6), pp. 82–89. https://doi.org/10.25103/jestr.166.10

BASSIOUNEY, R. (2024), 'The politics of writing and reading: An Arabic sociolinguistics perspective [Journal of Arabic Sociolinguistics]', *International Journal of the Sociology of Language*, 289–290, pp. 53–58. https://doi.org/10.1515/ijsl-2024-0131

BASSIOUNEY, R. and MUEHLHAEUSLER, M. (2017), 'Cairo: The linguistic dynamics of a multilingual city', [in:] SMAKMAN, D. and HEINRICH, P. (eds), *Urban sociolinguistics: The city as a linguistic process and experience*, Routledge.

BETTENCOURT, L. M. A., KAISER, D. I., KAUR, J., CASTILLO-CHAVEZ, C. and WOJICK, D. E. (2008), 'Population modeling of the emergence and development of scientific fields', *Scientometrics*, 75 (3), pp. 495–518. https://doi.org/10.1007/s11192-007-1888-4

BORNMANN, L. and MUTZ, R. (2015), 'Growth rates of modern science: A bibliometric analysis based on the number of publications and cited references', *Journal of the Association for Information Science and Technology*, 66 (11), pp. 2215–2222. https://doi.org/10.1002/asi.23329

CHEN, C. and LEYDESDORFF, L. (2014), 'Patterns of connections and movements in dual-map overlays: A new method of publication portfolio analysis', *Journal of the Association for Information Science and Technology*, 65 (2), pp. 334–351. https://doi.org/10.1002/asi.22968

DONTHU, N., KUMAR, S., MUKHERJEE, D., PANDEY, N. and LIM, W. M. (2021), 'How to conduct a bibliometric analysis: An overview and guidelines', *Journal of Business Research*, 133, pp. 285–296. https://doi.org/10.1016/j.jbusres.2021.04.070

GANDIA, R. M., ANTONIALLI, F., CAVAZZA, B. H., NETO, A. M., LIMA, D. A. DE, SUGANO, J. Y., NICOLAI, I. and ZAMBALDE, A. L. (2019), 'Autonomous vehicles: Scientometric and bibliometric review', *Transport Reviews*, 39 (1), pp. 9–28. https://doi.org/10.1080/01441647.2018.1518937

GONZALEZ-BRAMBILA, C. N., VELOSO, F. M. and KRACKHARDT, D. (2013), 'The impact of network embeddedness on research output', *Research Policy*, 42 (9), pp. 1555–1567. https://doi.org/10.1016/j.respol.2013.07.008

HICKS, D., WOUTERS, P., WALTMAN, L., DE RIJCKE, S. and RAFOLS, I. (2015), 'Bibliometrics: The Leiden Manifesto for research metrics', *Nature*, 520 (7548), pp. 429–431. https://doi.org/10.1038/520429a

HILLIER, B. (1996), Space is the machine: A configurational theory of architecture, Cambridge University Press.

KING, D. A. (2004), 'The scientific impact of nations', *Nature*, 430 (6997), pp. 311–316. https://doi.org/10.1038/430311a

KRENZ, K., PSARRA, S. and NETTO, V. M. (2023), 'Mapping the conceptual system of an urban theory and its evolution: A text analysis of space syntax conference papers over 20 years', *Urban Morphology*, 27 (2), Article 2. https://doi.org/10.51347/UM27.0014

LANGUM, V. and SULLIVAN, K. P. H. (2020), 'Academic writing, scholarly identity, voice and the benefits and challenges of multilingualism: Reflections from Norwegian doctoral researchers in teacher education', *Linguistics and Education*, 60, 100883. https://doi.org/10.1016/j.linged.2020.100883

LEYDESDORFF, L. and WAGNER, C. (2009), 'Is the United States losing ground in science? A global perspective on the world science system', *Scientometrics*, 78 (1), pp. 23–36. https://doi.org/10.1007/s11192-008-1830-4

MARTINS, A. (2020), 'Reimagining equity: Redressing power imbalances between the global North and the global South', *Gender and Development*, 28 (1), pp. 135–153. https://doi.org/10.1080/13552074.2020.1717172

MENG, D. and ZHANG, J. (2025), 'The evolution of space syntax over the past two decades: Evidence from China', *Journal of Asian Architecture and Building Engineering*, 24 (5), pp. 4606–4624. https://doi.org/10.1080/13467581.2024.2399739

MERTON, R. K. (1968), 'The Matthew Effect in Science: The reward and communication systems of science are considered', *Science*, 159 (3810), pp. 56–63. https://doi.org/10.1126/science.159.3810.56

MOHAMED, A. A. (2025), 'Using BERTopic modelling to map the evolution of space syntax research', *Land Use Policy*, 157, 107639. https://doi.org/10.1016/j.landusepol.2025.107639

MOHAMED, A. A. and VAN DER LAAG YAMU, C. (2024), 'Space Syntax has Come of Age: A Bibliometric Review from 1976 to 2023', *Journal of Planning Literature*, 39 (2), pp. 203–217. https://doi.org/10.1177/08854122231208018

MUR-DUEÑAS, P. (2019), 'The experience of a NNES outer circle novice scholar in scholarly publication', [in:] HABIBIE, P. and HYLAND, K. (eds), *Novice Writers and Scholarly Publication: Authors, Mentors, Gatekeepers*, pp. 97–115, Springer International Publishing. https://doi.org/10.1007/978-3-319-95333-5_6

OZTIG, L. I. (2024), 'IR and the Global South: Revising Obstacles to a Global Discipline', *Global South Review*, 5 (2), Article 2. https://doi.org/10.22146/globalsouth.89891

PARNELL, S. and ROBINSON, J. (2012), '(Re)theorizing Cities from the Global South: Looking Beyond Neoliberalism', *Urban Geography*, 33 (4), pp. 593–617. https://doi.org/10.2747/0272-3638.33.4.593

PETERS, D. P. and CECI, S. J. (1982), 'Peer-review practices of psychological journals: The fate of published articles, submitted again', *Behavioral and Brain Sciences*, 5 (2), pp. 187–195. https://doi.org/10.1017/S0140525X00011183

SAREWITZ, D. and PIELKE, R. A. (2007), 'The neglected heart of science policy: Reconciling supply of and demand for science', *Environmental Science and Policy*, 10 (1), pp. 5–16. https://doi.org/10.1016/j.envsci.2006.10.001

SINGH, V. K., SINGH, P., KARMAKAR, M., LETA, J. and MAYR, P. (2021), 'The journal coverage of Web of Science, Scopus and Dimensions: A comparative analysis', *Scientometrics*, 126 (6), pp. 5113–5142. https://doi.org/10.1007/s11192-021-03948-5

SMITH, M. J., WEINBERGER, C., BRUNA, E. M. and ALLESINA, S. (2014), 'The Scientific Impact of Nations: Journal Placement and Citation Performance', *PLOS ONE*, 9 (10), e109195. https://doi.org/10.1371/journal.pone.0109195

TIKLY, L. (2024), *Transforming knowledge and research for just and sustainable futures: Towards a new social imaginary for higher education* (Nos. 33; ED-2024/WP-33/1; Education, Research and Foresight: Working Papers, p. 13), UNESCO, https://unesdoc.unesco.org/ark:/48223/pf0000390388 [accessed on 24.12.2025].

VAN NES, A. and YAMU, C. (2021), *Introduction to Space Syntax in Urban Studies*, Springer International Publishing. https://doi.org/10.1007/978-3-030-59140-3

VAUGHAN, L., PEPONIS, J. and DALTON, R. C. (eds) (2025), *Space Syntax: Selected papers by Bill Hillier*, UCL Press. https://doi.org/10.14324/111.9781800087712

WAGNER, C. S., WHETSELL, T. A. and MUKHERJEE, S. (2019), 'International research collaboration: Novelty, conventionality, and atypicality in knowledge recombination', *Research Policy*, 48 (5), pp. 1260–1270. https://doi.org/10.1016/j.respol.2019.01.002

WATSON, V. (2014), 'African urban fantasies: Dreams or nightmares?', *Environment and Urbanization*, 26 (1), pp. 215–231. https://doi.org/10.1177/0956247813513705

YAMU, C., VAN NES, A. and GARAU, C. (2021), 'Bill Hillier's legacy: Space syntax—A synopsis of basic concepts, measures, and empirical application', *Sustainability*, 13 (6), 3394. https://doi.org/10.3390/su13063394

ZHOU, P. and LEYDESDORFF, L. (2006), 'The emergence of China as a leading nation in science', *Research Policy*, *35*(1), pp. 83–104. https://doi.org/10.1016/j.respol.2005.08.006

ZUPIC, I. and ČATER, T. (2015), 'Bibliometric methods in management and organization', *Organizational Research Methods*, 18 (3), pp. 429–472. https://doi.org/10.1177/1094428114562629

Member since 2018
JM13710

EUROPEAN SPATIAL RESEARCH AND POLICY

Volume 33 2026 Number 1

https://doi.org/10.18778/1231-1952.33.1.04

Hicret AYDOĞAN [*], **Mehmet Emin ŞALGAMCIOĞLU** [**]

SYSTEMATIC LITERATURE REVIEW OF WORKPLACE ENVIRONMENT STUDIES AT THE SPACE SYNTAX SYMPOSIA 1-13

Abstract. This systematic scoping review investigates the influence of spatial design on employee behaviour by analysing workplace research presented at the Space Syntax Symposia (SSS). Adhering to PRISMA guidelines, 37 articles from the 1st–13th SSS were analysed regarding their spatial, social, and methodological components. The study reveals correlations between analysis techniques, syntactic properties, and social behaviours. Although limited to symposium proceedings, the review demonstrates strong representativeness and operational consistency.

Two primary contributions emerge: the identification of three contextual patterns mapping the relationship between syntactic metrics and behavioural phenomena across office types, and the establishment of a comprehensive empirical foundation connecting behaviour, perception, and metrics. This work provides a critical baseline for future meta-analyses and theoretical research in the field.

Key words: workplace, space syntax symposium, organisational behaviour, literature review, spatial morphology.

[*] Hicret AYDOĞAN, Istanbul Medeniyet University, Department of Architecture, Kuzey Kampüs, Unalan Mah. Unalan Sok. D-100 Karayolu Yanyol, 34700 Usküdar/Istanbul, Türkiye; Istanbul Technical University, Architectural Design Doctoral Program, Istanbul, Türkiye; e-mails: aydoganhi@itu.edu.tr, hicret.aydogan@medeniyet.edu.tr, ORCID: https://orcid.org/0000-0001-9098-7416

[**] Mehmet Emin ŞALGAMCIOĞLU, Istanbul Technical University, Department of Architecture, TÜ Taşkışla Campus Harbiye Mh. Taşkışla Cd. No:2, 34367 Şişli/Istanbul Türkiye; e-mail: salgamcioglu@itu.edu.tr, ORCID: https://orcid.org/0000-0002-7218-8044

Received: 10.07.2025, Revised: 15.01.2026, Accepted: 21.01.2026

Funding information: Istanbul Medeniyet University, Istanbul Technical University. **Conflicts of interests:** None. **Ethical considerations:** The Authors assure no violations of publication ethics and take full responsibility for the content of the publication. **The percentage share of the Author in the preparation of the work is:** H.A. 80%, M.E.S. 20%. **Declaration regarding the use of GAI tools:** The Authors declare that they used Gemini, ChatGPT and Grammarly for the following purpose: enhancing linguistic clarity, ensuring grammatical accuracy, organizing the systematic research framework, and refining the authors' original draft partially. The Authors then carried out a thorough and critical review of the text, with particular attention to potential false, incomplete, or biased information, possible plagiarism or lack of proper/accurate authorship attribution and revised it accordingly.

1. INTRODUCTION

Workplace environment studies focus on social and physical aspects. Space syntax, with its „theory and set of techniques," explores these aspects and their relationships using specific concepts, theories, and methods (Burdet, 1997). Bridging theory and practice, space syntax is useful for empirical research because of its measurable results. As a result, it has gained attention over the years and has evolved through contributions from various fields.

In 1997, the first Space Syntax International Symposium was held to promote these advancements and new studies in the field. Researchers gathered to share research and information, and this conference has continued biennially since then (Greene *et al.*, 2012; Karimi, 2016; Space Syntax Network Symposia Database, 2024). Accordingly, a study analysing conference papers from the first to the eleventh symposium found a shift in the use of methodological, conceptual, and theoretical foundations of space syntax theory in line with these developments (Krenz *et al.*, 2019). Similarly, another study, a meta-analysis of the relationship between pedestrian movement and the built environment, identified patterns between syntactic metrics, techniques, and pedestrian movement. The analysis methods influenced the outcomes of space syntax studies from 1975–2016 (Sharmin and Kamruzzaman, 2018). Furthermore, a systematic review incorporating socio-spatial experiences in space syntax studies revealed a consistent pattern showing that several syntactic measures are significant regardless of scale and analysis (Lee *et al.*, 2023). Lastly, a bibliometric review of space syntax research from 1976 to 2023 indicated that urban studies primarily focus on how morphology and street layout influence limited cognitive and behavioural aspects, forming recognizable patterns (Mohamed and Yamu, 2024). However, another systematic review on sociability in urban environments argues that, although space syntax is useful, there is a gap in the literature because it concentrates on limited topics and concepts related to the social environment in urban areas (Askarizad *et al.*, 2024). Consequently, Space Syntax Symposia (SSS) have been held every two years since 1997 to bring together researchers, discuss new developments, contributions, and discoveries, which are often verified multiple times.

In summary, despite the accumulated knowledge and experience, few reviews have focused on analysing trends in the use of space syntax within the literature. Furthermore, these studies generally evaluate spatial and behavioural patterns without considering behavioural differences related to scale, function or social identity, which are vital in architectural space. Therefore, there is still a need for fresh, comprehensive, focused, and systematic reviews on space syntax research that also address these factors.

Building on this, this literature review will include these factors and focus on workplace studies presented at the SSS 1–13. It will examine social and spatial impacts on employee behaviour at the architecture scale through a systematic literature review process—PRISMA. The main question of this review is how spatial morphology and employee behaviour (interaction, movement, and co-presence) relate and what research components are used to investigate the relationships between spatial and social environments. Due to the specific standards of the systematic literature review method, this review aims to identify patterns objectively among research components such as spatial, social, and methodological elements, and to discuss common findings and variations among studies according to standards established by this method. The goal is to provide evidence from existing literature that supports workplace design aligned with organisational needs and a healthy social environment.

2. METHODS AND MATERIALS

2.1. Method of the review

In this study, a systematic literature review process is followed to establish high standards for analysing and synthesising previous research findings in a systematic, transparent, and reproducible manner (Davis *et al.*, 2014; Snyder, 2019). They organise the review process around a well-defined research question to ensure comprehensive identification, critical assessment, and synthesis of all relevant empirical evidence, following a predetermined set of inclusion and exclusion criteria to ensure transparency and reproducibility. This rigorous process aims to minimise bias and provide a reliable overview of current knowledge (Moher *et al.*, 2009; Page *et al.*, 2021; Lee *et al.*, 2023).

Based on this, the current literature review aims to explore space syntax studies in the workplace more thoroughly and accurately regarding employee behaviours, to uncover the connections between social, spatial, and methodological components through predefined criteria that filter relevant articles and assess their quality, enabling careful conclusions to be drawn from the literature. Additionally, the use, patterns, and research results related to space syntax are examined.

Given that, this literature review can be classified as a ‚systematic scoping review' since it limits the scope to the Space Syntax Symposia, the academic community that focuses exclusively on space syntax studies, in order to meet the homogeneity criteria of the procedure and address practical constraints such as limited time, workload, and researcher capacity. Moreover, the SSS committee applies a blind peer-review process and specific eligibility criteria to reduce bias and uphold academic standards

(Greene *et al.*, 2012). Nonetheless, this remains the first and most comprehensive effort on this topic to date, aiming to advance the field through its detailed approach and serving as a meaningful proxy for the broader research landscape.

2.2. Finding material

In this literature review, a pre-study was conducted to screen relevant literature through a multi-pronged strategy involving Web of Science Core Collection (WoS), Scopus, citation research, and the Space Syntax Network Symposia Database. This screening yielded 101 relevant papers with duplicates identified from 1982–2022. It is observed that some researchers frequently contributed to the literature and presented similar cases and content at the SSS, either as individuals or groups. Also, many of these contributors are connected through research groups, have worked together multiple times, and participated in the SSS.

Furthermore, Fig. 1 indicates that these researchers have the highest scores and are ranked among the top 15 in the relevant literature, according to Scopus, Web of Science Core Collection, and the Space Syntax Network Symposia Database, from left to right respectively. Researchers listed in all three databases are marked in bold black, while those appearing in two are in bold grey. The authors enclosed in frames are partners in the same research and are listed together, though other collaborations also exist.

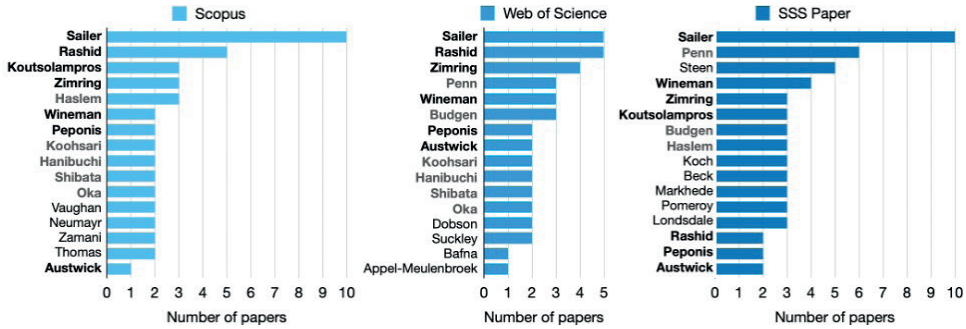


Fig. 1. Researchers with the highest contributions to the relevant literature in the period 1982–2022

Note: Researchers highlighted in bold black appear at the top of all three lists, while those highlighted in bold grey appear at the top of two lists.

Source: own work based on Scopus, WoS, and the Space Syntax Network Symposia Database.

Additional research showed that they presented parts of the same studies, similar cases, and content from the SSS papers; in some instances, the exact same material appeared in other publications (Steen, 2009; Steen, 2010; Markhede and Steen, 2008; Penn *et al.*, 1997; Serrato and Wineman, 1997).

Lastly, the SSS papers constitute the majority of the relevant literature, with 37 out of 72 papers screened through Scopus, Web of Science Core Collection, and the Space Syntax Network Symposia Database, including papers with high similarity. Therefore, although not every researcher in the field participates in the SSS, it is believed that limiting the relevant literature to the SSS can offer useful insights into the broader discipline by covering the majority, as shown in Fig. 2 and other reasons mentioned above. Nevertheless, it should be noted that the results of this literature review are subject to debate regarding their generalisability due to its scope, as it only partially covers the relevant literature.

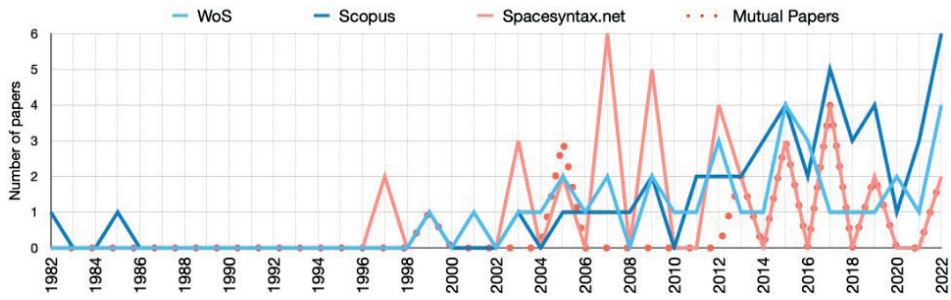


Fig. 2. Comparative analysis of literature via Scopus, WoS, and the Space Syntax Network Symposia Database

Note: Thirty-seven of the 72 papers originate from the SSS, exhibiting significant overlaps in cases, content, and research groups with the non-SSS papers.

Source: own work.

2.2.1. Eligibility for symposium criteria

The SSS was chosen as the primary eligibility criterion to standardize research qualifications because it is a multidisciplinary, comprehensive, and prestigious conference that accepts peer-reviewed papers presenting new scientific research, ensuring reliability and objectivity, and is written in academic English.

The conference has been hosted internationally by various institutions across different countries, accepting full papers, short papers, and posters within a structured format provided annually by the steering committee. To date, 14 symposia have been held, with the most recent in 2024 in South Cyprus; however, this study reviews presentations from 1 to 13, which have been published. The proceedings from these symposia are available through two databases: Scopus and the Space Syntax Network Symposia Database. Scopus has indexed proceedings since 2013, covering nearly half of all published papers

(846 out of 1551), starting with SSS9. The Space Syntax Network Symposia Database, owned by Space Syntax Limited and affiliated with The Space Syntax Laboratory at University College London, has made all proceedings from the first to the thirteenth symposium available, totalling 1551 papers through 2024. Although all studies are accessible via the Space Syntax Network Symposia Database without Scopus, the latter is used for analysing data such as researcher and institution participation, keywords, and evaluating the quality of the proceedings.

2.2.2. Keywords criteria

To identify workplace-related studies in the symposium, relevant keywords „workplace," „workspace," and „office" were searched in the titles, abstracts, and keywords. Different search strategies were used for each database. Initially, the search on Scopus.com was refined to „space AND syntax AND symposium" in the „conference" field and further limited to „workplace" OR „workspace" OR „office" in the „article title, abstract, keywords" field. This search yielded 34 papers out of a total of 846 papers with „space AND syntax AND symposium" on the site. After removing an abstract, an introductory letter, and three papers lacking keywords in the correct sections, 29 papers met the criteria. Next, since the Space Syntax Network Symposia Database does not have an effective search engine, the following process was used: all papers were downloaded and compiled into a single file. The file's „finder" search function was used to identify relevant papers containing the defined keywords; then, they were manually examined to remove those where keywords appeared only in the wrong sections. This process identified 1,551 papers from the 1st to the 13th SSS, totalling 611 papers mentioning these keywords, of which 103 were eligible. After excluding papers with multiple keywords, 76 relevant papers remained. Finally, posters and abstracts were excluded, leaving 73 papers for further review on the Space Syntax Network Symposia Database.

2.2.3. Spatial criteria

Since this systematic review aims to examine evidence-based practices related to employee behaviour in the workplace, spatial factors such as scale, function, and user profile are essential considerations. Therefore, spatial criteria were set to exclude urban studies, virtual space studies, and other research unrelated to employee behaviour, such as studies on libraries, prisons, and housing. Using the same screening method as before, 13 papers from Scopus.com and 37 papers from Space Syntax Network Symposia Database were identified as eligible for this review and are listed in an Excel file for further analysis, as shown in Fig. 3.

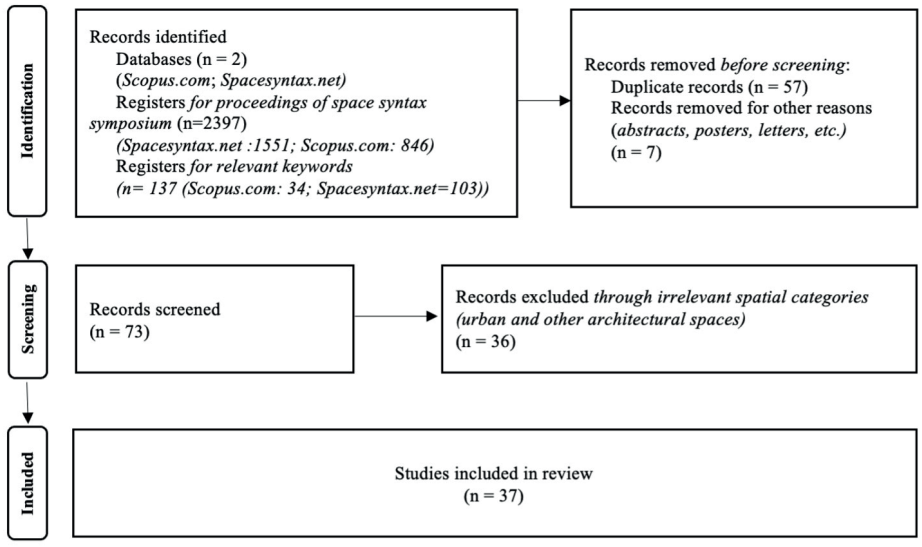


Fig. 3. PRISMA flow diagram showing database and register searches
Source: PRISMA Executive.

3. DATA ANALYSIS PROCEDURE

The correspondence theory of space syntax suggests that behaviour patterns are influenced by the spatial configuration if trans-spatial aspects legitimise them (Hillier and Hanson, 1984; Hillier, 2007). Based on this, the overall approach of space syntax research begins with analysing spatial configuration syntactically to assess interaction possibilities, then traces actual spatial behaviours and interaction patterns, and concludes with examining the relationship between these possibilities and actual patterns in the observed space. While spatial configuration is presumed to guide space use patterns, trans-spatial factors such as perception, culture, and demands can also significantly influence these patterns. Space syntax helps identify these relationships through complementary concepts, theories, and techniques. This holistic approach enables workplace (WP) studies to explore the connection between social and spatial environments and to gather evidence of the effects of spatial design.

In this context, four research components are discussed in this literature review within the framework of the WP studies of the SSS, two are data types investigated for correlation: spatial and social aspects. Additionally, research methodology, including spatial analysis techniques and social data collection methods, will be

discussed. Since most studies do not elaborate on the correlation methods, the discussion is limited to the data types and collection methods, which are sufficiently defined for classification in the research.

3.1. Social components

In space syntax studies, the effect of spatial configuration is primarily observed through social aspects, mainly behavioural patterns. In addition, trans-spatial factors such as perception are important elements that are assumed to influence behaviour patterns and be affected by the spatial configuration. Similarly, WP studies at the SSS examined these two social components to understand the relationship between social and spatial environments. However, there are also studies that evaluate behavioural patterns solely through morphological analysis without considering the social environment. Based on this, this review will discuss the studies in three categories based on the type of social data analysed: morphology, behaviour, and perception.

3.1.1. Morphology-based studies

One common approach is focusing on spatial morphology and analysing the spatial patterns using the methodological and theoretical basis of space syntax to evaluate the workplace environment without observing any social patterns. However, they may still discuss the possibilities of the social environment based on spatial configuration. Given that, morphology-based studies measure only spatial aspects and do not directly assess social aspects, even though they estimate the potential social environment in those spaces.

3.1.2. Behaviour-based studies

Behavioural patterns are vital for understanding social and spatial environments in workplaces because they provide data on activity types, frequencies, and the influences of trans-spatial and spatial factors on behaviour in workplace studies (Grajewski and Hillier, 1982).

Given that, space syntax theory proposes that there are two main activities people perform in a place: moving or occupying space; and their patterns naturally arise from spatial factors (Hillier and Hanson, 1984; Hillier, 2007). Therefore, these two activities are described as spatial behaviours that are also assumed to exhibit trans-spatial factors according to the theory.

Additionally, Hillier (2007) has suggested that social behaviours are created by spatial configuration, as it shapes opportunities for co-presence. Observing interaction patterns and examining their relationship with interaction possibilities are key techniques in space syntax research. For example, a proportional relationship is believed to show that spatial configuration supports socio-organisational needs, while a lack of relationship indicates that trans-spatial factors—such as organi-

sational and perceptual aspects—influence behaviour patterns. Moreover, social behaviours are linked to organisational behaviours, including communication, collaboration, knowledge sharing, innovation, productivity, and creativity. These are key components of WP studies at the SSS regarding employee behaviour.

Based on this, studies are categorised as behaviour-based when they focus on behaviour patterns as the primary social data rather than other psychosocial constructs, observing behaviour patterns through various methods to correlate with spatial components in this literature review.

3.1.3. Perception-based studies

Perceptual components, which can be defined as subjective judgments of environmental factors that influence behaviour, are among the social aspects examined in employee behaviour studies of the SSS such as satisfaction, safety, and privacy. The studies are classified as perception-based in this review because they focus on perceptual components like sense of security, autonomy, control, communication, social support, satisfaction, and usefulness, and are analysed quantitatively in most cases using different methods. These studies primarily observe behaviour patterns, as well as perception and investigate the relationships between behaviour, perception, and spatial configuration; thus, their content and approach differ from behaviour-based studies.

3.2. Spatial components

Spatial components are the morphological dimensions and syntactic properties in space syntax research. Morphological dimensions include physical limits and connections of built environments, such as visibility and accessibility. Visibility is the most studied morphological dimension for understanding the use limits and potentials of space in space syntax (Krenz *et al.*, 2019). However, this dimension relies on eye-level visual perception, excluding gaps and obstacles above that level, while accessibility, defined as knee-level visibility, includes them to describe movement limits. Conversely, syntactic properties are related morphological measures that identify the accessibility or visibility of space based on factors like integration, connectivity, and occlusivity.

3.3. Research methodology

3.3.1. Spatial analysis techniques

In space syntax theory, three spatial analysis techniques were initially proposed: axial line, justified graph, and convex space maps (Hillier and Hanson, 1984). However, visibility graph analysis, introduced decades later, has become the most widely used technique since then (Turner, 2001; Hillier, 2007; Benedikt and McElhinney, 2019; Krenz *et al.*, 2019).

By description, axial line analysis (ALA) relies on linear representations of spatial configurations, which are accumulations of the longest paths between any two points within the space. Justified graph analysis (JGA) is based on an abstract graph that depicts the connection system of the layout and measures the syntax of the space by counting the transitions to access other spaces from a point. Convex space analysis (CSA) uses regional representations that define the largest spatial partitions within which all points are mutually visible (Hillier and Hanson, 1984). Given that, CSA is also recognised as a "functional map," which identifies the spatial boundaries of functions within a configuration, and it is used to define organisational borders that delineate departmental territories as well (Markus, 1993; Hillier, 2007; Ostwald, 2011; Dawes and Ostwald, 2018). Finally, visibility graph analysis (VGA) is based on grid representations of spatial configurations, assessing permeability via isovist, which defines the visible boundaries of a base point in a space (Benedikt, 1979; Turner, 2001; Dawes and Ostwald, 2018).

Given that, spatial analysis techniques are important factors in studies since different techniques can produce varying results according to findings (Benedikt and McElhinney, 2019; Krenz *et al.*, 2019; Lee *et al.*, 2023; Azkarizad *et al.*, 2022). For instance, VGA provides more detailed insights into spatial visibility compared to ALA, which may explain its increasing popularity (Benedikt and McElhinney, 2019).

3.3.2. Social data collection methods

Data about social components is collected through various methods depending on the type and context of the information. Generally, two main approaches are used, each involving different techniques: self-report and on-field observation. First, on-field observation techniques, such as space syntax analysis, are widely applied to study behaviour patterns. Researchers collect data in real time at the site using methods like snapshot analysis, tracking, and gate counting. Second, self-report techniques are also commonly used, where participants provide data about their activities through digital or handwritten logs, notepads, questionnaire surveys, and interviews, including ethnographic observation methods.

4. RESULTS OF THE DATA ANALYSIS PROCEDURE

The results of the analysis of the WP research in the SSS, according to the defined procedure, are shown in Table 1. The rates, frequencies, and preference patterns of these data types and their collection methods are discussed based on the selected sample following the systematic review process. Research gaps and weaknesses in approaches will be addressed based on these topics.

Next, the findings of the studies will be discussed in three categories according to social data type: perception, behaviour, and morphology.

Table 1. Research components of the studies

Authors	Cases	Social/ Behavioural patterns and methods				Spatial analysis technique				Syntactic properties			
		Int	Occ	Mov	Perc	ALA	CSA	JGA	VGA	Integ.	Depth	Conn.	Others
Penn *et al.*, 1997	A case + a pre-post case	O, S	O	O, S	Quest.-usefulness of interactions	+	+			+	+		-
Wineman and Serrato, 1997	2 cases	S	S	S	-	+				+			-
Spiliopoulou and Penn, 1999	4 cases	O, S	O	O	-	+				+			-
Steen, 2001	A pre-post case	S	O	O	-	+		+		+	+		-
Shpuza, 2003	17 cases	-	-	-	-								average perimeter distance, perimeter length
Rashid and Zimring, 2003	4 cases	-	-	-	-	+	+			+	+	+	-
Steen and Blombergsson, 2003	A case	O, S	O	O	-		+		+	+			-
Rashid *et al.*, 2005	4 cases	O	O	O	Quest.-psychosocial constructs	+				+	+	+	-
Shpuza and Peponis, 2005	7 cases	-	-	-	-	+				+	+		compactness
Bafna and Ramash, 2007	48 cases	-	-	-	-	+				+			-
Markhede and Carranza, 2007	A case	O, S	O, S	O, S	-				+	+			intervisibility
Markhede and Koch, 2007	2 cases	O, S	O, S	O, S	-				+	+			-
Wineman and Adhya, 2007	7 cases	-	-	-	Quest.- job satisfaction	+				+		+	-

Table 1. (cont.)

Authors	Cases	Social/ Behavioural patterns and methods				Spatial analysis technique				Syntactic properties			
		Int	Occ	Mov	Perc	ALA	CSA	JGA	VGA	Integ.	Depth	Conn.	Others
Sailer, 2007	3 cases	O, S	O	O, S		+		+		+	+		metric distance, angular distance, topological distance
Sailer *et al.*, 2007	A pre-post case	O, S	-	-	Quest.-usefulness of interactions				+	+			-
Sailer *et al.*, 2009	2 pre-post cases	O	O	O	Quest.-usefulness of interactions				+	+			-
Sailer and Penn, 2009	3 cases + 1 pre-post case	O, S	-	O	-	+					+		-
Appel-Meulenbroek, 2009	A case	S	S	S	-				+		+	+	isovist field, isovist perimeter, occlusivity, compactness
Steen, 2009	A case	O, S	O	O	-		+		+	+			-
Lu *et al.*, 2009	A case	O	O	O	-				+		+	+	targeted visual conn., targeted mean step depth
Koch and Steen, 2012a	5 cases	O, S	-	O, S	-		+		+	+			-
Koch and Steen, 2012b	5 cases	S	-	S	-		+		+	+			-
Sailer *et al.*, 2012	62 cases	-	-	-	-				+	+	+		-
Beck, 2012	2 cases	S	S	S	Quest.- satisfaction with social and physical env.	+	+		+	+	+	+	half-isovist (area, compactness, occlusivity, maximum radial)
Beck, 2013	2 pre-post cases	S	S	S	Quest.- satisfaction with physical env.	+			+	+	+		half-isovist (area, perimeter, occlusivity)

Wineman *et al.*, 2013	A case	O	O	O	-				+		+		movement choice (metric choice)
Beck, 2015	A pre-post case	S	S	S	Quest.-satisfaction with physical env.	+			+	+	+		isovist, full isovist (area, length, perimeter, compactness, occlusivity; window array) back-half isovist; front- half isovist
Koutsolampros *et al.*, 2015	27 cases	O	O	O	-		+		+		+		-
Sakr *et al.*, 2015	2 pre-post cases	O	O	O	-				+	+	+		-
Koutsolampros *et al.*, 2017	45 cases	O	O	O	-		+		+		+	+	-
Lehrer-Melamed and Fisher-Gewirtzman, 2017	2 cases	O	O	O	interview -sense of privacy	+		+		+		+	-
Wackernagel, 2017	A pre-post case	Agent-based	Agent-based	Agent-based	-		+		+	+			-
Pachilova *et al.*, 2017	4 cases	O, S	O, S	O, S	-				+		+		visual step depth, angular step depth, metric step depth
Koutsolampros *et al.*, 2019	41 cases	O	O	O	-				+	+	+	+	compactness; control; controllability; metric mean shortest path angle; angular mean depth; visual relativised entropy; metric mean straight-line
Sailer and Thomas, 2019	2 cases	O	O	O	-		+		+	+			-
Hajo, 2022	A case	O, S	O	O	-				+	+		+	intervisibility
Yenel-Güler and Demirkan, 2022	A case	S	S	-	-	+				+		+	generic visibility analysis, targeted visibility analysis

(Int.: Interaction; Occ: Occupancy; Mov: Movement; Perc: Perception; O: Field observation; S: Self-report techniques; Quest.: Questionnaire; Integ.: Integration; Con.: Connectivity)

Source: own work.

4.1. Preference of spatial components

Starting with the morphological dimensions, visibility is the favoured dimension by 86% of the selected sample, indicating that visual perception dominates for spatial perception, as shown in Fig. 4. Accessibility was used by 49% of the sample, particularly regarding power distance, face-to-face interaction frequency, organisational structure, network, and hierarchy. Half of the studies focused solely on visibility, while only 14% focused exclusively on accessibility. The remaining studies analysed both dimensions, accounting for 35%. In contrast, preferences for morphological dimensions in relation to syntactic properties are similar, except for isovist-based metrics such as targeted visibility and intervisibility.

Various forms of visibility are highly emphasised in nearly one-fifth of the sample, including targeted isovist fields, half, back, front, and side isovist (parts of visible area in a specific direction) (Beck, 2012, 2013, 2015); exposure (visibility to others), surveillance (visibility of others), and intervisibility (visibility to each other) analyses (Markhede and Carranza, 2007; Lu *et al.*, 2009; Beck, 2012, 2013, 2015; Yenel-Güler and Demirkan, 2022; Hajo, 2022). These derivative properties are used to understand the impacts of different perspectives and scopes of visibility, such as visible contacts on interaction patterns when seated or standing, on the sense of privacy, or control.

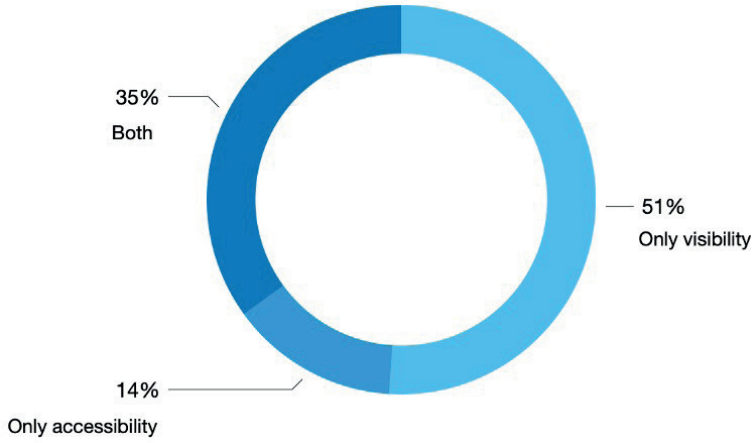


Fig. 4. General preference rates of morphological dimensions in the WP studies of the SSS
Source: own work.

In terms of syntactic metrics, space syntax software defines at least 25 measures of spatial configurations, and 18 different metrics are used in the selected sample, while 10 of them appeared only once, such as choice, control, controllability, entropy, maximum radial, window array, path angle, angular depth, and mean straight-line.

The preference rates show that integration and depth, the oldest syntactic properties and their reciprocals, were significantly more favoured, as shown in Fig. 5. Moreover, except for one study which generated its own metrics (Shpuza, 2003), each has certainly participated in research, while coexisting in one third (12/37). However, integration was the most preferred property, appearing in three quarters (28/37), while depth appeared in half (19/37) of the selected sample. Additionally, 12 studies, one third, relied solely on integration, while only four studies, one tenth, relied solely on depth.

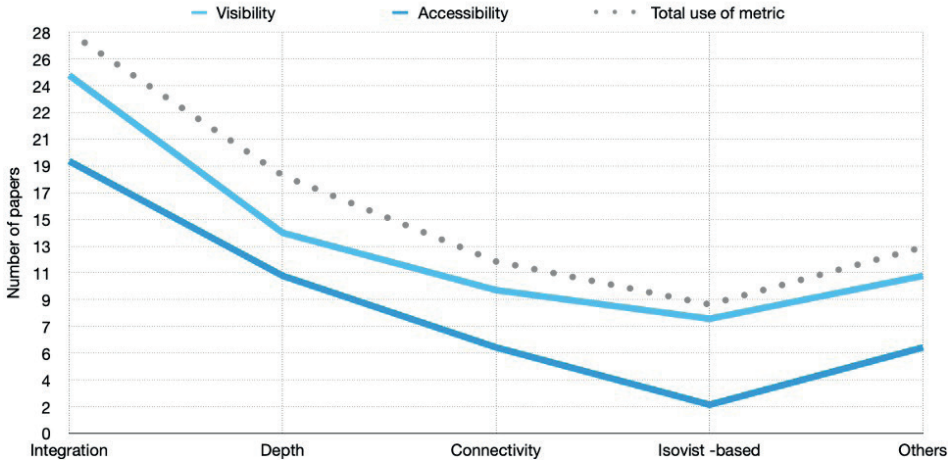


Fig. 5. Relational use of morphological dimensions and syntactic metrics in the WP studies of the SSS

Source: own work.

The overall ranking of these properties is as follows: connectivity ranks third and is used in one third of the studies; isovist field follows at one fifth, 22% (8/37); then compactness at one sixth, 14% (5/37); occlusivity at one tenth, 11% (4/37); isovist perimeter and area each at less than one tenth, 8% (3/37); and various properties used only once account for 3% of these 37 studies as shown in Fig. 6.

Among them, 11 new metrics are generated in the sample, mostly based on the isovist field, as mentioned above. Furthermore, new analysis techniques and metrics are developed to measure perimeter length and perimeter distance to explore correlations between floor plate shapes and natural daylight (Shpuza, 2003). Finally, intelligibility, which measures the relationship between integration and connectivity, appears in several behaviour-based studies (Rashid and Zimring, 2003; Beck, 2012; Lehrer-Melamed and Fisher-Gewirtzman, 2017).

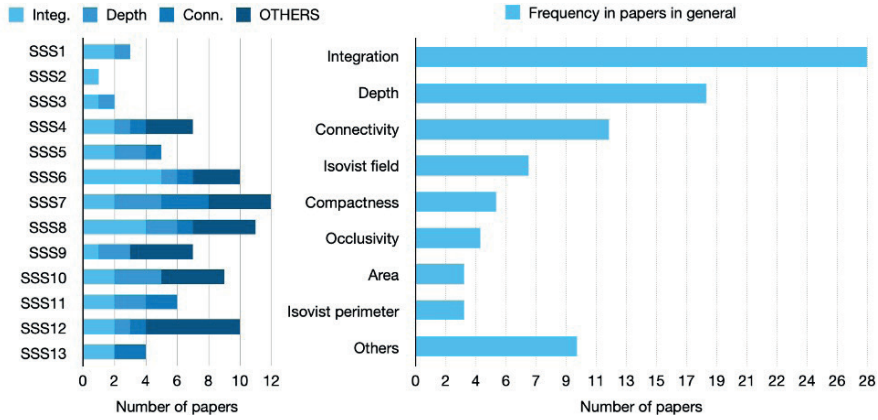


Fig. 6. Preference of syntactic metrics; and frequencies by year at the left; overall use frequencies (number of papers they are used) at the right (Integ.= Integration, Conn.= Connectivity)

Source: own work.

Briefly, while integration has always been the primary measure and has never lost interest, more than half of the studies in the selected sample also measured depth or connectivity. These metrics have remained prominent to date, and many other metrics have been measured alongside them in later cases. Therefore, integration and depth are the metrics that mostly coexisted with others, since at least one or the other was certainly measured in papers concerning any spatial analysis techniques. However, integration is mentioned more frequently in studies, especially for metrics based on the isovist-field.

Regarding spatial analysis techniques, VGA is the most commonly used technique, unsurprisingly employed in 64% (24/37) of the selected sample, as shown in the schema in Fig. 7. It was quickly adapted to studies, having been introduced at the 3rd SSS by Turner (2001), and was immediately applied in WP studies starting from the 4th SSS (Steen and Blombergsson, 2003), as shown in Fig. 8 and 9.

In the second place, ALA is employed in 43% (16/37) of the cases from the first to the last Symposia, as shown in Fig. 7 and Fig. 8. Although the least-line map is the most common, all-line maps and segment line maps are also used in behaviour studies to measure accessibility (Penn *et al.*, 1997; Sailer, 2007). However, ALA is mostly used in morphology-based studies, especially after VGA.

Third, CSA appears in 32% (13/37) of the selected samples and is combined with ALA or VGA because it does not assess overall syntax but rather describes co-presence and transition patterns, as shown in Fig. 9. It is generally used to define functional or organisational maps, particularly regarding collaboration between departments or teams (Rashid *et al.*, 2003; Steen *et al.*, 2003; Koch and Steen, 2012a, b) and how architectural programs influence space use and movement patterns (Rashid *et al.*, 2003; Steen *et al.*, 2003; Koch and Steen, 2012a, b; Koutsolampros *et al.*, 2015, 2017; Sailer and Thomas, 2019).

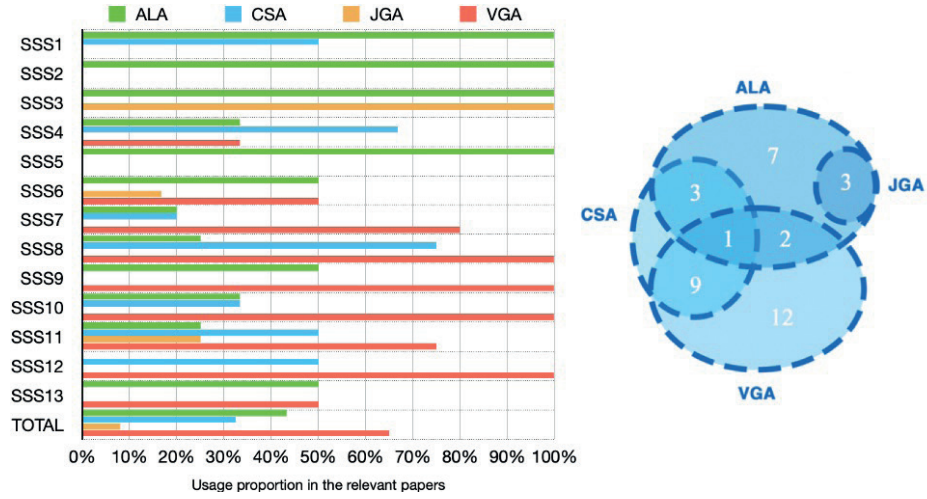


Fig. 7. Preference rates of spatial analysis techniques by year on the left and their mutual usage on the right in the WP studies of the SSS

Note: General use of only VGA 32%; only ALA 19%; 49% added CSA or JGA to ALA or VGA in the sample.

Source: own work.

Following this, JGA appears in only 10% (4/37) of the studies, supporting ALA but not VGA, as shown in Fig. 7. It is used to explore the relationship between organisational structure, hierarchy, network, and spatial configuration through integration, depth, and connectivity (Steen, 2001; Sailer, 2007; Lehrer-Melamed and Fisher-Gewirtzman, 2017).

Additionally, some studies have developed their own techniques, claiming that existing methods had limitations for these analyses. For example, one study used an original method involving drawing outlines through the centre of the floorplate to estimate daylight penetration and analyse its relationship with perimeter morphology, finding a positive correlation (Shpuza, 2003). Another study used a grid to measure distance and compactness, similar to the VGA method (Shpuza and Peponis, 2005).

Finally, one study employed agent-based analysis based on isovists, categorised under VGA for further evaluations (Wackernagel, 2017).

In summary, four main space syntax techniques were used for spatial analysis in the selected sample. As ALA and VGA are the most prominent, ALA was preferred for measuring distance over VGA (Sailer, 2007; Beck, 2015). The usage trends show a shift over time; ALA was used in nearly all the studies before VGA was developed, with 7 out of 9 papers; however, after VGA was announced in 2001, it overtook ALA, accounting for 72% of the sample (24 out of 33). The use of ALA decreased to 35% after 2001, with half of those studies also supporting the use of other techniques, including VGA. ALA and VGA were used together in

only three studies from the same research group (Beck, 2012; 2013; 2015). Overall, ALA was used alone in nine studies (24%), VGA alone in 12 (35%), and JGA or CSA were used only as supportive techniques in 42% of the sample.

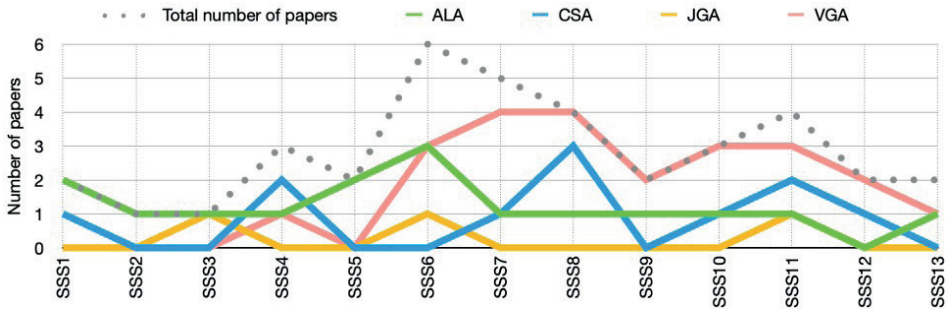


Fig. 8. Frequency of spatial analysis techniques by year in the WP studies of the SSS

Source: own work.

Additionally, there are correlations between spatial analysis techniques and syntactic properties in the sample, as shown in Fig. 9. For example, ALA, CSA, and JGA, which are the oldest techniques, are only used to measure integration, depth, and connectivity. In contrast, VGA is employed for all preferred properties, including derived ones. Furthermore, studies used VGA to measure either integration or depth analyses, which are interchangeable. Overall, these patterns indicate that spatial analysis techniques influence the preference for certain syntactic properties due to their geometric capabilities for measuring spatial configurations.

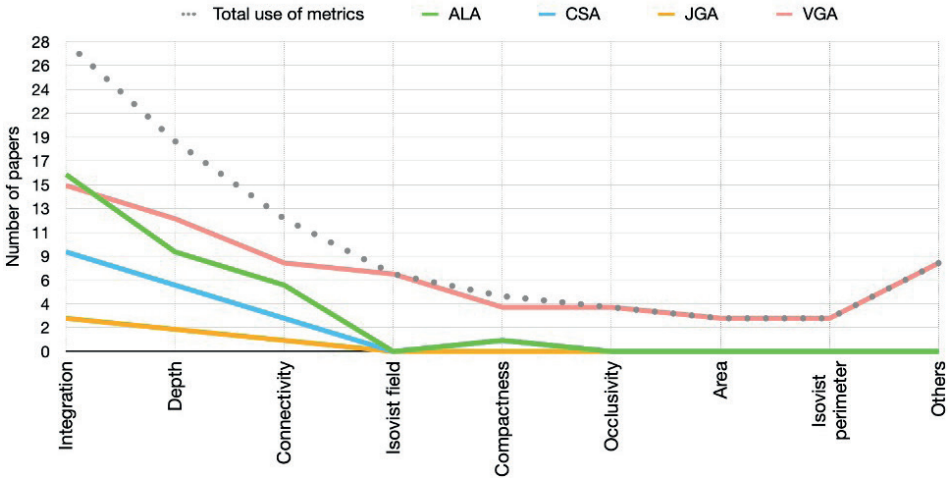


Fig. 9. Relations of syntactic metrics and spatial analysis techniques in the WP studies of the SSS

Source: own work.

4.2. Preference of social components and data collection methods

4.2.1. Social components

There are three types of research based on social components: behaviour, perception, and morphology studies. However, these components overlap across different categories.

Preference rates show that behaviour patterns are the most significant components, with 83% of the sample participating, while 21% of those are perception-based studies, as shown in Fig. 10. The remaining studies focusing on morphology discuss their predictability through syntactic patterns despite often neglecting them (Rashid and Zimring, 2003; Shpuza, 2003; Shpuza and Peponis, 2005; Wineman and Adhya, 2007; Bafna and Ramash, 2007; Sailer *et al.*, 2012). Although occupancy and movement studies frequently overlap, one to five studies observing one element disregarded the other. Conversely, studies focusing solely on occupancy patterns addressed similar issues without incorporating movement patterns, such as working and interaction behaviours (Lu *et al.*, 2009; Beck, 2012; 2013; 2015; Yenel-Güler and Demirkan, 2022). Meanwhile, studies concentrating only on movement patterns explored the relationship between organisational hierarchy, workflow, and spatial configuration (Sailer, 2007; Sailer and Penn, 2009; Markhede and Carranza, 2007; Koch and Steen, 2012b). Notably, interaction is the most prominent topic, appearing more frequently than others, and is connected to all studies examining spatial behavioural patterns, linking them to interaction patterns.

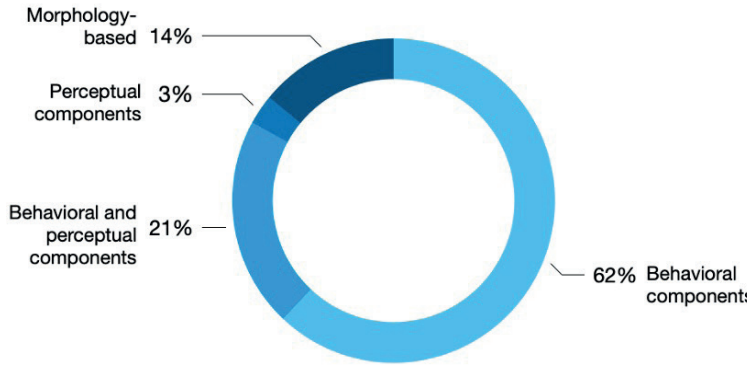


Fig. 10. Preference rates of social components in the WP studies of the SSS

Source: own work.

Within the scope of perceptual components, 9 out of 37 papers investigated correlations with the spatial environment, while eight of them also observed behaviour patterns to analyse the social environment more accurately, as shown by the schema in Fig. 11. Therefore, major topics relate to interaction and social

environment, such as sense of security, safety, territoriality, communality, communication, hierarchy, privacy, control, comfort, social support, and the usefulness of interactions. While privacy is mentioned most frequently, 6 out of 9 papers address it, and three papers investigate perceptions of the physical environment (Beck, 2012; 2013; 2015), while another three examine the usefulness of the interactions (Penn *et al.*, 1997; Sailer *et al.*, 2007; 2009); their researchers are related.

Lastly, there are five studies in the selected sample that ignore social patterns, which are referred to as morphology-based studies in this review (Shpuza, 2003; Rashid and Zimring, 2003; Shpuza and Peponis, 2005; Bafna and Ramash, 2007; Sailer *et al.*, 2012), as shown in the schema in Fig. 11. Although they focus on relationships such as daylight, floorplate shape, spatial hierarchy, spatial efficiency, workstation allocation, workstation density, and floor plate, they assume that these spatial factors may not always predict use patterns and social interactions. Since these studies adopt a comparative approach with the highest number of cases—ranging from 62 to the lowest of 7—their findings may have some degree of generalisability.

Overall, these preference patterns indicate that social components maintained their significance over time. For example, morphology-based studies are subjected only in 2003–2012, while behaviour patterns, observed through various methods, have become more prominent especially in the last decade. It also suggests that exploratory research may become more important with small case sets and detailed approaches over time, whereas morphology-based studies with large case numbers have shifted away from a focus on comparative approaches.

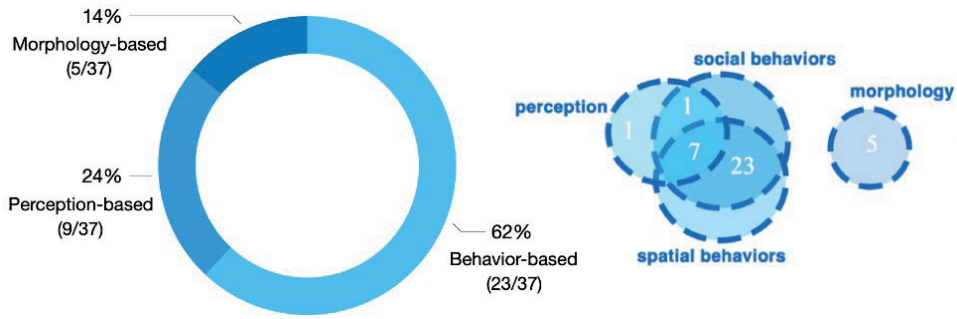


Fig. 11. Research rates of the social aspects on the left and their mutual usage on the right in the WP research at the SSS

Source: own work.

4.2.2. Preference of data collection methods

According to preference rates, behaviour patterns are the most important social aspects examined in WP studies at the SSS. For example, occupancy and movement patterns were analysed in 70% of the sample, with different variations, while

interaction patterns were examined in 84%, 31 out of 37 papers. Studies mostly preferred combining methods, with about one-third (12/37) using different methods for different behaviour patterns, or observing twice with different methods in some cases, as shown in Fig. 12. About one-fourth (9/37) relied solely on field observation, and one-sixth (6/37) employed various self-report techniques such as handwritten logs or digital records kept by participants.

Regarding occupancy patterns, the field observation technique was used in half of the sample, including two studies that utilised digital recordings complemented by ethnographic methods (Wineman *et al.*, 2013; Pachilova *et al.*, 2017). Similarly, movement patterns were observed on-site in 59% (22/37) of cases, with two studies collecting data via digital badges (Wineman *et al.*, 2013; Pachilova *et al.*, 2017), and four studies supported by self-reported data (Penn *et al.*, 1997; Koch and Steen, 2012; Markhede and Carranza, 2007; Pachilova *et al.*, 2017). While digital badges or devices recorded movement patterns, occupancy locations, and interactions, project or publication partnerships are used to objectively observe social and collaboration networks within organisations (Wineman *et al.*, 2013). Conversely, interaction patterns were directly observed in 64% (24/37), with more than half of these incorporating self-reported techniques. Three studies used survey methods to infer space use habits (Beck, 2012; 2013; 2015), while one relied exclusively on prospective interaction data that employees self-reported as part of their work habits (Sailer *et al.*, 2007).

Additionally, agent-based analysis was used to simulate behaviour patterns in a study (Wackernagel, 2017). Compared to behavioural components, very few methods were used for perceptional components in the sample. Because perception is subjective and intrinsic data, a self-report approach was preferred, and Likert-type questionnaire surveys were mainly used for quantifiable data—except for one study, like one tenth, which employed interviews to assess perceptions of privacy (Lehrer-Melamed and Fisher-Gewirtzman, 2017). Besides another study that collected only perceptual data as a social component (Wineman and Adhya, 2007), all perception studies also examined correlations with behaviour patterns. Half of them used observations (Penn *et al.*, 1997; Rashid *et al.*, 2005; Sailer *et al.*, 2009; Lehrer-Melamed and Fisher-Gewirtzman, 2017), and the other half relied on self-report (Sailer, 2007; Beck, 2012; 2013; 2015) to find correlations. Therefore, it can be said that exploring the links between perceptual, behavioural, and spatial components is a key issue for this community.

Finally, as a standard practice, morphology studies that discuss configurational patterns without examining social outcomes did not use any methods for social data collection. However, they analysed the relationships between various spatial needs of organisations, such as daylight, spatial efficiency, and interactive environments. They argued that behavioural patterns might not be predicted solely based on spatial configuration (Bafna and Ramash, 2007; Shpuza and Peponis, 2005).

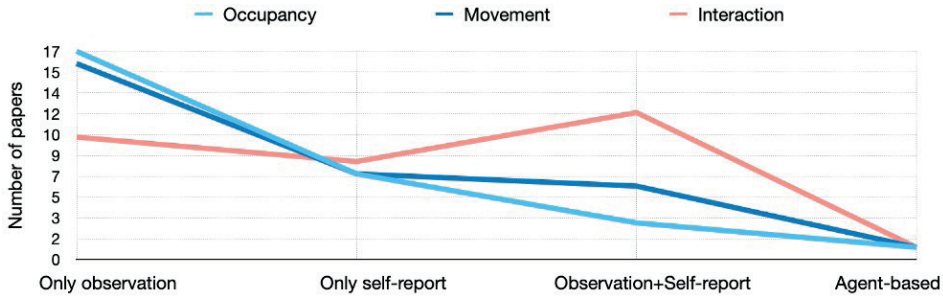


Fig. 12. Relations of social data and methods used for them in the sample

Source: own work.

Overall, social data was collected through two main methods in the selected sample: self-report and direct observation. While each has specific pros and cons, they are used to identify social patterns and relate them to spatial patterns in WPs. Compared to on-field observation, self-report methods were debated regarding scientific reliability due to limited sample sizes and personal biases, but they remained relevant because they were time-saving, manageable, and effective for data that direct observational techniques often find hard to capture due to security, time, and privacy issues (Rashid *et al.*, 2005; Steen, 2009). As a result, the use of ethnographic techniques for behaviour patterns have decreased, while on-field observation has increased over time. Although preferences have shifted, both methods were mainly used together either for different types of data or the same data to minimise technical limitations.

4.3. Rates of socio-spatial analysis and patterns of spatial and social data

Socio-spatial analyses are regression analyses of collected social and spatial data aimed at revealing their interrelationships and causal connections. Common patterns of components, such as behaviour patterns and syntactic properties, were preferred when discussing the socio-spatial environment of WPs in the selected sample.

For instance, the preference rates of components in behavioural research are highly responsive to overall preference rates, since they constitute the majority. The preference rates of spatial analysis techniques in behavioural research are nearly the same as the general preference rates shown in Fig. 13. Furthermore, the preference rates of syntactic metrics in general are also very similar to those in behaviour studies, as shown in Fig. 14. Their preference rates over the years are also similar, such as VGA being the most used technique in behaviour-based studies, while integration, depth, and connectivity are leading metrics. However,

different behavioural patterns correlate with different syntactic metrics. For example, interaction is studied in greater detail compared to spatial behaviours and is linked to all spatial properties in the sample. Similar findings are observed in occupancy; movement patterns are correlated with fewer spatial properties. For instance, the isovist field, ranked fourth in preference, is often correlated with co-presence and interaction patterns through alternative approaches like different scopes of visibility.

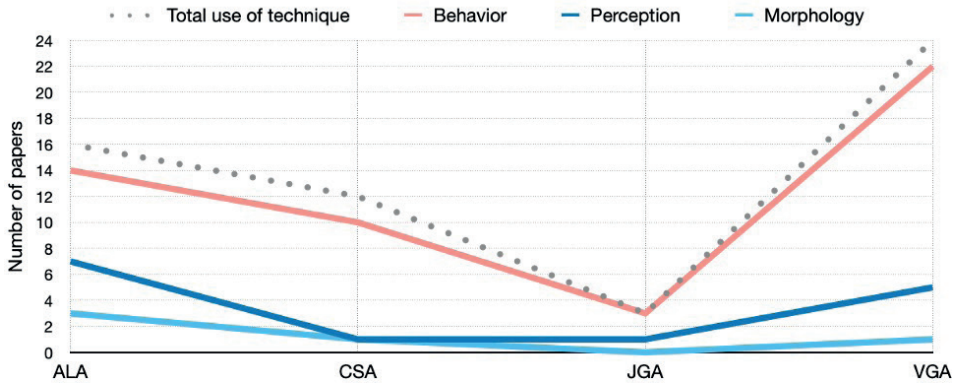


Fig. 13. Preference of spatial analysis techniques across research types in the WP studies of the SSS

Source: own work.

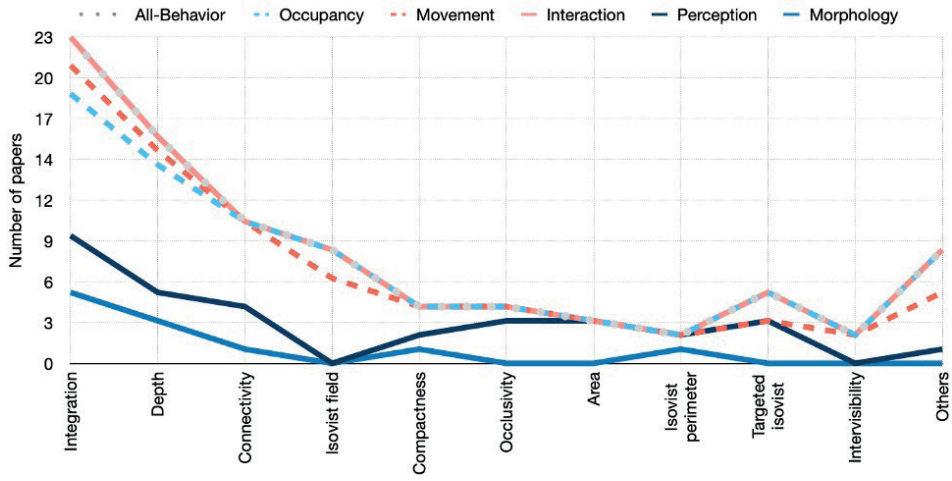


Fig. 14. Preference of syntactic metrics in relation to research types in the WP studies of the SSS

Source: own work.

On the other hand, although most perception studies were conducted after VGA was developed, ALA remains the most popular technique in the selected sample. For example, seven of nine studies, almost 80%, used ALA, while VGA was used in half of the studies and was the second most popular, as shown in Fig. 13. Additionally, JGA and CSA are used only once, mainly to support ALA or VGA (Penn *et al.*, 1997; Lehrer-Melamed and Fisher-Gewirtzman, 2017).

Conversely, preference rates for syntactic metrics are comparable to the overall preference rates, with similar rankings. Integration, depth, and connectivity are the primary metrics, with integration used in all these studies. The remaining five properties utilised in perception studies were examined in three papers related to the same study, evaluating exposure, surveillance, and intelligibility (Beck, 2012; 2013; 2015).

Similarly, on the one hand, morphological studies predominantly preferred ALA exclusively in three of the five studies in the selected sample, even though they were conducted after VGA between 2003 and 2012. VGA and a specific method, on the other hand, were used once in the remaining two studies. While only one of each spatial analysis technique is preferred in these studies, only four syntactic properties were measured in the sample, with the ranking of preference rates being identical to the general preference rates, as shown in Fig. 14. While integration is used in all, depth is used in three out of five, and connectivity and compactness are used only once. According to this, integration and depth—opposite configurational patterns—are dominant for identifying morphological patterns. Furthermore, the relationship between spatial hierarchy and organisational hierarchy is discussed, particularly through these properties, regarding potential behaviour and interaction patterns (Rashid *et al.*, 2005; Wineman and Adhya, 2007; Beck, 2012; 2013; 2015).

4.4. Findings of socio-spatial analysis

In summary, the findings indicate that space syntax analysis can provide valuable insights into how office design decisions influence organisational, behavioural, and perceptual dynamics within a workspace. However, some conclusions are questionable due to ongoing development of more rigorous technical, methodological, and conceptual approaches.

In the first quarter, between 1997 and 2001, studies involving SSS 1–3 employed elemental spatial properties, such as integration and depth, with ALA as the main analysis technique, and included on-field observations of behaviour patterns, except for one study. Perceptual components were observed through self-report techniques in another study (Penn *et al.*, 1997; Wineman and Serrato, 1997; Spiliopoulou and Penn, 1999; Steen, 2001). All four papers supported the idea that integrated spatial configurations often promote greater interaction and knowledge

sharing. They also highlighted the perceived usefulness of interactions alongside organisational status, emphasising that spatial design remains a key factor in shaping organisational behaviour despite telecommunications.

In the second quarter, between 2003 and 07, SSS 4–6, the use of space syntax and social components remained quite similar to the first quarter, with VGA also present and used in four out of six behaviour-based studies during this period, representing a quarter of the 11 papers. However, morphology-based studies were prominent during this period, with four papers, making up 80% of morphology-based studies in the overall sample. All of these studies preferred ALA for integration, along with depth, connectivity, or compactness, except for one that developed its own metrics and analysis method (Shpuza, 2003). These studies indicated that spatial configuration and organisational structure influence communication, privacy, territoriality, and movement accessibility (Rashid and Zimring, 2003), and that spatial depth and global integration impact flexibility, visibility, and interaction potential (Shpuza, 2003). Conversely, later research on office layout and workstation density showed that, although morphology alone poorly predicts behaviour, it still helps with space efficiency and workstation allocation (Shpuza and Peponis, 2005; Bafna and Ramash, 2007). Additionally, one-third of perception-based studies from this period focus on morphology rather than behaviour patterns, finding correlations between syntactic properties and user perception based on several psychosocial factors (Wineman and Adhya, 2007). The other perception-based studies involving behaviour patterns revealed that spatial configuration indirectly influences perceptions such as privacy, control, satisfaction, safety, and autonomy, as well as social behaviours like collaboration, by affecting spatial behaviour patterns (Rashid *et al.*, 2005; Sailer *et al.*, 2007). Finally, earlier VGA-based behaviour research in this sample found that spatial configuration may facilitate movement but does not always lead to increased interaction when organisational culture intervenes (Steen *et al.*, 2003). Similarly, evidence- based design research has shown that spatial redesign can reshape organisational culture, as changing space often alters behaviour patterns (Sailer, 2007; Sailer *et al.*, 2007). However, complementary approaches, such as positioning analysis and prototype tools like SPOT, argued that visibility, intervisibility, and movement structures influence interaction (Markhede and Koch, 2007; Markhede and Carranza, 2007).

In the third quarter, between 2009 and 13, SSS 7–9, there are noteworthy changes in the use of space syntax, social data, and methods. For instance, self-report techniques for behaviour patterns are used only as much as solo observation and combinations, with one third of 11 papers employing one of each. Moreover, the reliance on earlier methods declined, and studies began applying more refined techniques and additional syntactic properties due to VGA. Eventually, isovist-based metrics such as the isovist field in different scopes and directions became in demand, affecting interaction according to organisational role, perception, and behaviour, with better workstation orientation, visibility, and layout

linked to higher satisfaction and increased interaction through various metrics (Lu *et al.*, 2009; Beck, 2012; 2013). However, another study found that central position in a social network supported collaboration, while spatial depth or isolation supported productivity (Wineman *et al.*, 2013). Other research revealed that interaction patterns are influenced by formal ties and schedules (Appel-Meulenbroek, 2009; Beck, 2012; 2013). Additionally, continuation of evidence-based studies, including the only study with ALA in this period, reports similar findings as the previous quarter – such as changing spatial configurations helping to increase collaborativeness (Sailer and Penn, 2009; Sailer *et al.*, 2009). Lastly, besides the perception-based studies in the second and third parts of this period, the final morphology-based study of this quarter revealed that elemental syntactic metrics like integration are shaped by factors such as the number of floors, circulation layout, and the proportion of open space, based on an analysis of more than sixty office buildings (Sailer *et al.*, 2012).

In the last quarter, in 2015–22, or SSS 10–13, the use of space syntax has evolved from just techniques to also include more metrics, with a focus on behaviour research—11 studies in this period concentrated on this. Most studies increased field observation, except for one that was the only agent-based study simulating behaviour patterns within the sample, finding that certain configurational patterns influence perceptual factors like control, privacy, and protection (Wackernagel, 2017). Conversely, research shows that spatial layout does not always boost interaction. For instance, while corridor width, visibility, and circulation patterns affect interaction, results suggest that high visibility may actually decrease work-related interactions if visual privacy is compromised (Yenel Güler and Demirkan, 2022; Lehrer-Melamed and Fisher-Gewirtzman, 2017; Beck 2015). Still, other studies using multiple syntactic properties have found that spatial layout can significantly shape behaviours and user satisfaction, especially when balancing open and enclosed spaces (Sakr *et al.*, 2015; Koutsolampros *et al.*, 2015; Koutsolampros *et al.*, 2017; Koutsolampros *et al.*, 2019; Yenel-Güler and Demirkan, 2022).

Overall, these studies highlight the complex relationship between spatial design and organisational factors, emphasising the need to understand both spatial and social elements thoroughly. While earlier research suggested that more integrated spatial layouts tend to promote greater interaction and knowledge sharing, later studies reveal that spatial integration does not always lead to increased interaction due to organisational influences. Therefore, while spatial configuration can influence employee behaviour, organisational factors such as hierarchical culture and structure generally have a stronger impact. This confirms that space syntax provides a foundation and toolkit for understanding the connection between spatial and social factors and employee behaviour.

Additionally, several factors influence research findings, including social and spatial aspects, as well as methods. Preference for ALA has diminished significantly in behaviour studies due to the development of VGA and is now primarily

used in morphology-based research. Moreover, the limited metric options of ALA are another disadvantage compared to VGA for detailed analyses. Furthermore, ALA-based analyses typically support space syntax theory and confirm links between spatial configuration and aspects of behaviour, perception, and organisation, despite some mixed results. Conversely, VGA studies have produced different outcomes by employing more advanced techniques and concepts, such as agent-based analysis and new syntactic properties. Similarly, these conflicting results underscore the complex relationship between spatial design, behaviour, and perception.

4.5. Results

Space syntax has become a key method in workplace architecture research, progressing from basic spatial metrics to more comprehensive approaches that incorporate behaviour and perception. This review of WP studies from the SSS 1st to 13th shows evolving priorities in spatial techniques and user-centred insights.

Briefly, space syntax suggests that behavioural patterns are social structures stemming from spatial arrangements and offers a supplementary method to its theoretical foundation. Based on this, WP studies generally focus on actual and potential behaviour patterns to explore how spatial and social variables impact employee conduct. This review shows evolving priorities in spatial techniques and user-centred insights.

In this sample, social behaviours such as interaction received more emphasis than spatial behaviours, with almost all spatial patterns being examined for their correlation with social behaviour patterns. Moreover, they are believed to be products of spatial behaviours and perception; thus, the correlations with these factors are also widely investigated. Besides, perceptual aspects such as privacy, satisfaction, and awareness have gained attention in recent years, but are still inconsistently addressed. Nevertheless, one in seven studies in the sample ignored actual behaviour patterns but estimated them through spatial morphology.

Researchers have employed a variety of observational and ethnographic methods to study these behaviours, with observational data becoming more common over time because it carries more credibility. However, two key morphological characteristics significantly affecting how people move, occupy, and interact in space are identified: visibility and accessibility, with visibility being preferred roughly twice as much. The choice of these characteristics depends on specific research goals and the advantages each offers in measuring spatial data and its impact on occupant behaviour and social patterns.

Additionally, variables and research methods have evolved over time. While CSA and JGA assisted other techniques throughout, ALA was the dominant analysis method in the first decade, primarily focusing on a few basic syntactic properties. Subsequently, VGA was developed and has taken the lead, utilising various specified

syntactic properties in studies. This shift also influenced the main research questions and results, providing more detailed and comprehensive information about spatial configuration. For example, factors such as co-presence and visibility fields which is a crucial factor in perception, space usage, and knowledge-sharing environments. Similarly, different syntactic properties like occlusivity, maximum radial, isovist perimeter, area, control, and entropy are examined in relation to behaviours and perception. However, while VGA generally offers more detailed measurements, it showed less correlation with behavioural patterns, whereas ALA analyses often revealed positive or negative, weak or strong correlations. This is also questionable.

Furthermore, although several syntactic properties were measured, only a few were used commonly, and the greater the number of properties, the less significant the correlations. Lastly, an exploratory and comparative approach prevailed, helping to identify differences resulting from organisational or spatial setups and seeking to uncover causality between spatial arrangements and behaviour.

All in all, the field has experienced three identifiable phases chronologically. From the 1990s to the early 2000s, studies were dominated by ALA and CSA with a focus on movement and direct interaction. In the mid-2000s, researchers began integrating perceptual and psychosocial variables and adopting more diverse methods, including VGA and their experimental techniques. Since the 2010s, attention has shifted toward visibility, awareness, and organisational culture, accompanied by greater use of mixed methods and larger sample sizes. Despite the extent and workload of the observation methods, some of them analysed behaviours as well. This progression mirrors changes in workplace design from cellular and hierarchical setups to open, flexible, and user-centric environments and reflects a broader transition in space syntax from measuring spatial efficiency to evaluating spatial experience.

Overall, the preferences in technical, methodological, and social aspects of WP studies at the SSS followed certain patterns, showing clear progress and common yet debatable results.

5. DISCUSSION

Space syntax has advanced architectural understanding of workplace environments by offering empirical tools that reveal how spatial configuration influences social behaviour and perception. The adoption of visibility graph analysis (VGA) and perceptual metrics aligns with contemporary priorities like visibility, autonomy, and collaboration. The field has matured methodologically, shifting from single-case studies to broader, mixed-method research incorporating real-time analytics and sensor-based tools.

Despite this progress, several challenges remain. Most studies are descriptive, lacking predictive power or causal inference. While VGA is increasingly used, it is not consistently integrated with other spatial models like topological analysis. Behavioural components are often cited but insufficiently contextualised, and perceptual measures remain inconsistently defined. User diversity, such as age, gender, or neurodivergence, is rarely addressed. Furthermore, large-sample studies are limited, hindering the development of generalisable workplace typologies.

Pre- and post-occupancy studies are common but lack standardised evaluation frameworks and long-term tracking. Future research should refine these methods, adopt structured evidence-based approaches, and incorporate digital tools for dynamic behavioural insight. Overall, space syntax research is evolving toward multi-dimensional analysis, but future progress depends on methodological rigor, inclusion, and alignment with organisational realities.

Briefly, workplace studies in space syntax have evolved from simple spatial-behavioural correlations to complex, multi-dimensional analyses that integrate spatial, social, and experiential data. This trajectory reflects not only advances in analytical tools but also a deepening understanding of how space influences, and is influenced by, organisational life. Strengthening methodological rigor and embracing diversity in data and users will be critical to future progress.

This systematic review provides a focused synthesis of workplace-oriented space syntax research, offering an in-depth assessment of how spatial techniques such as axial analysis and visibility graph analysis have been applied to understand interaction, movement, occupancy, and perception in office environments. Unlike broader studies such as Askarizad *et al.* (2024), which focus on sociability in public spaces, or Lee *et al.* (2023), which span diverse domains, this review delivers typological specificity and architectural relevance. It complements bibliometric overviews like Mohamed and Yamu (2024) by illustrating how shifts toward experiential metrics are reflected in empirical workplace studies. Similarly, it extends the thematic mapping of Krenz *et al.* (2019) by translating conceptual trends into methodological patterns across nearly three decades. The use of a PRISMA protocol enhances transparency, while the introduction of a novel research component framework enables systematic comparison across spatial and social dimensions. Although limited to SSS papers, this focus ensures thematic consistency and highlights evolving design priorities. The study also identifies persistent gaps, such as inconsistent treatment of perception, underuse of evaluative frameworks, and minimal attention to user diversity. While the framework would benefit from further validation and expansion to newer data sources (e.g., digital behaviour or hybrid models), this review establishes a rigorous and practice-relevant foundation for advancing space syntax research in workplace architecture.

The findings of this review align with prior research in highlighting visibility and spatial integration as key drivers of interaction, echoing conclusions in

Askarizad *et al.* (2024) and Lee *et al.* (2023). However, this study reveals that in workplace contexts, behavioural components like movement and occupancy are less consistently analysed, and perceptual factors—while increasingly present—remain underdeveloped. Unlike earlier reviews that emphasise thematic or disciplinary trends, this review shows a clear methodological shift from axial to VGA and growing, yet uneven, interest in user experience. It uniquely demonstrates how these spatial-social pairings vary across case scales and periods, offering more nuanced architectural insights.

In practice, these findings offer practical guidance for workplace design and management. Companies can use this information to create spaces that foster collaboration, boost efficiency, and increase employee satisfaction. However, it is important to recognise that optimal design solutions depend on each organisation's unique culture and needs.

Limitations of this review include a focus on traditional office layouts and the inclusion of only English-language sources, which may not fully reflect current trends such as remote and hybrid work.

Future research should focus on longitudinal studies to evaluate how office design influences organisations over time and explore cultural and industry-specific differences.

6. CONCLUSIONS

This study provides the first systematic, PRISMA-guided review of workplace-oriented space syntax research, filling a significant gap in the literature. Focusing on workplace research presented at the Space Syntax Symposia, it reveals important insights into how spatial design influences employee behaviour. Reviewing 37 relevant studies, it demonstrates that space syntax provides a strong theoretical and methodological foundation for exploring how office layouts relate to organisational dynamics.

Yet narrowing scope to the SSS brings generalisability and bias risks within, it also brings a consistency in some ways such as quality issues across studies that are evaluated together. Besides, its core strength lies in its combination of methodological rigor and architectural specificity; it goes beyond thematic aggregation to classify, quantify, and compare how spatial metrics are paired with behavioural and perceptual outcomes across nearly three decades of research. The structured framework it introduces offers a replicable model for future systematic reviews within architecture and environmental behaviour studies.

The review also identifies critical field-wide gaps: limited integration of spatial and social models, underrepresentation of diverse user profiles, and a lack of

evidence-based or pre/post-evaluation methods. Addressing these gaps is essential for advancing space syntax as a predictive, evaluative, and inclusive design tool. By consolidating empirical knowledge within a practical, theory-informed structure, this review makes a timely and valuable contribution to the architectural research community, with strong relevance for both scholars and practitioners navigating the future of workplace design. Likewise, it highlights progress in research methods over time, with more sophisticated spatial analyses and data collection techniques emerging. Lastly, the findings emphasise that the interaction among physical space, organisational factors, and employee behaviours is highly complex.

All in all, this review offers a foundation for future research by clarifying which spatial and social variables are well-studied and which remain underexplored. It supports more informed methodological choices and highlights gaps in user diversity and evaluation. Future studies should further develop space syntax approaches while recognising the essential role of social and cultural influences in shaping how office spaces function and are perceived. For design, it provides empirical guidance to create more responsive, inclusive workplace environments.

Acknowledgements. The authors received no financial support for the research, authorship, and/or publication of this article. The authors declare that there are no conflicts of interest.

REFERENCES

ASKARIZAD, R., LAMÍQUIZ DAUDÉN, P. J. and GARAU, C. (2024), 'The Application of Space Syntax to Enhance Sociability in Public Urban Spaces: A Systematic Review', *ISPRS International Journal of Geo-Information*, 13, 227. https://doi.org/10.3390/ijgi13070227

BAFNA, S. and RAMASH, R. (2007), 'Designing the Spatial Syntax of Office Layouts', *Proceedings of the 6th International Space Syntax Symposium*, Istanbul.

BECK, M. P. (2012), 'The Role of Space Towards Intelligibility and Comfort in Justice Facilities', *Proceedings of the 8th International Space Syntax Symposium*, Santiago de Chile.

BECK, M. P. (2013), 'Visibility and Exposure in Workspaces', *Proceedings of the 9th International Space Syntax Symposium*, Seoul.

BECK, M. P. (2015), 'Slicing the Cake: An Isovist-Based Analysis of Computerised Workplace Configuration', *Proceedings of the 10th International Space Syntax Symposium*, London.

BENEDIKT, M. L. (1979), 'To Take Hold of Space: Isovists and Isovist Fields', *Environment and Planning B: Planning and Design,* 6 (1), pp. 47–65. https://doi.org/10.1068/b060047

BENEDIKT, M. L. and MCELHINNEY, S. (2019), 'Isovists and the metrics of architectural space', *Proceedings 107th ACSA annual meeting*, pp. 1–10, Pittsburgh, PA: Association of Collegiate Schools of Architecture: Pittsburgh, PA, USA.

BURDET, R. (1997), 'Welcome to the Symposium and Introduction of Sir Norman Foster', *Proceedings of the 1st International Space Syntax Symposium*, London.

DAVIS, J., MENGERSEN, K., BENNETT, S. and MAZEROLLE, L. (2014), 'Viewing Systematic Reviews and Meta-Analysis in Social Research Through Different Lenses', *SpringerPlus*, 2014, 3, 511. https://doi.org/10.1186/2193-1801-3-511

DAWES, M. J. and OSTWALD, M. J. (2018), 'Space Syntax: Mathematics and the Social Logic of Architecture', [in:] SRIRAMAN, B. (ed.), *Handbook of the Mathematics of the Arts and Sciences,* Cham: Springer International Publishing AG, part of Springer Nature. https://doi.org/10.1007/978-3-319-70658-0_6-1

GREENE, M., REYES, J. and MORA, R. (2012), 'News: JOSS, Vol. 3, Issue 1: Eighth International Space Syntax Symposium', *The Journal of Space Syntax,* 3 (1), pp. 150–154.

HAJO, H. (2022), 'The Future of Innovative Workplaces: A socio-spatial investigation of interaction patterns in accelerator and incubator workplaces', *Proceedings of the 13th Space Syntax Symposium*, Bergen.

HILLIER, B. (2007), *Space Is the Machine: A Configurational Theory of Architecture*, London: Space Syntax, Electronic Edition.

HILLIER, B. and HANSON, J. (1984), *The Social Logic of Space.* Cambridge, New York: Cambridge University Press. http://dx.doi.org/10.1017/CBO9780511597237

HILLIER, B. and HANSON, J. (1997), 'The Reasoning Art: or, the Need for an Analytical Theory of Architecture', *Proceedings of the 1st International Space Syntax Symposium*, London.

KARIMI, K. (2016), 'The Shifting Paradigm of Space Syntax Research and its Future Prospects: A Reflection on the 10th International Space Syntax Symposium in London, 2015', *The Journal of Space Syntax,* 6 (2).

KOCH, D. and STEEN, J. (2012a), 'Analysis of Strongly Programmed Workplace Environments – Architectural configuration and time-space properties of hospital work', *Proceedings of the 8th International Space Syntax Symposium*, 13.

KOCH, D. and STEEN, J. (2012b), 'Decomposing Programmes. Re-coding Hospital Work with Spatially Syntactic Information', *Proceedings of the 8th International Space Syntax Symposium*, Santiago de Chile.

KOUTSOLAMPROS, P., SAILER, K., HASLEM, R., AUSTWICK, M. Z. and VAROUDIS, T. (2017), 'Big Data and Workplace Micro-Behaviours: A Closer Inspection of the Social Behaviour of Eating and Interacting', *Proceedings of the 11th Space Syntax Symposium*, Lisbon.

KOUTSOLAMPROS, P., SAILER, K., POMEROY, R., AUSTWICK, M. Z., HUDSON-SMITH, A. and HASLEM, R. (2015), 'Spatial Databases: Generating New Insights on Office Design and Human Behaviours in the Workplace', *Proceedings of the 10th International Space Syntax Symposium*, London.

KOUTSOLAMPROS, P., SAILER, K., VAROUDIS, T. and HASLEM, R. (2019), 'Dissecting Visibility Graph Analysis: The Metrics and Their Role in Understanding Workplace Human Behaviour', *Proceedings of the 12th Space Syntax Symposium*, Beijing.

KRENZ, K., PSARRA, S. and NETTO, V. M. (2019), 'The Anatomy of Knowledge: Quantitative and Qualitative Analysis of the Evolution of Ideas in Space Syntax Conference Articles (1997–2017)', *Proceedings of the 12th Space Syntax Symposium*, Beijing.

LEE, J. H., OSTWALD, M. J. and ZHOU, L. (2023), 'Socio-Spatial Experience in Space Syntax Research: A PRISMA-Compliant Review', *Buildings*, 2023, 13, 644. https://doi.org/10.3390/buildings13030644

LEHRER-MELAMED, R. and FISHER-GEWIRTZMAN, D. (2017), 'The Balance Between Physical Closure and Openness in Office Workspace and the Relation of the Interaction Between Workers and Their Need for Privacy', *Proceedings of the 11th Space Syntax Symposium*, Lisbon.

LU, Y., PEPONIS, J. and ZIMRING, C. (2009), 'Targeted Visibility Analysis in Buildings Correlating Targeted Visibility Analysis with Distribution of People and Their Interactions within an Intensive Care Unit', *Proceedings of the 7th International Space Syntax Symposium*, Stockholm.

MARKHEDE, H. and CARRANZA, P. M. (2007), 'Spatial Positioning Tool: A prototype software and some background correlation data', *Proceedings of the 6th International Space Syntax Symposium*, Istanbul.

MARKHEDE, H. and KOCH, D. (2007), 'Positioning Analysis: social structures in configurative modelling', *Proceedings of the 6th International Space Syntax Symposium*, Istanbul.

MARKUS, T. A. (1993), *Buildings and Power Freedom and Control in the Origin of Modern Building Type*, NEW YORK: Routledge.

MARKHEDE, H. and STEEN, J. (2008), Creativity demands new office designs. Proceedings, CIB W70, European Facility Management Conference, Healthy and Creative Facilities, Edinburgh, pp. 313–320.

MOHAMED, A. A. and YAMU, C. V. (2024), 'Space Syntax has Come of Age: A Bibliometric Review from 1976 to 2023', *Journal of Planning Literature*, 2024*,* 39 (2), pp. 203–217.

MOHER, D., LIBERATI, A., TETZLAFF, J. and ALTMAN, D. G. (2009), 'Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement', BMJ 2009, 339. https://doi.org/10.1136/bmj.b2535

OSTWALD, M. J. (2011), 'The Mathematics of Spatial Configuration: Revisiting, Revising and Critiquing Justified Plan Graph Theory', *Nexus Network Journal,* 13, pp. 445–470. https://doi.org/10.1007/s00004-011-0075-3

PACHILOVA, R., SAILER, K. and KING, M. (2017), 'The Dynamic Nature of Caregiver Communication Networks and Spatialised Work Processes in Hospital Wards', *Proceedings of the 11th International Space Syntax Symposium*, 18.1–18.9.

PAGE, M., MCKENZIE, J., BOSSUYT, P., BOUTRON, I., HOFFMANN, T. and MULROW, C., (2021), 'The PRISMA 2020 statement: An updated guideline for reporting systematic reviews', *BMJ 2021,* 372, 71. https://doi.org/10.1136/bmj.n71

PENN, A., DESYLLAS, J. and VAUGHAN, L. (1997), 'The Space of Innovation: Interaction and Communication in the Work Environment', *Proceedings of the 1st International Space Syntax Symposium*, London.

PRISMA Executive, *PRISMA 2020 flow diagram for new systematic reviews which included searches of databases and registers only,* https://www.prisma-statement.org/prisma-2020-flow-diagram [accessed on: 27.07.2025].

RASHID, M. and ZIMRING, C. (2003), 'Organizational constructs and the structure of space: A comparative study of office layouts', *Proceedings of the 4th International Space Syntax Symposium*, London.

RASHID, M., ZIMRING, C., JEAN WINEMAN, F. T., NUBANI, L. and HAMMASH, R. (2005), 'The Effects of Spatial Behaviors and Layout Attributes on Individuals' Perception of Psychosocial Constructs in Offices', *Proceedings of the 5th Space Syntax Symposium*, Delft.

SAILER, K. (2007), 'Movement in Workplace Environments: Configurational or Programmed?', *Proceedings of the 6th International Space Syntax Symposium*, İstanbul.

SAILER, K. and PENN, A. (2009), 'Spatiality and Transpatiality in Workplace Environments', *Proceedings of the 7th International Space Syntax Symposium*, Stockholm.

SAILER, K. and THOMAS, M. (2019), 'Correspondence and Non-Correspondence: Using office accommodation to calculate an organization's propensity for new ideas', *Proceedings of the 12th Space Syntax Symposium*, Beijing.

SAILER, K., BUDGEN, A., LONSDALE, N., TURNER, A. and PENN, A. (2007), 'Effective Workplaces: bridging the gap between architectural research and design practice', *Proceedings of the 6th International Space Syntax Symposium*, Istanbul.

SAILER, K., BUDGEN, A., LONSDALE, N., TURNER, A. and PENN, A. (2009), 'Comparative Studies of Offices Pre and Post How Changing Spatial Configurations Affect Organisational Behaviours', *Proceedings of the 7th International Space Syntax Symposium*, Stockholm.

SAKR, F. L., PACHILOVA, R., HUTCHINSON, P. and MACGADIE, C. (2015), 'Elements of design in workplace environment: Pre and post studies', *Proceedings of the 10th International Space Syntax Symposium*, London.

SCOPUS, https://www.scopus.com [accessed on: 21.11.2024]. Search query: TITLE-ABS-KEY ("space syntax" AND (office OR workplace OR workspace)).

SHARMIN, S. and KAMRUZZAMAN, M. (2018), 'Meta-analysis of the relationships between space syntax measures and pedestrian movement', *Transport Reviews*, 2018, 38 (4), pp. 524–550. https://doi.org/10.1080/01441647.2017.1365101

SHPUZA, E. and PEPONIS, J. (2005), 'Floorplate Shapes and Office Layout', *Proceedings of the 5th International Space Syntax Symposium*, Delft.

SNYDER, H. (2019), 'Literature review as a research methodology: An overview and guidelines', *Journal of Business Research* 104 (2019) pp. 333–339. https://doi.org/10.1016/j.jbusres.2019.07.039

SPACE SYNTAX NETWORK, *Symposia Database*, https://www.spacesyntax.net/symposia [accessed on: 20.10.2024].

SPILIOPOULOU, G. and PENN, A. (1999), 'Organisations as Multi-layered Networks: Face to Face, e-mail and Telephone Interaction in the Workplace', *Proceedings of the 2nd International Space Syntax Symposium*, London.

STEEN, J. (2001), 'The Office: Form and Space for Action', *Proceedings of the 3rd International Space Syntax Symposium*, Atlanta.

STEEN, J. (2009), 'Spatial and Social Configurations in Offices', *Proceedings of the 7th International Space Syntax Symposium*, Stockholm.

STEEN, J. and BLOMBERGSSON, M. W. (2003), 'Useful Spatial Systems for Office Activities', *Proceedings of the 4th Space Syntax Symposium*, London.

STEEN, J. (2010), Offices – the need to design both the spatial and social configuration in new ways. CIB W070 International Conference in Facilities Management, 203–211.

TURNER, A. (2001), 'Depthmap: A program to perform visibility graph analysis', *Proceedings of the 3rd International Space Syntax Symposium*, Atlanta.

WACKERNAGEL, S. (2017), 'Combining Environmental Psychology and Space Syntax Analysis: The extent of users' well-being influencing variables control, protection and privacy in an open plan office', *Proceedings of the 11th Space Syntax Symposium*, Lisbon.

WEB OF SCIENCE CORE COLLECTION, https://www.webofscience.com; [accessed on: 20.10.2024]. Search query: space syntax (Topic) AND "workplace" or "workspace" or "office" (Topic).

WINEMAN, J. and SERRATO, M. (1997), 'Enhancing Communication In Lab-Based Organisations', *Proceedings of the Space Syntax First International Symposium*.

WINEMAN, J. and ADHYA, A. (2007), 'Enhancing Workspace Performance: predicting the influence of spatial and psychosocial factors on job satisfaction', *Proceedings of the 6th International Space Syntax Symposium*, İstanbul.

WINEMAN, J., HWANG, Y., KABO, F., OWEN-SMITH, J. and DAVIS, G. (2013), 'Spatial Layout, Social Networks and Innovation in Organizations', *Proceedings of the 9th International Space Syntax Symposium*, Seoul.

YENEL-GÜLER, G. and DEMIRKAN, H. (2022), 'The Effects of Visual Privacy on Work-Process Interactions in Open-Plan Offices a Computational Approach to Measure Interaction, Generic and Targeted Visibility', *Proceedings of the 13th Space Syntax Symposium*, Bergen.

EUROPEAN SPATIAL RESEARCH AND POLICY

Volume 33 2026 Number 1

https://doi.org/10.18778/1231-1952.33.1.09

Artur BOHÁČ [*], Emil DRÁPELA [*], Bartosz CZEPIL [**]

FORMER PRIVILEGED TRANSIT RAILWAY LINES AS INSTRUMENTS OF CROSS-BORDER INTEGRATION? A COMPARATIVE STUDY OF THE LINES IN THE CZECH-POLISH BORDERLAND

Abstract. Privileged transit traffic or similar railway lines illustrate Central Europe's historical interdependence and the persistence of infrastructural anomalies. This paper analyses their contemporary role as instruments of cross-border integration through two Czech-Polish cases: the Liberec–Bogatynia–Zittau–Varnsdorf–Seifhennersdorf line in the west, which also includes German territory, and the Jeseník–Głuchołazy–Krnov line in the east. Using a qualitative comparative approach that integrates document analysis, field observation, and stakeholder interviews, the study assesses how governance density, fare regimes, and accessibility influence the dimensions of cross-border integration. The results reveal contrasting trajectories. The Zittau line, embedded in trilateral governance frameworks and supported by fare integration, enables frequent services and symbolises everyday transnational normality, except for a small section. Conversely, the Głuchołazy line remains hindered by outdated legal arrangements, low frequency, and peripheral infrastructure. These differences underscore that multilevel governance and fare harmonisation are crucial preconditions for cohesion, while regulatory fragmentation and institutional inertia exacerbate marginality. Overall, the study argues that privileged transit railway connections, if supported by regional advocacy and coordinated investment, can evolve from historical exceptions into agents of European integration.

Key words: transport planning, transnational mobility, privileged transit traffic, Czechia, Poland.

[*] Artur BOHÁČ, Emil DRÁPELA, Technical University of Liberec, Faculty of Science, Humanities and Education, Department of Geography, Komenského 314/2, 460 05 Liberec, Czechia; e-mails: artur.bohac@tul.cz, emil.drapela@tul.cz, ORCIDs: https://orcid.org/0000-0001-6238-7472, https://orcid.org/0000-0002-6537-3962

[**] Bartosz CZEPIL, University of Opole, Institute of Political Science, Katowicka 89, 45-061 Opole, Poland; e-mail: bczepil@uni.opole.pl, ORCID: https://orcid.org/0000-0003-4907-795X

Received: 06.10.2025, Revised: 05.11.2025, Accepted: 19.11.2025

Funding information: The authors declare that this research was funded by the project "The Impact of Post-war Population Transfers on the Czech-Polish Cross-border Cooperation", supported by the Polish National Science Center (NCN), 2021/43/I/HS5/02529, and the Czech Science Foundation (GAČR), grant No. 23-04226L. **Conflicts of interests:** None. **Ethical considerations:** The Authors assure no violations of publication ethics and take full responsibility for the content of the publication. **The percentage share of the Author in the preparation of the work is:** A.B. 33%, E.D. 33%, B.C. 33%. **Declaration regarding the use of GAI tools:** The Authors hereby declare that they used ChatGPT for the following purpose: English language translations and corrections. The Authors then carried out a thorough and critical review of the text, with particular attention to potential false, incomplete, or biased information, possible plagiarism or lack of proper/accurate authorship attribution and revised it accordingly.

1. INTRODUCTION

In post-Schengen Central Europe, national borders no longer constitute significant barriers for physical movement. Yet in practice, many transport connections remain fragmented, especially in peripheral and mountainous areas (Kołodziejczyk, 2020). One notable case involves privileged transit traffic (PTT) (also known as corridor traffic or *péage*) railways, which traverse foreign territory as part of domestic routes. Although rooted in the functionalist logic of imperial railway planning, these corridors operate theoretically under a very different governance environment shaped by the European Union (EU), multilevel coordination, and the increasing salience of sustainable mobility. However, the interests of national or regional governments still play a crucial role in their functioning, and a passenger can experience a train ride at a speed of 30 km/h on a straight section. National sentiments are also important considering ties between Czechia and Poland or Germany, which have been sharpened by various border crises and incidents (e.g., the migration crisis, restrictions related to the COVID-19 pandemic, controversy surrounding the Turów Mine, and mass Czech shopping tourism in the Polish borderland).

Notable efforts were made to map transport connections in the region in a complex manner (Kołodziejczyk, 2020) or with a focus on the road network (Furmankiewicz *et al.*, 2025). Still, PTT railway lines remain underresearched, despite the topic intersecting recent European debates on railways, specifically cross-border integration (CBI) (EU Agency for Railways, 2022) and multilevel governance (MLG) (Perić, 2019). In addition, the Czech-Polish borderland provides a motivation for observing these dynamics, given its post-war territorial evolution, asymmetrical development patterns, and active Euroregional cooperation. This study emphasises the function of railway connections rather than the physical railways as infrastructure, but physical attributes cannot be overlooked. It seeks to contribute to the state of the art in cross-border transport studies in three main ways:

– It introduces the concept of PTT railway lines into the CBI analytical framework, emphasising their dual role as both products and drivers of multilevel coordination.

– It offers a comparative analysis of two unique cases, representing contrasting governance and performance models.

– It provides empirically grounded insights into the institutional and infrastructural conditions that enable or hinder the transformation of transport anomalies into cohesive systems.

This paper asks the following research questions:

RQ1: To what extent can railway lines that operate under PTT or similar arrangements function as drivers of regional CBI?

RQ2: Which institutional and infrastructural conditions enable or hinder such a role?

We respond by comparing two corridors that share historical origins but diverge in contemporary performance. We seek to unpack these transport phenomena's multiscalar challenges and potentials. Our contribution is threefold:

– We sharpen the four-dimensional CBI framework by specifying governance-density and accessibility mechanisms.

– We offer an analytically balanced comparison between two historically similar yet operationally divergent corridors.

– We derive implementable policy levers for Central European borderlands.

The following working hypotheses guide the study:

H1: The presence of multilevel governance structures enhances PTT railway lines' functional and symbolic integration.

H2: The lack of fare integration and passenger accessibility regimes constrains the potential of such railway lines to serve as tools of regional cohesion.

H3: Historical dependencies, infrastructural ownership and investment priorities are critical in shaping PTT railway lines' current utility and governance.

2. THEORETICAL BACKGROUND

The study draws on concepts from border studies, political geography, and transport geography. PTT railway connections are situated within the broader framework of cross-border spatial integration, defined by Perkmann (2003). The paper also draws on insights from MLG (Hooghe and Marks, 2003) and infrastructure regionalism (Bachtler *et al*., 2013), highlighting how transportation infrastructure can serve as both a product and a driver of integration. Recent analyses confirm that transport infrastructure remains a decisive factor in shaping regional development trajectories and integration potentials, particularly in Central and Eastern Europe (Komornicki and Goliszek, 2023). From a metatheoretical standpoint, the research is anchored in a relational constructivist perspective, which views borders and infrastructures not as fixed entities but as socially constructed and practice-dependent. PTT railways are thus conceptualised not merely as a line on a map, but as a dynamic field of cross-border interaction, power asymmetries, and policy experimentation (Sohn, 2014).

Borderlands often reflect the traits of peripheral regions, characterised by negative socioeconomic trends and structural disadvantages compared to the central areas. A notable example of vulnerable borderland peripheries includes territorial protrusions, geographical anomalies where a country's land extends into the territory of a neighboring state (Alpini, 2003). These cases are also connected to the railway lines studied in this text. These areas often face transportation disadvantages, as the most direct or practical routes between two points

within the same country may traverse foreign territory. The border effect is especially pronounced in such contexts, further weakening cross-border interactions and intensifying their peripheral status (Drápela and Bašta, 2018). Cross-border transport plays a pivotal role in regional integration and economic development, enabling the movement of people and goods across national frontiers. It significantly enhances cross-border cooperation (CBC) and cross-border integration, particularly in its functional dimension. However, it also strengthens the ideational dimension of CBI, fostering mutual contact, peaceful coexistence, and the development of cross-border identity (Durand and Decoville, 2019). Despite its importance, the development of cross-border transport systems, including the PTT ones, is frequently hindered by various challenges. Political barriers, including regulatory differences, a lack of intergovernmental coordination, and historically divergent priorities, often obstruct effective transport integration (Smolarski, 2018).

Generally, extraterritorial transport involves moving across national borders involving a foreign territory before returning to the original country of departure. In a stricter sense, it is formally or operationally under the jurisdiction of the originating state and is free from local policies in a foreign territory. It may include application of the originating state's legal norms, technical standards, administrative authority, or military presence within foreign territory. PTT constitutes a special case of extraterritorial transit rights. It passes through foreign territory under facilitated conditions, without conferring extraterritorial status to the infrastructure or rolling stock. It is defined by transit rights agreed through treaties, but the infrastructure remains fully subject to the laws and regulatory authority of the transit state. In other words, the privilege applies to the movement of people or goods, not to the infrastructure itself (Sohn, 2014). Extraterritorial or PTT corridors often persist due to historical border realignments, enclaves or exclaves, or path dependency in infrastructure (Popescu, 2012). In short, extraterritorial transport usually allows for disembarking on foreign territory, whereas PTT does not. Extraterritorial regulations often present significant hurdles. Harmonised regulations are essential for facilitating seamless transit operations and minimising conflicts arising from differing national laws (Beckman, 2024).

In practical terms, extraterritorial or PTT corridors can:

– Preserve the continuity of pre-existing routes after political or territorial changes.

– Reduce the economic isolation of regions dependent on transit through neighboring countries.

– Serve as models for flexible territorial governance in border-sensitive areas.

However, they may raise security, administrative, and sovereignty concerns, particularly when geopolitical tensions or bilateral trust deteriorate. An example of an extraterritorial railway was the famous Vennbahn, where Belgium controlled a railway on the territory of German enclaves. Elements of PTT can be observed

in both cases studied in this text, in particular in the case of the Porajów bottleneck on the Liberec–Bogatynia–Zittau–Varnsdorf–Seifhennersdorf line (later referred to as the Zittau line). In the case of the Jeseník–Głuchołazy–Krnov line (later referred to as the Głuchołazy line), there is no such section without a stop within a national territory. However, in the socialist period and on the Głuchołazy line until 2007 and in fact even later, embarking and disembarking were not possible on non-Czech territory. In the Alps region, the existence of PTT-type railway lines is primarily a result of significant geographical barriers (e.g., the Salzburg–Kufstein railway, which traverses German territory). However, these lines usually stop on the host state's territory due to advanced CBI in the region. Pure PTT without stops in the foreign territory is mostly a matter of the past in Europe.

Interwar Poland was fascinating in this aspect. New borders between Poland, Germany and the Free City of Gdańsk, which was under the management of the League of Nations, divided the transportation system previously located within the boundaries of the German Empire, with Poland inheriting from Prussia 2,500 km of railway tracks. The predominantly ethnic German Free City of Gdańsk was incorporated into the Polish customs area, and its railway system was subordinated to the Polish authority. Germany's primary concern was the effective transit of passengers and goods in the east-west axis, while Poland was focused on connecting the south with the ports of the newly accessed Baltic Sea (Sadowski, 2014). The Treaty of Versailles and the Paris Convention of 1921 provided guarantees for the freedom of transit without customs via Poland between mainland Germany and Eastern Prussia, while Poland had the right to transit to the Free City of Gdańsk via Eastern Prussia. Based on the Paris Convention, several railway connections crossing the Polish territory were established. The most prominent example was the former Prussian Eastern Railway (Ostbahn), which connected Berlin with Gdańsk and Königsberg, the capital of East Prussia. In the new border regime, trains from Berlin entered Poland in Chojnice (German-Polish border). In Tczew, they entered the Free City of Gdańsk (Polish-Free City of Gdańsk border) to finally cross the border with the Eastern Prussia in Marienburg (Free City of Gdańsk-German border). The PTT on that route stipulated that passengers could not embark and disembark trains along the non-German section, which was operated by the Polish personnel (Musekamp, 2024).

At the beginning of the interwar period, Polish trains also crossed through the territories of Germany and the Free City of Gdańsk to transport goods from the south to the Baltic Sea coast. As Poland managed the railways in the Free City of Gdańsk, the Polish State Railroad Directorate was established in Gdańsk, underscoring the city's connection with the Polish state. Similarly, Poles had 50% of the seats in the Council of Port and Waterways of Gdańsk, and the other 50% belonged to the delegates of the Free City of Gdańsk, which secured Poland's right to import and export via the port in Gdańsk before the construction of the port in Gdynia (Sławski, 1925).

Cross-border transport in cross-border regions (Euroregions) can be framed through functional regionalism, particularly the CBI. Among the most influential contributions to the study of CBI is the analytical framework proposed by Decoville *et al.* (2013), which conceptualises CBI through four interrelated dimensions: structural, institutional, functional, and ideational. Although this typology has been widely applied in studies of border regions across Western and Northern Europe, it remains relatively underutilised in research focusing on Central Europe, known for historical discontinuities and socio-spatial fragmentation. The institutional dimension pertains to the quality, density, and continuity of governance structures and cooperative networks that operate across borders. As Beck (2019) has suggested, such cooperation can range from informal, *ad hoc* collaborations to formalised, highly institutionalised partnerships. In the Czech-Polish context, such cooperation has been shown to depend heavily on EU-funded local partnerships and Rural Development Programs rather than on enduring governance frameworks (Furmankiewicz and Trnková, 2024). The functional dimension focuses on the tangible flows of people, goods, services, and capital across borders. Functional integration is operationalised through direct travel time, modal connectivity, and cross-border transfers, using analytical approaches similar to those applied in the Czech-German and Polish-Czech regions (Bertram *et al.*, 2023). The structural dimension highlights the critical role of transport and communication infrastructure, along with disparities in living standards, as key motivations for transport. It also accentuates spatial planning in cross-border regions. In the Czech-Polish borderland, the persistence of infrastructural discontinuities and uneven spatial development has repeatedly constrained integration efforts, with investments often addressing deficits in accessibility rather than promoting cohesive regional planning (Dołzbłasz and Raczyk, 2024). The ideational dimension concerns shared regional identity, collective historical memory, and mutual trust. Despite decades of cooperation, shared regional identity across the Czech-Polish border remains relatively weak, shaped more by pragmatic economic interests than by a deeply rooted sense of community or belonging, except for the specific cultural-historical region of Těšín/Cieszyn Silesia (Böhm *et al.*, 2023b).

3. CHARACTERISTICS OF THE STUDIED REGIONS

Both regions lie on the Czech-Polish border, but the western one also includes the Czech-German borderland. After World War II, the population exchange affected both regions, specifically the Czech and Polish border territories. Today, both regions, specifically their Czech and Polish parts, are inhabited primarily by post-war settlers and their descendants, most of whom lack a longstanding tradition of

cross-border interaction. This demographic legacy continues to shape the character of CBC and CBI, as well as overall cross-border continuity (Pászto *et al.*, 2019). The replacement of the historically bilingual or multilingual German-speaking population with monolingual Czech and Polish settlers has introduced a linguistic divide that complicates everyday communication and institutional collaboration. This language barrier persists, despite Czech and Polish being similar and belonging to the Western Slavic language family.

The western region with the Zittau line involves the trilateral Euroregion Nisa-Nysa-Neisse (ERN) territory. Since 1991, the ERN has served as a platform for CBC among subnational, primarily public, actors. It was the first cross-border structure to include partners from the former Soviet bloc. It operates through three legal entities, each representing one of the participating countries, and is supported by national secretariats based in Liberec, Zittau, and Jelenia Góra. The national parts of the Euroregion have relatively similar numbers of inhabitants, areas, and geography. While ERN is considered one of the more successful Euroregions in Central Europe, the level of engagement varies significantly among its national components, with the lagging Polish part (Böhm *et al.*, 2023a). Since 2002, Euroregional collaboration has also been reinforced by the Small Triangle (Malý trojúhelník-Kleines Dreieck-Mały Trójkąt, 2025), a local initiative linking border towns of Zittau, Hrádek nad Nisou, and Bogatynia. CBI in the region manifests in shopping tourism (Czechs in Poland and Germany), tourism (Germans and Poles in Czechia, Czechs in Germany), long-term labor mobility (Czechs and Poles in Germany, Poles in Czechia), and also living on the other side of the border (Czechs and Poles in Germany) (Łaborewicz, 2024; Havlíček, 2025). Generally, the Czech part of the ERN is a semiperiphery, the Polish part is a semiperiphery, and the German part is a periphery regarding the country levels of socioeconomic development. Still, despite the Görlitz District being among the economically weakest in Germany, it is substantially wealthier than the neighboring countries and attracts Czechs and Poles for employment opportunities. In Czechia, the railway lies in the Liberec Region (Liberec District with administrative powers) and the Ústí nad Labem Region (Varnsdorf District with administrative powers). In Poland, it passes through the Lower Silesian Voivodeship (Zgorzelec District) and in Germany through Saxony (Görlitz District).

The eastern region with the Głuchołazy line involves the territory of the bilateral Euroregion Praděd/Pradziad (ERP). ERP has existed since 1997, and its national secretariats are located in Vrbno pod Pradědem and Prudnik (Opiola, 2020). There is a considerable disparity between the Czech and Polish parts in terms of population and area, favoring the Polish part. The Czech part is mostly mountainous, and the Polish part is mostly lowland. The course of the railway bypasses the Zlatohorská Highland and Hrubý Jeseník Massif. Compared to the Polish part, the Czech side of the ERP has limited staffing and lower engagement, creating an asymmetric dynamic that hampers equal participation. Although

formal cooperation among public institutions remains relatively well-established, the involvement of non-governmental organisations is minimal. Their potential is undermined by administrative obstacles and insufficient capacity to participate in EU-funded programs. CBI remains primarily confined to shopping tourism (Czechs in Poland), tourism (Poles in Czechia), and seasonal labor mobility (Poles in Czechia) (Šmigurová, 2023; Bąk, 2024). Generally, the Czech part of the ERP is considered a periphery, and the Polish part is classified as a semiperiphery in terms of country-level socioeconomic development. The studied railway is in Czechia on the territory of the Moravian-Silesian Region (Krnov District with administrative powers) and the Olomouc Region (Jeseník District with administrative powers). It lies in Poland's Opole Voivodeship (Nysa and Prudnik Districts). The maps of both researched railways/regions are depicted in the Results.

4. METHODOLOGY

The study has adopted a qualitative comparative case study approach (Yin, 2014), selecting two functionally similar yet operationally different railway lines with PTT characteristics. The paper is not only qualitative, as numerical data also support railway line operations. The rationale for case selection lies in their historical origin, current legal arrangements, and relevance for regional mobility. Selected railways are the only PTT ones on the Czech-Polish border. The methodology combines the analysis of available documents and statistics (legal instruments, operator materials, EU programs), field observation (stations, ride-along segments), and semi-structured interviews with regional planners, transport coordinators, and passengers.

Passengers for brief interviews to capture perceived accessibility were selected at random, and no records of their identities were made. However, the rest of the interviewees were selected purposefully. The interviews were conducted with the representatives of all national secretariats of the ERN and ERP, transport departments from the Liberec and Moravian-Silesian Regions, and organisations responsible for coordinating and operating public transport, namely KORID in the Liberec Region and KODIS in the Moravian-Silesian Region. These interviews were transcribed and thematically coded against an *a priori* codebook aligned with the four CBI dimensions. They aimed to evaluate the current conditions of cross-border public transport on chosen lines, assess demand and institutional engagement, identify key challenges to implementation, and determine whether active measures were being taken to overcome these barriers. Selected interview responses are cited in the study. All respondents were informed about the research objectives and their intended publication.

The document analysis included primary and secondary sources of varying ages. Relevant data sources included up-to-date public transport timetables, obtained via online platforms such as IDOS.cz for Czechia and E–podróżnik for Poland, as well as the official websites of transport operators. Data collection took place between 2023 and 2025 in both studied cases. The selected information was subsequently visualised using GIS tools. For clarity, the study does not provide the historical German names of many of the towns examined.

Each railway line is analysed along operationalised indicators that are derived from the CBI dimensions (Decoville *et al.*, 2013; Durand and Decoville, 2019):

– Institutional CBI – density and quality of governance and cooperation, legal issues and use of projects.

– Functional CBI – purposes of mobility, including commuting, shopping, and leisure.

– Structural CBI – railway infrastructure condition and speeds, passenger accessibility and number of connections, fare integration, and stops location.

– Ideational CBI – symbolic or identity function of cross-border railway connections and travel.

5. RESULTS

5.1. Barriers to cross-border railway transport in the studied regions

The key legislation is Regulation (EC) No. 1370/2007, binding for all EU countries. However, for both studied lines, a special Czech-Polish Convention (Sdělení č. 6/2007 Sb. m. s.) exists. Overall, specific national differences, such as different VAT rates, can cause considerable difficulties for carriers. In international rail transport, the main complication arises from differing national regulations governing the operation of rolling stock on a country's rail network. Although all railway vehicles must comply with centrally defined EU standards, each type of vehicle must also be approved by the national authority. This homologation is lengthy, often leading carriers on international routes to deploy older rolling stock. A similar problem arises with train drivers, as national examinations include a local language test. Unfortunately, the shortage of bilingual or trilingual train drivers is a limiting factor in developing cross-border services (Rubinstein, 2024). The solution would be to address this centrally at the EU level and designate a single communication language for its entire territory.

Another significant problem that carriers must address in cross-border services is the difference in local VAT rates. Generally, if a passenger uses a cross-border service solely within one country, the local VAT rate should apply and be paid in that country. Conversely, for international tickets, a 0% VAT rate is applied.

This situation creates problems for carriers, as their accounting systems and ticket machines are often not equipped to handle such scenarios. For example, KORID prefers to pay VAT at 21% even on international tickets, because their accounting system cannot distinguish between them and domestic ones (Pospíšil, 2024). Paying VAT in another country is also a complication that leads some carriers, for instance, to refusing the sale of tickets for journeys that do not cross the border.

There are also obstacles connected to financing and organising public transport in various countries. In Czechia, long-distance rail transport is centrally commissioned by the Ministry of Transport, while the regions commission regional rail and bus services. In Germany, rail transport is under the authority of the individual federal states, while bus services are managed at the district level. In Poland, the relevant authorities are at the national and voivodeship levels for rail transport. This asymmetry leads to complications during negotiations or to a limited engagement by the other side toward proposed services that are not among the priorities of central authorities. Lengthy bureaucratic procedures result in delays in project approval or indefinite postponement. Aligning international timetables with domestic transport is also complicated, as partners on both sides of the border sometimes have different requirements for arrival and departure times.

One of the main financial obstacles is the high cost of funding regional cross-border transport, where operations are typically financed from regional budgets. However, under the budgetary tax allocation system, which is the source of revenue for the regions, cross-border transport is not considered – it is merely an additional factor. Therefore, it depends on the willingness of the regional leadership whether cross-border services will be funded or not. The so-called soft projects within the Interreg calls are often used, but these do not address the most essential issue – the financing of operations. Such projects reportedly existed, but they are no longer available today.

In some cases, misunderstandings arise due to passengers' lack of knowledge about the fare systems on the other side of the border. Interviews have indicated that it is vital for drivers to be well-informed about the different types of tickets available in both countries, and for stops to display the clearest possible information about the fare system, not just the timetable. A good solution is international network tickets, such as the Euro-Nisa-Ticket+, which spare passengers the need to handle these issues (Mehnert, 2024).

From a political perspective, there is only one key factor – the willingness to finance cross-border services. The problem primarily lies in the fact that cross-border areas are often a low priority for public transport funding. The existence of cross-border connections usually depends on whether they are attractive to residents of regional capitals and borderland agglomerations, such as Ostrava or Liberec. Another issue may be one-sided interest in cross-border services or the absence of suitable partners on the other side of the border, especially in cases where the same agenda is handled only at the central level, or conversely, only at the municipal level.

5.2. The Zittau line: A model of operational flexibility with a minor constraint

This line crosses three countries within 5 km: Czechia, Poland (Porajów and Kopaczów, settlements of the Bogatynia Commune), and Germany, then it returns to Czechia (Varnsdorf), and in most cases, it continues to Germany (Seifhennersdorf), where the line ends. The line is currently operated by Die Länderbahn (Trilex), linking Liberec with Saxon towns and forming a vital node for regional commuters. The line can be perceived as extraterritorial from both the Czech and German perspectives. However, the transit in the German-Czech-German segment is seamless, so the text is focused on the Czech-Polish-German section.

The need for a railway network around Liberec was connected to the expansion of the textile industry in the city, specifically the need to import coal and to enhance the export of goods. It led to the construction of the Liberec–Pardubice and Liberec–Zittau railway lines, which were opened in 1859 (Schreier, 2004). The Zittau line was based on the cooperation of the Habsburg Monarchy and Saxony. Still, the Habsburgs did not want a foreign railway operator on their territory, so the company called Zittau-Liberec Railways, with a dominant Saxon share, was established. The first traces of PTT could be observed in the legal settings, although the line permitted passenger embarkation and disembarkation within the host state's territory. Since the 1870s, the line has gone from Liberec through Zittau and Varnsdorf to Seifhennersdorf (Rettig, 2010). At the beginning of the 20th century, the Zittau-Liberec Railways were nationalised by the Saxon Railways and then by the German Railways. During the First Czechoslovak Republic, the line was operated by the German Railways. After 1938, the railway experienced its most significant period of growth. The Zittau–Liberec segment was used by express trains running between Berlin and Cheb, or Berlin and Vienna (Bufe *et al.*, 2003).

After World War II, railway operations were limited due to the five-year Soviet blockade in Zittau. In Czechoslovakia, the connection between Liberec and Hrádek nad Nisou was operating under the auspices of Czechoslovak Railways. In Germany, the line was used for accessing warehouses. The stops in Kopaczów and Porajów were abolished due to unclear territorial arrangements (Rettig, 2010). The Treaty on Privileged Railway Traffic on the line sections Seifhennersdorf–Großschönau via Varnsdorf and Liberec–Varnsdorf via Zittau, signed in 1951 between Czechoslovakia, Poland and the German Democratic Republic, formally framed and restored cross-border connections (Vursta, 2014). Since the 1970s, lengthy border checks were gradually shortened, and from 1982, it became possible to embark and disembark in Zittau. Between 1980 and 1990, long-distance express trains operated on the Dresden–Košice and Leipzig–Margecany routes (Šindlauer, 1999). The 1990s meant changes in railway operators. Czechoslovak Railways became Czech Railways in Czechia after the split of Czechoslovakia in 1993. Next year, the East German Deutsche Reichsbahn merged with the West German Deutsche Bundesbahn and Deutsche Bahn was created.

In 2004, operations on the line began to include the companies Connex and Railtrans alongside the Czech Railways. Connex provided services on the Liberec–Zittau–Dresden–Berlin–Stralsund route, while Railtrans operated the Liberec–Zittau–Varnsdorf–Eibau connection. In 2010, the company Vogtlandbahn (then part of Arriva, now Die Länderbahn) took over services on the Zittau line. The Liberec–Dresden connection remained operated by the Czech Railways in cooperation with German Railways. Since 2014, all railway operations have been taken over by Vogtlandbahn-GmbH.

The operation relies on Schengen rules and trilateral agreements regarding track access and rolling stock. The infrastructure is split among the Railway administration in Czechia, PKP Polish Railways in Poland, and German Railways Network in Germany. Despite technical and linguistic complexity, daily passenger services run uninterrupted. Partial fare integration is available through the Euro-Nisa-Ticket+, IDOL, and ZVON systems for the Liberec Region and Upper Lusatia. A small area around Varnsdorf is part of the DÚK system of the Ústí nad Labem Region. Euro-Nisa-Ticket+ is an example of a cross-border fare system that has significantly simplified travel within another country's territory and eliminated a high handling fee charged upon crossing the border. Using such a ticket is also very simple, and passengers do not have to worry about the cost of the trip.

Trains run regularly every hour on weekdays and weekends during the day. The railway between Liberec and Zittau is also used for the Liberec–Dresden line, which operates only on weekends, runs six times a day, and is predominantly intended for tourists. The section between Liberec and Zittau is used daily by approximately 2,500 passengers, as the stream of passengers between the Šluknov Protrusion and the Liberec agglomeration is high. The line is also vital for commuting from Saxon municipalities to Zittau. During weekends, tourists constitute a significant segment of the passengers.

Long-term problems exist with the substandard condition of the railway running on 2.7 km of the Polish territory. This area creates a Porajów infrastructural bottleneck, a small territorial spur wedged between Czechia and Germany and a part of the larger Turoszów Protrusion (Fig. 1). Trains can go there at no more than 30 km/h, which complicates traveling from Liberec to Zittau by half an hour. Reconstruction efforts are connected with plans to reestablish the stop in Porajów. The stop would make it easier for citizens of Bogatynia to travel to Germany and Czechia for work or tourism. The Czech and German sides have been striving to modernise the Polish section for decades, but PKP Polish Railways has practically no interest in doing anything about the dismal state. In 2019, Czech, Polish, and German local and regional politicians and transport coordinators met and prepared the Joint declaration on improving the quality of the railway transport connection Hrádek nad Nisou–Zittau, which was sent to their central institutions (Genus, 2019). In 2025, Martin Půta, the governor of the Liberec Region, met with Paweł Gancarz, the governor of the Lower Silesian Voivodeship. Also, the ERN actively supported the process. It participated mainly as a coordination

(especially KORID and ZVON) and partnership platform, as Euroregions manage Interreg microprojects and in large projects, they are involved in soft roles (Havlíček, 2025). Negotiations led to PKP Polish Railways promising reconstruction by 2025, which is expected to enable trains to travel at a speed of 120 km/h. Nonetheless, the stop on the Polish territory is not a part of the project. Today, the operator pays PKP Polish Railways for transit. Building a stop in the Polish territory could change that.

Multinational dispatching systems complicate real-time coordination. Regulatory fragmentation (e.g., safety standards, driver certification) persists. However, the line exemplifies cross-border normality in everyday life and demonstrates how institutional experimentation and EU co-funding (Interreg large infrastructural projects, Saxon-Czech cooperation) can overcome spatial complexity.

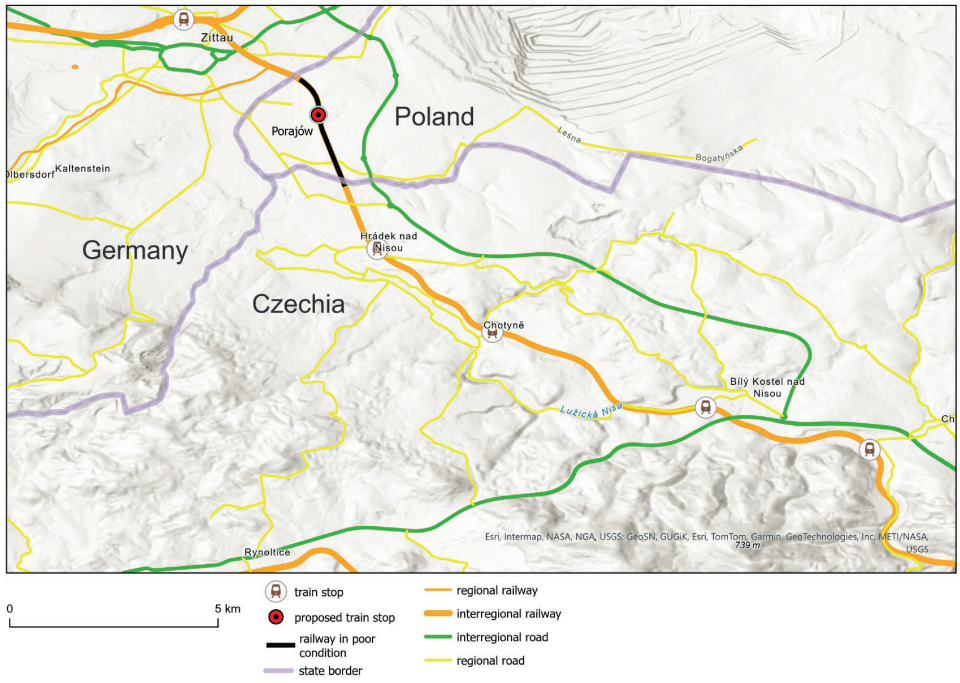


Fig. 1. Map of the Zittau line with a focus on the Porajów question
Source: own work (2025).

5.3. The Głuchołazy line: residual peripheral railway with sparks of hope

This line now serves Czech domestic routes via Polish territory (Głuchołazy). The line's 19th-century origins lie in an Austro-Hungarian-German infrastructural constellation. In 1875, Głuchołazy was connected with Krnov, and in 1888, with Jeseník

(Strauchmann, 2025). Later, the railway was extended to regional centers. The railway was also connected to the Austrian-Hungarian Emperor Ferdinand Northern Railway via Ostrava and the German Upper Silesian Railway via Opole. It was possible to embark and disembark in Głuchołazy despite the legal settings of PTT.

At the end of the 19th century, both sides of the border were populated by Germans, so linguistic and cultural bonds facilitated cross-border passenger movements, including tourism to the Hrubý Jeseník Massif. Since 1918, the line has been operated by Czechoslovak/Czech Railways. A decisive rupture came in 1945–1947 with border shifts, expulsions of ethnic Germans, and securitised border regimes on both sides. Of several pre-war border-crossing lines in the area, three were dismantled. The Jeseník–Głuchołazy–Krnov line survived primarily as a PTT route serving Czech domestic connectivity across a narrow Polish salient. The arrangement was codified in the 1948 Convention (Sdělení č. 45/2005 Sb. m. s.) on PTT via Głuchołazy, which prohibited boarding and alighting in Poland, restricted opening doors and windows, and mandated armed border-guard escorts. These provisions entrenched a transit-only logic and a strong sense of separateness in the everyday experience of the line.

Border-crossing and railway agreements (e.g., convention – Sdělení č. 6/2007 Sb. m. s.) that softened the strict regime emerged after the fall of socialism in both countries. They aimed to align the practice with EU law and enable boarding in Poland under certain conditions. From the Schengen accession in 2007 to 2023–2024, passengers to the Głuchołazy station were checked in accordance to the Czech national tariff, with limited integration into Polish distribution channels and an absent international regional ticket. Passengers from the Głuchołazy station were checked in as if they had travelled from an unstaffed stop in Czechia. Euroregional institutionalisation (ERP) expanded spaces for cross-border dialogue and project programming (Opioła, 2020; Böhm *et al.*, 2023a). Yet these positive shifts did not translate into a fully embedded cross-border passenger service in Głuchołazy. Until recently, passengers could board in Poland only under ad-hoc arrangements; timetable and fare information often remained invisible in Polish channels. The service bypassed the renovated city center station, using an outlying stop 3 km away, which dampened Polish ridership. One random local in the city center told the first two authors, when they were speaking Czech, that the station for Czechs is far to the north. On the Polish territory, low track speeds around 40 km/h compounded the accessibility deficit, while headways on the Czech service pattern remained around 240 minutes, which is inadequate for everyday commuting.

In this context, observed demand outside peak tourist seasons fell to several dozen passengers per day. The resulting equilibrium is self-reinforcing, as low frequency depresses ridership. Weak demand reduces political salience and investment priority. Poor infrastructure constrains speeds and reliability, and the service's weak visibility in Polish information systems dampens new user acquisition (cf. Dołzbłasz, 2017). According to information obtained by the authors from the Polish Ministry of

Infrastructure (following a public information request on 14 November 2024), steps to supersede the 1948 convention culminated in a new bilateral agreement signed on 18 August 2023 (unpublished), harmonising safety and rolling-stock admission standards with EU law. However, the financial architecture remains delicate: the Czech side pays infrastructure charges to the Polish infrastructure manager. The values are modest in absolute terms (approximately 50,000 euros), yet they symbolically reinforce a transit framing rather than a shared, integrated service logic.

There were efforts to limit or cancel the railway operation from the Czech side (Ministry of Transport, Olomouc Region, Moravian-Silesian Region) because of the small number of passengers (several dozen, except during the summer and winter tourist seasons) and the payments to Polish Railways. There were ideas for complete replacement by bus transport that would not go through Polish territory, partial replacement with buses going from the Zlaté Hory railway station to Krnov, or building a new connecting railway between Zlaté Hory and Jindřichov. Currently, both Jeseník and Krnov are advocating for an increase in the number of connections on the route. Considering the planned reconstruction of the Polish segment, they also point to the dismal railway parts on the Czech side. They strive to increase the frequency of trains to 120 minutes, at least on Fridays, weekends and holidays. Since 2013, the rail connection between the two towns has consisted of four pairs of semi-fast trains, operating every four hours. It may be sufficient for occasional travel, such as weekly trips to boarding schools or universities, but not for daily commuting to work or school. Moreover, the connection between the two regions is gradually deteriorating due to the reduction of long-distance bus services (Deník.cz, 2025). Even a direct bus ride takes two hours, while other connections involve additional transfer problems. People then prefer individual car transport, which puts further strain on the region's rather poor-quality roads. Generally, the high interest in functioning railway connections is in the Olomouc Region, because the Jeseník area is relatively isolated. An agreement between the Moravian-Silesian and Olomouc Region on financing the line exists, including payments to the Polish side (Muras, 2024).

Since Poland and Czechia entered the Schengen zone, there have been debates about reconstructing the Polish part and creating stops in the center of Głuchołazy and Pokrzywna/Moszczanka (Fig. 2), which existed before 1945 (Tygodnik Prudnicki, 2025). The stop in the city center would attract more passengers, because the current stop/railway station is distant. A small stop could be built on the Czech track, connected by a footbridge to the existing station in the center of Głuchołazy. Stopping in Pokrzywna would benefit tourists due to the local swimming pool and its proximity to hiking destinations.The strategy of the ERP for 2021–2029 (Euroregion Pradziad, 2020) presents the connection as a strength and a chance for enhancing cooperation. Still, at the same time, it is defined as a weakness, because this connection is not fully exploited, and the railway infrastructure is in poor technical condition, and the Polish section epitomises an infrastructural bottleneck. Finally, the Euroregion has become a platform for lobbying for change.

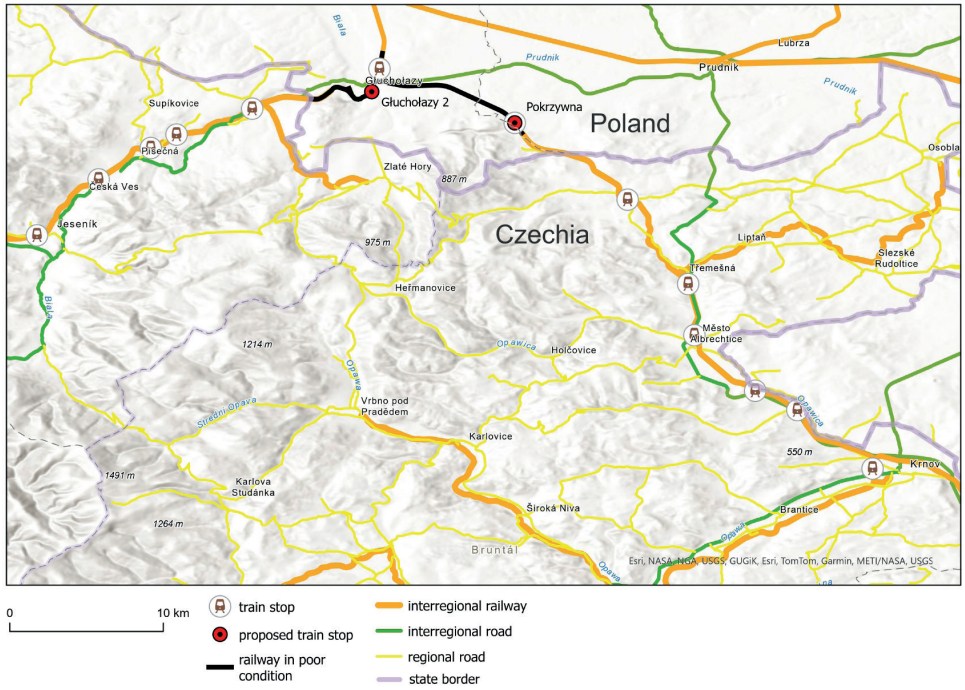


Fig. 2. Map of the Głuchołazy line with a focus on the Głuchołazy question
Source: own work (2025).

Fig. 3. Photos of the tracks in stations Głuchołazy-Center (left) and Głuchołazy (right)
Source: own work (2025).

Administrative inertia prevented the renegotiation of outdated legal regimes. Głuchołazy remains disconnected from broader mobility strategies in the region, and trains to Opole are not frequent. Despite its potential, the line is locked into

a legacy mode of transit. With modest, coordinated interventions, such as increasing the frequency to 120-minute headways on priority days, re-centering access in Głuchołazy plus a tourism stop in Pokrzywna/Moszczanka, targeted renewals on both sides, and a simple cross-border ticket, the line could evolve from a residual corridor into an everyday regional transport axis.

Table 1. Comparative overview of the studied railway lines

Dimension	The Zittau line	The Głuchołazy line
Historical context	Built within the Austro-Hungarian-Saxon cooperation; strong industrial logic; maintained operations during the Cold War via trilateral arrangements.	Developed within the Austrian Northern Railway system; the Cold War bilateral treaty underpins today's regime; relevance declined after 1945.
Geographical context	Mainly in the urbanized lowlands of the Nisa/Nysa River and the Zittau Basin; with one minor barrier in the Nisa/Nysa Valley bridged by the viaduct.	Mostly in rural areas in the foothills of Hrubý Jeseník Massif; with a dispersed settlement network; rugged terrain with pronounced gradients in Czechia.
Governance structure	Trilateral with active ERN and the Small Triangle roles.	Bilateral with growing involvement of the ERP; the legacy treaty framework limits flexibility.
Infrastructure condition	Largely modernised; one Polish bottleneck with upgrading announced for 2025.	Substandard segment on the Polish side; planned works lack national priority.
Service frequency and accessibility	Approx. hourly all day; full boarding/alighting services in all three countries; serves commuters and visitors.	4 semi-fast pairs/day; until 2023, largely transit-only in the Polish territory; the station sits far from Głuchołazy center.
Fare integration	Partial, via Euro-Nisa-Ticket+ and regional systems; comparatively user-friendly.	Minimal until recently; sales under the Czech tariff; no widely usable international integrated ticket.
Passenger demand	High: mix of commuters, cross-border workers, and tourists.	Low: several dozen/day off-season; weak commuter base.
Symbolic/identity function	Strong: an everyday symbol of cross-border normality and regional cohesion.	Weak: residual corridor, weakly embedded in regional mobility narratives.
Key barriers	Speed constraint and no stop in Poland; multilingual driver certification; taxation friction.	Outdated legal base; low national salience; peripheral station siting; low service frequency; terrain.
Drivers of change	Robust regional advocacy (municipalities, ERN); EU co-funding; tourist demand.	Municipal pressure and regional backing (Olomouc, Moravian-Silesian, ERP), but fragile without national commitment.
Overall assessment	Functioning, adaptive cross-border service with solvable constraints; model of operational flexibility.	Peripheral corridor with potential dependent on legal/infrastructure reform and frequency gains.

Source: own work (2025).

The first case demonstrates that even complex PTT arrangements can function effectively when political will, regional advocacy, and EU incentives are aligned. The second case illustrates a stagnant institutional landscape, where historical agreements hinder contemporary functionality.

6. DISCUSSION

In our opinion, the modernisation of problematic sections on Polish territory is a local issue connected with pressure from people and municipalities on regional governments. The studied railway connections are of little importance to the central government. While both lines originated under similar geopolitical and functional conditions, their contemporary trajectories diverge.

The findings speak to the study's guiding questions:

RQ1: To what extent can railway lines that operate under PTT or similar arrangements function as drivers of regional CBI?

They can act as effective instruments of functional and ideational CBI, but only contingently, i.e., when embedded in dense MLG and user-friendly service designs. The Zittau line provides hourly all-day service, partial fare integration, and clear symbolic value normalising everyday cross-border mobility. In contrast, the Głuchołazy line remains weakly integrative due to sparse service and poor accessibility.

RQ2: Which institutional and infrastructural conditions enable or hinder such a role?

Enablers include active governance density (Euroregions, European Groupings of Territorial Cooperation – EGTCs, city-triangles, transport coordinators) that routinise cross-border coordination, simple cross-border tickets and fare integration, regular and short headways, central and intermodal stop locations, targeted capital works on short foreign bottlenecks via trilateral agreements, and recognition of cross-border services in fiscal formulas. Barriers involve regulatory fragmentation (vehicle and driver certifications, multilingual requirements), VAT/accounting asymmetries for international tickets, legacy bilateral treaties, discontinuous upgrades that lock in slow segments, peripheral station siting, long headways, and poor presence in national sales and timetable channels.

Taken together, the results, assembled in Table 1, speak directly to our hypotheses:

H1: The presence of MLG structures enhances PTT railway lines' functional and symbolic integration.

The findings largely confirm this hypothesis. The Zittau line, embedded within a trilateral governance structure and supported by the ERN and the Small Triangle

initiative, demonstrates how institutional density can foster operational flexibility and symbolic integration. Despite technical and legal obstacles, such as speed restrictions on the Polish section and regulations on driver certification, the line has maintained hourly services, integrated partial fare systems, and functioned as a symbol. In contrast, the Głuchołazy line operates under an old bilateral treaty. Its institutional environment is characterised by inertia and asymmetry. The weaknesses of MLG and CBC mechanisms have hindered their functionality and symbolic role. This comparison confirms that governance structures matter in their formal design and capacity to mobilize actors across different levels and sectors (Hooghe and Marks, 2003).

H2: The lack of fare integration and passenger accessibility regimes constrains the potential of such railway lines to serve as tools of regional cohesion.

The analysis strongly supports this hypothesis. The Zittau line benefits from the Euro-Nisa-Ticket+, simplifying cross-border travel by reducing costs and eliminating administrative hurdles for passengers. Additionally, passengers can board and alight at multiple stations across all three national territories without restriction. These factors have generated significant demand, consisting of commuters, tourists, and cross-border workers. By contrast, the Głuchołazy line illustrates the detrimental impact of absent fare integration and limited accessibility, which is closely tied to the region's geographical settings. Until recently, boarding was not permitted on the Polish segment, and passengers were checked under Czech domestic tariffs as if departing from a ghost stop. The current Głuchołazy station is far from the town center, making it inconvenient for everyday use, particularly in combination with the low service frequency of only four train pairs daily. This severely undermines the line's ability to attract passengers. The contrast between the two cases highlights the importance of fare integration and accessible infrastructure as prerequisites for functional and symbolic cross-border mobility, a finding also confirmed by Kołodziejczyk (2020).

H3: Historical dependencies, infrastructural ownership and investment priorities are critical in shaping PTT railway lines' current utility and governance.

This hypothesis is partly confirmed. The Zittau line exemplifies how historical legacies, such as ownership fragmentation between Czech, German, and Polish railway administrations, continue to shape operational challenges. The poor condition of the Polish section remains a bottleneck that undermines the efficiency of the entire corridor. However, through sustained lobbying, trilateral declarations, and EU co-funding, actors have pushed for modernisation, with reconstruction of the Polish segment now planned. Historical infrastructural constraints can be mitigated when there is a political will and external resources are available. Conversely, the Głuchołazy line reveals how deeply entrenched historical arrangements can lock a railway line in a residual mode of operation. The Cold War-era treaty continues to frame operations in ways that are disconnected from contemporary mobility needs. At the same time, infrastructural neglect reinforces its marginal

status. The absence of strong incentives to renegotiate legal regimes or invest in modernisation perpetuates a cycle of decline. However, it is worth noting that the terrain along the line is more complicated than on the Zittau line. This underlines the weight of institutional and infrastructural path dependency, especially in contexts where peripheral position and low passenger numbers reduce political visibility. A general shift in planning responsibility from central to regional levels is also apparent in the road network (Furmankiewicz *et al.*, 2025). This kind of change requires a robust MLG and CBC foundation.

The Zittau line illustrates that PTT railway lines can serve as integration tools when embedded in dense governance networks and supported by integrated fare systems and accessible infrastructure. The Zittau corridor's hourly pattern and partial fare integration reflect the shift from symbolic to functional integration highlighted in cross-border regionalism (Durand and Decoville, 2019). This echoes Sohn's (2014) notion of functional integration in cross-border metropolitan regions: when accessibility and governance routines converge, networks override discontinuities in territorial jurisdiction. It also proves that historical path dependencies can be reframed by strong regional actors and bottom-up cooperation (cf. Perkmann, 2003; Bachtler *et al*., 2013). With the planned reconstruction of the Porajów bottleneck and the potential construction of a stop there, the line could become a standard cross-border railway connection, featuring reciprocal boarding rights across all territories, fare integration, and user-focused governance.

The Głuchołazy line demonstrates how outdated legal frameworks, lack of accessibility, and entrenched infrastructural dependencies can limit the integrative potential of such corridors. These findings align with previous work (Bertram *et al.*, 2023), which demonstrates that mode choice (rail vs. road) has a significant impact on cross-border mobility patterns. Infrastructural barriers and outmoded legal frameworks continue to obstruct the integration potential of the Głuchołazy line. Such developments contrast with Kołodziejczyk's (2020) findings in the Czech-Polish context, which emphasise the catalytic role of multilateral coordination in transforming spatial discontinuities into opportunities for tourism, labor mobility, and regional identity. The stop in Głuchołazy is scarcely used, so in fact, the line is still in a quasi PTT regime. Railway reconstruction and the construction of accessible stops can change this situation.

Notably, the comparison suggests that historical legacies do not predetermine outcomes. With sufficient political will, regional advocacy, and EU-level incentives, PTT connections can overcome structural CBI obstacles and evolve into meaningful instruments of cross-border cohesion. Placing the findings in relation to MLG and infrastructure regionalism, the cases support the claim that transport corridors are both products and drivers of integration, especially connected to the dependence between institutional thickness and user-level integration (Hooghe and Marks, 2003; Perkmann, 2003).

Our results also align with the recent push for sustainable and decarbonized transport in EU strategies (European Commission, 2025). Both lines, despite their anomalies, represent low-emission mobility solutions that could aid in the ongoing modal shift from car to rail. However, only the Zittau line currently illustrates the argument of Bertram *et al.* (2023) that integrating rail into everyday mobility patterns requires reliable schedules and perceptual normality.

Seen in the light of other European and historical cases, as outlined in the theoretical background, the divergent trajectories of the Zittau and Głuchołazy lines reinforce the broader argument that PTT railways reflect wider border dynamics. As exemplified by the Vennbahn between Germany and Belgium or the Ostbahn's post-Versailles configurations, the persistence of corridor-like railways reflects enduring tensions between territorial segmentation and functional connectivity (Sadowski, 2014; Musekamp, 2024). The Czech-Polish cases demonstrate that similar tensions persist in present-day EU borderlands: infrastructural enclaves (Porajów on the Zittau line), legacy transit treaties (Głuchołazy line), and uneven national investment priorities reflect earlier constellations where extraterritorial exceptions were tolerated but rarely integrated. Nevertheless, as illustrated by Alpine PTT-like lines, where former bottlenecks were absorbed into advanced cross-border regimes, contemporary PTT railways may evolve into everyday regional connectors when supported by synchronised reconstructions, fare harmonisation, and user-centred governance.

7. CONCLUSION

Several policy recommendations emerge from this study. Regional authorities should:

– Proactively advocate for the modernisation of bottlenecks located on foreign territory, as local and regional pressure often proves more effective than relying solely on national governments.

– Treat cross-border fare integration as a central accessibility element, extending successful models like the Euro-Nisa-Ticket+.

– Ensure that new or reactivated stops are strategically located to serve residents and tourists, preferably in town centers or near key destinations and multimodal hubs.

– Advocate for reforms in intergovernmental fiscal systems to recognise cross-border mobility within budget allocations, ensuring stable long-term funding instead of relying on short-term project support.

– Strengthen institutional cooperation through structures such as EGTCs, which can provide co-management mechanisms and reduce dependence on outdated bilateral treaties.

Beyond these functional improvements, the ideational dimension of CBI is equally important. The Zittau line illustrates how seamless railway operations normalise everyday transnational practices. Visible markers such as integrated tickets, bilingual signage, and frequent cross-border services reinforce this symbolic dimension. In contrast, the Głuchołazy line demonstrates how inadequate service, restrictive legal frameworks, and infrastructural neglect sustain the perception of borders as barriers, limiting their contribution to regional identity formation.

In conclusion, PTT railway lines hold significant promise as functional and ideational CBI instruments in Central Europe. Realising this potential requires policymakers to view them not as peripheral technical problems but as strategic resources for enhancing connectivity, cohesion, and shared identity in border regions. Far from being anomalies, these railway lines are stress tests of institutional coordination, regulatory flexibility, and political ambition. To fully unlock their potential, policymakers should:

– Update legal frameworks to reflect contemporary needs, including regional stopping rights.

– Pursue technical harmonisation in electrification, rolling stock, and timetabling.

– Foster strong cross-border governance bodies (e.g., EGTCs) capable of co-management.

– Integrate PTT lines into EU transport strategies, particularly the Trans-European Transport Network (TEN-T) (European Commission, 2025) and sustainable mobility initiatives.

– Enhance their tourism appeal, a key driver of cross-border railway demand in the Czech-Polish and Czech-German borderlands.

At the same time, these cases resonate with current EU policy priorities. The Green Deal and the TEN-T framework emphasise decarbonisation, modal shift from road to rail, and improved cross-border connectivity. Successful integration of the mentioned PTT railway lines into European transport strategies would demonstrate the EU's ability to transform historical anomalies into drivers of sustainable regional development and cross-border cohesion.

There are several limitations of the study:

– Relying on qualitative triangulation, as comprehensive multi-year passenger counts were unavailable.

– Interviews were conducted primarily with institutional actors and selected passengers, which may bias perceptions toward governance and operational perspectives.

– Infrastructural and legal changes are ongoing, and the situation may evolve rapidly.

Future work should integrate mobile-device location data and datasets from transport operators to quantify frequency and fare integration. The data, combined with qualitative governance analysis, could be used to test how institutional densi-

ty translates into measurable changes in ridership, frequency, and modal shift. Comparative studies could be extended to other Central European PTT and PTT-like railway connections (e.g., in Austria, Germany or Switzerland) to assess whether similar governance mechanisms and infrastructural path dependencies apply.

REFERENCES

ALPINI, J. (2003), 'De la naissance des territories aux « queues de poêle » et autres écarts de forme', *Mappemonde*, 71 (3), pp. 38–41.

BACHTLER, J., MENDEZ, C. and WISHLADE, F. (2013), EU cohesion policy and European integration: the dynamics of EU budget and regional policy reform, Routledge.

BĄK, P. (2024), Interview with the employee of the Polish part of the ERP, 10 April.

BECK, J. (2019), 'Cross-border cooperation in Europe as an object in transdisciplinary research. An introduction', [in:] BECK, J. (ed.), *Transdisciplinary Discourses on CBC in Europe*, Peter Lang, pp. 13–28.

BECKMAN, L. (2024), 'Authority and coercion beyond the state? The limited applicability of legitimacy standards for extraterritorial border controls', *Jus Cogens*, 6 (2), pp. 141–160. https://doi.org/10.1007/s42439-024-00092-5

BERTRAM, D., CHILLA, T. and HIPPE, S. (2023), 'Cross-border mobility: Rail or road? Space-time-lines as an evidence base for policy debates', *Journal of Borderlands Studies*, 39 (5), pp. 913–930. https://doi.org/10.1080/08865655.2023.2249917

BÖHM, H., BOHÁČ, A. and WRÓBLEWSKI, Ł. (2023a), 'Evaluation of cross-border cooperation in Czechia since 1993: Euroregions on the way to authentic cross-border regions?', *Geografický časopis*, 75 (3), pp. 253–267. https://doi.org/10.31577/geogrcas.2023.75.3.13

BÖHM, H., BOHÁČ, A., NOWAK-ŻÓŁTY, E. and SZAFRAŃSKA, A. (2023b), 'The divided town of Český Těšín/Cieszyn as the most integrated part of the Czech-Polish borderland: a life in the cross-border educational togetherness or side by side?', *Moravian Geographical Reports*, 31 (4), pp. 194–202. https://doi.org/10.2478/mgr-2023-0018

BUFE, S., SCHRÖPFER, H. and LOSOS, L. (2003), Železnice v Sudetech 1938–1945, Praha: RCH.

DRÁPELA, E. and BAŠTA, J. (2018), 'Quantifying the power of border effect on Liberec region borders', *Geografické informácie*, 22 (1), pp. 51–60. https://doi.org/10.17846/GI.2018.22.1.51-60

DECOVILLE, A., DURAND, F., SOHN, C. and WALTHER, O. (2013), 'Comparing cross-border metropolitan integration in Europe: towards a functional typology', *Journal of Borderlands Studies*, 28 (2), pp. 221–237. https://doi.org/10.1080/08865655.2013.854654

DENÍK.CZ (2025), Po letech redukcí obrat, Jeseník žádá dvojnásobek vlaků do Krnova, https://sumpersky.denik.cz/zpravy_region/jesenik-vlak-krnov-20250721.html [accessed on: 16.04.2025].

DOŁZBŁASZ, S. (2017), 'From divided to shared spaces: Transborder tourism in the Polish-Czech borderlands', [in:] HALL, D. (ed.), *Tourism and Geopolitics*, Wallingford: CABI, pp. 123–145. https://doi.org/10.1079/9781780647616.016

DOŁZBŁASZ, S. and RACZYK, A. (2024), 'The stability of cooperation in the context of cross-border cooperation: The example of Poland's borderlands', *Moravian Geographical Reports*, 32 (3), pp. 164–175. https://doi.org/10.2478/mgr-2024-0014

DURAND, F. and DECOVILLE, A. (2019), 'A multidimensional measurement of the integration between European border regions', *Journal of European Integration*, 42 (1), pp. 1–16. https://doi.org/10.1080/07036337.2019.1657857

EU AGENCY FOR RAILWAYS (2022), *Cross-border Rail Transport Potential*, Luxembourg: Publications Office of the EU.

EUROPEAN COMMISSION (2025), Trans-European Transport Network (TEN-T), https://transport.ec.europa.eu/transport-themes/infrastructure-and-investment/trans-european-transport-network-ten-t_en [accessed on: 30.10.2025].

EUROREGION PRADZIAD (2020), *Strategia rozwoju współpracy polsko-czeskiej w Euroregionie Pradziad na lata 2021-2029*, Prudnik: Stowarzyszenie Gmin Polskich Euroregionu Pradziad.

FURMANKIEWICZ, M. and TRNKOVÁ, G. (2024), 'Cross-border cooperation of Polish and Czech area-based partnerships supported by Rural Development Programmes: Genuinely international or solely national projects?', *Moravian Geographical Reports*, 32 (2), pp. 137–150. https://doi.org/10.2478/mgr-2024-0012

FURMANKIEWICZ, M., BURYŁO, K., DOSTÁL, I., HEŁDAK, M., LIPSA, J. and ZATHEY, M. (2025), 'Planning and practice of the Polish-Czech transborder road network development: From ineffective top-down plans to bottom-up lack of coordination?', *European Spatial Research and Policy*, 32 (1), pp. 57–93. https://doi.org/10.18778/1231-1952.32.1.01

GENUS (2019), 2,7 kilometru dlouhý úsek trati přes polské území je v tak špatném stavu, že tam vlaky mohou jezdit max. čtyřicítkou, https://genus.cz/regiony/liberecko/2-7-kilometru-dlouhy-usek-trati-pres-polske-uzemi-je-v-tak-spatnem-stavu-ze-tam-vlaky-mohou-jezdit-max-ctyricitkou-n661977.htm [accessed on: 10.04.2025].

HAVLÍČEK, O. (2025), Interview with the secretary of the Czech part of the ERN, 2 June.

HOOGHE, L. and MARKS, G. (2003), 'Unraveling the Central State, but How? Types of Multilevel Governance', *The American Political Science Review*, 97 (2), pp. 233–243.

KOŁODZIEJCZYK, K. (2020), 'Cross-border public transport between Poland and Czechia and the development of the tourism functions of the region', *Geographia Polonica*, 93 (2), pp. 261–285. https://doi.org/10.7163/gpol.0173

KOMORNICKI, T. and GOLISZEK, S. (2023), 'New Transport Infrastructure and Regional Development of Central and Eastern Europe', *Sustainability*, 15 (6), 5263. https://doi.org/10.3390/su15065263

ŁABOREWICZ, I. (2025), Interview with the historian connected to the Polish part of the ERN, 17 March.

MALÝ TROJÚHELNÍK-KLEINES DREIECK-MAŁY TRÓJKĄT (2025), Official Facebook page, https://www.facebook.com/profile.php?id=100064705987771 [accessed on: 10.04.2025].

MEHNERT, C. (2024), Interview with the managing director of ZVON, 14 November.

MURAS, I. (2024), Interview with the head of the transport department of the Moravian-Silesian region, December 4.

MUSEKAMP, J. (2024), Shifting lines, entangled borderlands: mobilities and migration along the Prussian Eastern Railroad, Bloomington: Indiana University Press.

OPIOŁA, W. (2020), 'Euroregion Pradziad/Praděd', [in:] WASSENBERG, B. and REITEL, B. (eds), *Critical Dictionary on Borders, Cross-Border Cooperation and European Integration*, Peter Lang, pp. 437–439.

PÁSZTO, V., MACKŮ, K., BURIAN, J., PÁNEK, J. and TUČEK, P. (2019), 'Capturing cross-border continuity: the case of the Czech-Polish borderland', *Moravian Geographical Reports*, 27 (2), pp. 122–138. https://doi.org/10.2478/mgr-2019-0010

PERIĆ, A. (2019), 'Multi-level governance as a tool for territorial integration in Europe: Example of the Orient/East-Med Corridor', [in:] SCHOLL, B., PERIĆ, A. and NIEDERMAIER, M. (eds), *Spatial and transport infrastructure development in Europe: Example of the Orient/ East-Med Corridor*, Hannover: Verlag der ARL – Akademie für Raumforschung und Landesplanung, pp. 91–105.

PERKMANN, M. (2003), 'Cross-border regions in Europe: significance and drivers of regional cross-border cooperation', *European Urban and Regional Studies*, 10 (2), pp. 153–171. https://doi.org/10.1177/0969776403010002004

POPESCU, G. (2012), Bordering and ordering the twenty-first century: understanding borders, Rowman & Littlefield.

POSPÍŠIL, O. (2024), Interview with the managing director of KORID, Liberec region, 15 November.

RETTIG, W. (2010), Eisenbahnen im Dreiländereck: Ostsachsen (D), Niederschlesien (PL), Nordböhmen (CZ); Band, Geschichte der Hauptstrecken, Betriebsstellen, Elektrifizierung und Fahrbeschreibungen, Freiburg: EK-Verlag.

RUBINSTEIN, E. (2024), Interview with the managing director of Die Länderbahn, 10 November.

SADOWSKI, S. (2014). 'Separacja sieci kolejowych na Pomorzu Nadwiślańskim w latach 1920–1939', [in:] SIERZPUTOWSKA, K., SADOWSKI, S. and KOSECKI, A. (eds), Świat – Niemcy – Polska: szkice politologiczne i historyczne ofiarowane prof. dr. hab. Zbigniewowi Leszczyńskiemu w 70. rocznicę urodzin, Bydgoszcz: Uniwersytet Kazimierza Wielkiego w Bydgoszczy, pp. 299–317.

SCHREIER, P. (2004), Zrození železnic v Čechách, na Moravě a ve Slezsku, Praha: Baset.

SDĚLENÍ č. 45/2005 Sb. m. s. 2005, Sdělení Ministerstva zahraničních věcí o sjednání Dohody mezi republikou Československou a republikou Polskou o privilegované průvozní dopravě železniční z Československa do Československa přes Głuchołazy.

SDĚLENÍ č. 6/2007 Sb. m. s. 2007, Sdělení Ministerstva zahraničních věcí o sjednání Dohody mezi vládou České republiky a vládou Polské republiky o železniční dopravě přes státní hranice.

ŠINDLAUER, Z. (1999), Už dlouho nejel žádnej vlak: zvídavý pohled do dějin soukromých drah v širším okolí Lužických hor, Česká Lípa: END.

SŁAWSKI, S. (1925), *Dostęp Polski do morza a interesy Prus Wschodnich*, Gdańsk: Drukarnia Gdańska.

ŠMIGUROVÁ, A. (2023), Interview with the director of the Czech part of the ERP, 29 November.

SMOLARSKI, M. (2018), 'Railway border crossings on Polish-Czech borderland. Level of utilization and public transport offer', *Transportation Overview – Przeglad Komunikacyjny*, 3, pp. 1–7. https://doi.org/10.35117/a_eng_18_03_01

SOHN, C. (2014), 'Modelling cross-border integration: the role of borders as a resource', *Geopolitics*, 19 (3), pp. 587–608. https://doi.org/10.1080/14650045.2014.913029

STRAUCHMANN, K. (2025), 'Dlaczego czeskie pociągi jeżdżą przez Polskę? To jedyna taka linia tranzytowa w tej części Europy', https://nto.pl/dlaczego-czeskie-pociagi-jezdza-przez-polske-to-jedyna-taka-linia-tranzytowa-w-tej-czesci-europy/ar/c1-19046092 [accessed on: 12.04.2025].

TYGODNIK PRUDNICKI (2025), *O czeskim tranzycie kolejowym przez Głuchołazy i Moszczankę*, https://www.youtube.com/watch?v=sGCzcTpihq4&ab_channel=TygodnikPrudnicki [accessed on: 12.04.2025].

VURSTA, P. (2014), Mezinárodní železnice Liberec-Žitava-Varnsdorf; Internationale Eisenbahn Liberec-Zittau-Varnsdorf, Liberec: Liberecký kraj.

YIN, R. K. (2014), *Case study research: Design and methods (5th ed.)*, Los Angeles: SAGE Publications.

Book Review

Member since 2018
JM13710

EUROPEAN SPATIAL RESEARCH AND POLICY

Volume 33 2026 Number 1

https://doi.org/10.18778/1231-1952.33.1.06

CITY BRANDING IN A COMPLEX AND CHANGING WORLD: A COMBINED BOOK REVIEW

With a review of:

Bill BAKER, *Place Branding for Small Cities, Regions & Downtowns: The Essentials for Successful Destinations* (4th ed.), Total Destination Management, Portland 2024, 294 pages, Eric HÄUSLER and Jürgen HÄUSLER, *How Cities Become Brands: Developing City Brands Purposefully and Thoughtfully*, Springer, Wiesbaden 2024, 226 pages, and Alex DEFFNER and Mihalis KAVARATZIS (eds), *City Branding: Concepts and Tools for Reputation Management and Tourism Development*, Edward Elgar Publishing, Cheltenham 2025, 213 pages

1. INTRODUCTION

While leafing through the Wizz Air inflight magazine earlier this year, the first author of this article has noticed that Budapest is now promoting itself as a destination with culinary hotspots and other gastronomic highlights (WIZZ, 2026). Apparently, the Hungarian capital wants to shake off its image as a wellness hotspot and a cheap party destination. Interestingly, as we can read in chapter 11 of the last book we are reviewing here, Budapest is indeed advised to rebrand itself and highlight other attractive aspects of the city in an

Received: 07.04.2026, Accepted: 15.04.2026

Funding information: The Authors declare that the work presented in the text was financed by the European Union under the REFRESH – Research Excellence For REgion Sustainability and High-tech Industries project number CZ.10.03.01/00/22_003/0000048 via the Operational Programme Just Transition. **Conflicts of interests:** None. **Ethical considerations:** The Authors assure no violations of publication ethics and take full responsibility for the content of the publication. **The percentage share of the Author in the preparation of the work is:** G.-J.H. 50%, P.R. 50%. **Declaration regarding the use of GAI tools:** Not used.

attempt to cope with overtourism. This example illustrates how relevant city branding is today and that it makes sense for cities to reflect on it. To prevent their image from becoming a plaything of the outside world, more and more European cities are investing in branding: they are positioning themselves strategically to increase their visibility, appeal, and competitive position in a dynamic world.

City branding encompasses more than promotion and marketing aimed primarily at the outside world. Or, as Kavaratzis (2014, p. 70) has put it: "City branding is understood as the means both for achieving competitive advantage in order to increase inward investment and tourism, and also for achieving community development, reinforcing local identity and identification of the citizens with their city and activating all social forces to avoid social exclusion and unrest." Ideally, a city brand should generate positive feelings among all the city's target groups, whether they are visitors, locals or other stakeholders. That is a high ambition, especially in this complex and changing world in which cities are exposed to numerous and sometimes conflicting forces. What exactly is city branding, how does it work and which actors are relevant? What can be said about contemporary city branding from a theoretical perspective? And are there real-world examples from which cities that want to invest in place branding can learn?

2. A BELOVED SENSE OF PLACE

Among city branding professionals, Baker's *Place Branding for Small Cities, Regions & Downtowns* (2024) has become a classic. In 2024, the fourth completely revised edition of the book was published. Consultant Bill Baker has advised numerous cities and regions in the USA and beyond. What is new about the latest edition of his book is that he relates his knowledge and experience to insights from academic literature and also discusses quite a few examples outside the USA (including European cities and regions). In the text, Baker refers to numerous other experts. Nevertheless, the author positions his handbook as an introduction to place branding without academic pretences. It is intended as a guide for professionals working in everyday city branding practice. The nice thing is that Baker focuses specifically on smaller places. They have fewer resources than large cities, but can nevertheless develop and promote a unique identity – which, according to Baker, is ultimately what it is all about.

The book has three parts, each divided into handy chapters. In part 1, Baker familiarises the reader with the most important concepts from the world of branding and place branding. He explains what brands are, how place brands

differ from commercial brands, and that it sometimes makes sense to consider repositioning and rebranding. A striking example he cites is Bergen: previously, the Norwegian city positioned itself as the 'Gateway to the Fjords' (i.e., as a stop-over destination), but now it brands itself as a UNESCO World Heritage City that lends itself well to a longer visit. According to Baker, city branding is about discovering the local identity, with a focus on the unique characteristics of the place. A city should not create an artificial image but build a brand that is rooted in the local community. Part 2 elaborates on this and shows that place branding involves more than marketing: it touches on local history, culture, economy, spatial quality, and food. All these aspects provide input for a distinctive brand promise that goes beyond clichés such as 'a great place to live, work and play.' Ideally, the process of 'brand truth finding,' as the author calls it, leads to a 'beloved sense of place' and a long-term strategy with which residents can identify. Baker also points to the importance of 'placemaking,' which he describes as "(…) the practice of creating, administering, and managing the public environment so that it presents attractive and rewarding experiences" (p. 112). In other words, users of the city must be able to see the place brand reflected in the public space on the spot. In part 3, Baker offers a step-by-step plan for putting the theory into practice. Being a consultant, he does so in an appealing way: successful place branding requires going through 'the seven As,' namely Assessment, Analysis, Architecture, Articulate, Activation, Adoption, and Action. The book concludes that place branding cannot exist without placemaking: it always comes down to the alignment between policy, communication, and spatial development.

Anyone who compares this fourth edition with the book's first edition (Baker, 2007) will see that place branding as a field has become more complex, comprehensive, and professional over the years. This is particularly evident in the second part of *Place Branding for Small Cities, Regions & Downtowns*, in which the author discusses the influence of recent megatrends like new technological developments (such as social media), changes in consumer behaviour (e.g., overtourism and the impact of digital influencers), and the need felt by policymakers to involve the population in urban policy choices (citizen participation). Whereas branding initially focused mainly on the communication side – with the associated and heavily criticised logos and taglines – at present the field is interdisciplinary and holistic in nature. Ideally, place branding is a lens through which local authorities view their city and steer urban development. Baker admits that place branding does not usually fulfil that role as a 'compass.' But he conveys his message with verve, partly through quotations – there are a lot of them, fewer would have been better – and with the help of examples of place branding from all corners of the globe. Thanks to these examples, from Brainport (the Dutch technology hub of Eindhoven) to the French perfume town of Grasse, practitioners seeking inspiration in the book are well served.

3. CITY BRANDING AS NUDGING

The next book under review, *How Cities Become Brands: Developing City Brands Purposefully and Thoughtfully* (2024) by Häusler and Häusler, is a valuable contribution to the literature on city branding. It considers the field from alternative perspectives, namely the social sciences (Jürgen Häusler's background), and urban history (his son Eric's specialisation). The fact that Häusler senior has also led an internationally operating consultancy firm in the field of branding is evident: while going through the book, the reader must stay focused, because the argument is often related to insights from the world of commercial branding. Surprisingly, the authors do not define place branding until page 80, at the end of chapter 2, using Bill Baker's definition from the 2012 edition of his book discussed above (Baker, 2012) as a starting point. Anyone who thinks that the authors then base their work on this guru is mistaken: the work of Baker and other 'believers' in place branding is strongly criticised in *How Cities Become Brands*. The main thesis of the Häuslers is that a city's image depends on a series of factors – and if place branding is important at all, its role is limited, leaving aside the question of how much autonomy and influence city branders and other local authorities actually have. At best, city branding works as nudging: a push in the right direction in an inherently complex world.

The authors substantiate their argument with a variety of insights. For them, the city is a kaleidoscope. Among other things, they point to the versatility and path dependency of cities, as well as the importance of novels, films and travel guides for urban image formation. In addition to classic and modern place branding literature sources, they refer to the work of authors such as historian Karl Schlögel (2006), sociologist Richard Sennett (2018), and historian Ben Wilson (2021). This provides a refreshing perspective and food for thought for place branders. For example, research shows that, on a global scale, the average city dweller prefers cities with a population of around 625,000 people. And the notion that poor population groups, especially in the Global South, are often not guided by a city's image – they simply go to big cities to look for job opportunities – is thought-provoking as well. Häusler and Häusler also subtly note that, in practice, 'urban icons' like landmarks and other big attractions often fulfil the role that many place branders still attribute to logos. The authors structure their analysis logically: after the introduction, they share their observations of the city as a brand (chapter 2), their own vision of it (chapter 3), and its implications for city branding (chapter 4). In the conclusion, they bring the threads of their story together and urge city branding professionals not to overestimate their role. In fact, they end their book with a kind of Hippocratic oath: if you cannot help, at least make sure you do not harm the city. It is a sobering advice, which leaves readers – especially if they come from the field of place branding – somewhat confused and disillusioned.

It is clear that Häusler and Häusler wrote their book in order to make a critical contribution to the literature and the field. They have succeeded in this – and for that reason alone, the book is well worth reading. At the same time, their extremely detailed argument is open to criticism. To substantiate their vision, they often refer to the 'usual suspects' such as Venice, New York, and Tokyo. These cities are so well known that it is indeed questionable how much influence city branders can have on their image. But what about 'ordinary' cities that are not so well known and popular? To be sure, in this context, the authors discuss their consultancy role in a branding process for the German city of Ulm (2008−2015). However, this case does not really excel in originality and persuasiveness. It is also a pity that the book is full of classifications, lists, and quotations (in this respect, they resemble Baker in their excessive 'name-dropping'), which occasionally makes it difficult for the reader to see the wood for the trees. In order to have an impact on the city branding debate, the authors should perhaps have been less guided by their desire for completeness. After all, we know from the branding literature that it is a short, clear and powerfully formulated message that sticks best with the target group.

4. CITY BRANDING PERSPECTIVES

The third book we review here is the edited volume *City Branding: Concepts and Tools for Reputation Management and Tourism Development* (2025). In 12 chapters, a total of 27 authors shed light on all kinds of aspects of contemporary city branding, from ethical aspects of place marketing to co-creation with stakeholders. Practical examples abound in the form of 15 case studies, which also focus on cities outside Europe, such as Bangkok or Johannesburg. The book was edited by Alex Deffner, retired professor at the University of Thessaly, and Mihalis Kavaratzis, professor of place marketing at Manchester Metropolitan University and the co-founder of the IPBA (International Place Branding Association). The publication of their book also originates from this association: the chapters are largely based on papers presented at the IPBA's annual conferences. As everyone knows, edited volumes are often a miscellany of contributions without a clear common thread. We see that here as well. In their search for a common denominator, the editors ended up with the following structure of the book: Towards new understandings of tools and theories in city branding (part 1), City brand, identity, and reputation (part 2), and City branding and tourism (part 3). In the introductory chapter, the editors try to convince the reader why their book does indeed show coherence. As is usually the case, the emphasis is placed on the motto 'unity in diversity.'

The lack of a common thread in the book is not a problem, however, as the individual contributions are worth reading in their own right. Take the chapter we referred to at the start of this article: in their contribution on Budapest, Pinke-Sziva and three of her colleagues discuss rebranding as a possible response to overtourism in the Hungarian capital. There are four other chapters that are also very inspiring. To begin with, Warren *et al.* (chapter 3) use research conducted in English and Canadian cities to argue that city branding and urban climate policy can complement each other well. As communication and behavioural influence specialists, city branders are ideally placed to encourage residents to think and act in a climate-friendly manner. The contribution by Jørgensen and Clausen on the Danish cities of Herning and Horsens (chapter 4) also offers hope for place branders. Based on Top-of-Mind Awareness (TOMA) measurements over a longer period, the authors show that organising supra-local sports and music events is an effective strategy for raising the profile of an 'ordinary' city, especially if the event venue remains visible and recognisable afterwards. In Chapter 8 on Łódź, Poland's third largest city in terms of population, Hereźniak and Florek share their experiences with co-creation in place branding. Although involving entrepreneurs in this process is challenging, according to the authors, it ultimately results in a place brand that is more professional and effective and, moreover, supported by the stakeholders. Chapter 9 on regional identity and the architecture of public buildings in municipalities is also interesting. The authors, De Jong and Lu, conducted research in three French border regions and show that locally specific architectural styles – in these regions, for example, the neo-Alsatian and Rhinelandic Renaissance style – are more common in smaller towns in the periphery than in centrally located cities.

Viewed from the perspective of Häusler and Häusler (2024), the city branding book edited by Deffner and Kavaratz is a good example of 'preaching to the choir,' i.e., written by and for the 'believers' in the field. Nevertheless, we would be doing the volume injustice with that view, because, as indicated, it offers a great deal of inspiration that is also based on original, innovative, and serious research. And more importantly, unlike the book by the Häuslers, it also pays attention to 'non-usual suspect' cities in addition to Venice, London or Paris. Indeed, let's be honest: what is the added value of yet more research into 'the big and the beautiful' when most people live in cities and towns that are not so well-known? Better to look at the aforementioned case studies on ordinary Danish towns, a city in Poland or border towns in northern France. Another strong point of *City Branding* (2025) is that it discusses strategies that have proven their value in practice. For professionals, this offers hope and a perspective for action; in any case, it is much more motivating than the finger-wagging from Häusler senior and junior, warning city branders not to think that their activities have much impact.

5. CONCLUSION: IF MEN DEFINE SITUATIONS AS REAL…

What is the role of city branding in the current complex and changing world? The books discussed in this review are not unanimous on this point. They focus on different target groups and take different perspectives. This creates an ambivalent picture of city branding and calls for a nuanced conclusion. On the one hand, it is becoming increasingly difficult for place branders to present the city they work for as a clear, distinctive, and consistent brand – their interventions are only some in a large range of determinants of urban image formation, as Häusler and Häusler see it. And in today's short-term society, in which the latest messages on social media platform X seem to be leading, it is increasingly hard to stick to a long-term strategy – even though this is crucial for branding (Krznaric, 2021). On the other hand, the field of city branding has undergone considerable professionalisation in the 21st century. We can observe this both in theory (cf. the empirical studies with policy implications in Deffner and Kavaratzis) and in practice (think of the link between place branding and placemaking stressed by Baker). This professionalisation of city branding has undoubtedly increased its effectiveness in practice.

And what is more, can cities today afford not to engage in branding? Other cities are not standing still, and in this increasingly fierce competition, doing nothing is not an option. As the Thomas theorem, a classic sociological wisdom, powerfully puts it: "If men define situations as real, they are real in their consequences" (DeLamater *et al.*, 2014). According to this principle, perceptions are not just images, but forces that help shape reality. And that also applies to cities – if people think that a former industrial city, for example, has nothing to offer, they will not go there. City branding is, in fact, an application of the Thomas theorem: by telling a compelling city story and translating it into public space, city branders and their municipal colleagues can influence how people see, experience, and treat the city. This is not a simple marketing trick, but making sense of a place. After all, cities flourish when they are able to articulate and reinforce their own identities. In the time of ongoing globalisation, technological change, and social uncertainty, city branding can offer stability. It helps cities to develop a vision, build coalitions, and create trust.

REFERENCES

BAKER, B. (2007, 2012), *Destination Branding for Small Cities: The Essentials for Successful Place Branding*, Portland: Creative Leaf Books.

DELAMATER, J., MYERS, D. and COLLETT, J. (2014), *Introduction to Sociology* (2nd ed.), New York: W. W. Norton.

KAVARATZIS, M. (2004), 'From city marketing to city branding: Towards a theoretical framework for developing city brands', *Place Branding*, 1 (1), pp. 58–73. https://doi.org/10.1057/palgrave.pb.5990005

KRZNARIC, R. (2021), *The Good Ancestor: A Radical Prescription for Long-Term Thinking*, London: Penguin Books.

SCHLÖGEL, K. (2006), *Im Raume lesen wir die Zeit: Über Zivilisationsgeschichte und Geopolitik*, Frankfurt am Main: Fischer.

SENNETT, R. (2018), *Building and Dwelling: Ethics for the City*, London: Allen Lane.

WILSON, B. (2021), *Metropolis: A History of the City, Humankind's Greatest Invention*, New York: Simon & Schuster.

WIZZ (2026), *Inflight Magazine of Wizz Air*, Larnaca: LXM Media and Publishing Ltd.

Gert-Jan HOSPERS * and Petr RUMPEL *

* Gert-Jan HOSPERS, Petr RUMPEL, University of Ostrava, Faculty of Science, Department of Human Geography and Regional Development, 30. Dubna 22, 701 03 Ostrava, Czech Republic; e-mails: gert-jan.hospers@osu.cz, petr.rumpel@osu.cz, ORCIDs: https://orcid.org/0000-0002-7569-7354, https://orcid.org/0000-0003-1583-4983

EUROPEAN SPATIAL RESEARCH and POLICY is an interdisciplinary review

concerned with the problems of social and economic space organization at the local, regional, and supranational levels. The journal, comprising both theoretical and empirical aspects of spatial analysis, is aimed at academics, policy-makers, and practitioners interested in a broad range of spatial developments in contemporary Europe. The scope of the journal is defined by the concepts of space, environment, society, and economy rather than by the names of specific disciplines. Its main areas of interest include regional policy, spatial planning, European integration processes, locational studies, labour market developments, foreign investments, environmental problems, and other crucial issues influencing the shape of contemporary and future European space. The contributions prepared by geographers and regional scientists, as well as economists, planners, architects, sociologists, and historians conducting spatial research within their disciplines reflect the interdisciplinary character of the review.

EUROPEAN SPATIAL RESEARCH AND POLICY is published annually as one volume consisting of two issues and includes refereed articles, notes, commentaries, reports, and book reviews. The journal, being itself a result of close academic cooperation between scholars and universities representing different countries, is an important forum for an international exchange of information and opinions in the field of spatial studies.

CONTENTS

WYDAWNICTWO UNIWERSYTETU ŁÓDZKIEGO
wydawnictwo.uni.lodz.pl
ksiegarnia@uni.lodz.pl
(42) 635 55 77

ISSN 1231-1952