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ARTICLES

Rodrigo KATAISHI [*], Dario MUSOLINO [**], Daniele BRUOGNOLO [***]

DEVELOPMENT OF PERIPHERAL REGIONS: A QUALI-QUANTITATIVE STUDY OF THE SOUTHERNMOST AREAS IN AMERICA AND EUROPE

Abstract. This study compares the economic development of Tierra del Fuego (Argentina) and Calabria (Italy), two highly peripheral regions. Despite their remoteness, they exhibit contrasting trajectories: Tierra del Fuego shows industrial growth driven by state-led policies, while Calabria faces stagnation despite EU support. Using a mixed-methods approach (quantitative institutional data and semi-structured direct interviews), we analyse factors influencing these divergent paths. Findings highlight the crucial role of institutional frameworks and sectoral specialisation, challenging the assumption that peripherality inherently hinders development. Remoteness does not necessarily preclude development. We suggest policy and strategic positioning can transform peripheral status into a catalyst for development.

Key words: peripheral regions, accessibility, manufacturing, development, location factors, Argentina, Italy.

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1. INTRODUCTION

The development of peripheral regions has long been the subject of academic debate, often framed within narratives of structural disadvantage at global or local scales (Oppido *et al*., 2023; Pezzi and Urso, 2016). Geographic isolation, relative location, difficult relationships with major economic hubs, history, and distinct patterns of integration into global markets are typically regarded as fundamental obstacles to growth in these regions (Kühn, 2015; Blowers and Leroy, 1994). While existing literature emphasises the constraints imposed by peripherality, the extent to which geographic remoteness necessarily leads to economic stagnation remains contested (Eder and Trippl, 2019; Frank, 1967). Rather than a fixed condition, peripherality is increasingly understood as a dynamic and relational phenomenon shaped by historical trajectories, institutional frameworks, and economic activity patterns (Oppido *et al*., 2023; Prebisch, 1949). Structural dependencies, governance asymmetries, and unequal access to resources and decision-making processes contribute to the persistence of regional disparities over time (Cardoso and Faletto, 1969; Kühn, 2015).

This study examines two highly peripheral regions located on the southern extremities of their respective continents, America and Europe: Tierra del Fuego in Argentina, and Calabria in Italy. Both regions are situated at the margins of national and continental peripheries, yet they differ significantly in economic structures, sectoral composition, and policy frameworks (Musolino, 2018; Musolino and Panuccio, 2022; Kataishi *et al*., 2023; Kataishi and Ortiz, 2024). Their shared characteristic of geographic remoteness makes them valuable case studies for exploring whether peripherality inherently acts as a constraint or if specific conditions enable the emergence of distinct economic models (Eder, 2019; Fitjar and Rodriguez-Pose, 2011; Kataishi and Brixner, 2024).

The research investigates whether geographic isolation inevitably hinders development (Kim, 2013; Letaifa and Rabeau, 2013) or if it can, under certain circumstances, generate competitive advantages (Buheji, 2020) and new development trajectories (Ganesan *et al*., 2005). Despite its distant location from national and continental cores, Tierra del Fuego has experienced notable economic and demographic growth, driven largely by state-led industrial policies (Deluca and Kataishi, 2023). In contrast, Calabria faces persistent stagnation and population decline, marked by weak institutional support and economic fragmentation (Ferdinando *et al*., 2023; Musolino and Panuccio, 2022; Musolino, 2018). This divergence problematises the notion that peripherality inherently constrains development, instead foregrounding the pivotal influence of institutions, policies, and local agency in shaping regional trajectories.

The contribution of this study lies in its reassessment of geographic peripherality through the lens of socio-economic and institutional frameworks, highlighting their role in shaping developmental trajectories in regions traditionally

viewed as disadvantaged. By examining Tierra del Fuego and Calabria – two geographically remote regions with diverging economic paths – it challenges the assumption that remoteness inherently leads to stagnation. Through this comparative analysis, the research reframes peripherality as a dynamic and contingent condition rather than a deterministic constraint. It underscores the significance of governance, sectoral specialisation, and institutional agency in fostering regional resilience, ultimately demonstrating that tailored policies and institutional coordination can transform peripheral status into a catalyst for development.

The paper addresses three core research questions: (1) Does extreme peripherality necessarily hinder economic development, or can it enable alternative growth models? (2) What factors – structural, institutional, or policy-related – account for the differing outcomes in Tierra del Fuego and Calabria? (3) Can peripherality itself become an advantage under specific circumstances? To answer these, we aim to analyse and compare the development models of these regions, identifying the drivers behind their contrasting performances.

Our approach combines quantitative and qualitative methods. We draw on statistical data from Argentine (INDEC, IPIEC) and Italian (ISTAT) sources, including metrics such as population trends, GDP per capita, and employment rates. Complementing this, we conducted semi-structured interviews with 15 key informants (10 from Calabria, 5 from Tierra del Fuego) between June 2019 and February 2020, analysing the responses through semantic and thematic techniques. This dual methodology provides a comprehensive view, blending empirical trends with stakeholder perspectives.[1]

The paper is structured as follows: Section 2 details the case study regions and their selection rationale. Section 3 presents a comparative analysis of their demographic and economic profiles. Section 4 explores findings from the interviews data, focusing on local development dynamics. Section 5 synthesises results and discusses broader implications. Through this systematic examination, we seek to clarify how peripheral regions navigate their geographic constraints, offering evidence that challenges conventional assumptions about remoteness and development.

2. THEORETICAL FRAMEWORK

Peripherality has long been framed as a condition of structural disadvantage, traditionally understood as a geographic and economic reality that limits a region's development prospects (Amin, 1976; Prebisch, 1972; Kühn, 2015). However,

[1] Data limitations and classification differences hindered comparisons. Adjustments included temporal alignment, currency conversion, and employment rate recalculation using ISTAT metadata.

contemporary scholarship increasingly conceptualises peripherality as a dynamic and relational phenomenon shaped by historical, institutional, and economic processes (Blowers and Leroy, 1994; Fischer-Tahir and Naumann, 2013; Rodríguez-Pose, 2018). Rather than being a fixed characteristic of remote territories, peripherality is produced and reinforced through patterns of capital accumulation, governance asymmetries, and integration into global economic networks (Arrighi, 1994; Gereffi, 1999).

Peripherality is not merely a matter of geography or distance from urban centres; it is increasingly understood as a multidimensional condition shaped by socio-economic and institutional relations that reveal configurations of power dynamics, inequalities, and development trajectories over time. In this view, being "peripheral" is a socially constructed status emerging through interactions between core and peripheral regions. Classic theories (Prebisch, 1949, 1972; Furtado, 1964; Dos Santos, 1970; Cardoso and Faletto, 1969) rooted in the Latin American structuralist tradition established the core-periphery framework in economics, which later informed dependency theory. These scholars emphasised that peripherality is produced and reinforced by historical patterns of hierarchical relations: core-periphery models, for instance, illustrate a dynamic where central regions concentrate decision-making power, resources, and innovation, while peripheral regions are confined to subordinate roles (Amin, 1976). Such dynamics are historically shaped as communities grow, expand, or conquer one another (Frank, 1967). Crucially, this concept is not an inherent or immutable characteristic of a place. Instead, it arises from complex interactions in which certain locations become "central" by accumulating wealth, talent, and influence, whereas others are relegated to "peripheral" status due to subordination to the core and internal disparities. This highlights divergent development trajectories between regions and underscores that peripheral status must be defined relationally – it is not a fixed state but may shift over time due to changes in underlying relationships (e.g., political power, economic networks, global hierarchies, or production systems). Peripherality should thus be regarded as a socio-spatial construct, produced through structural relations, policy frameworks, and narratives developed over time, rather than a natural outcome of geographic location alone (Lang and Görmar, 2019; Copus, 2024).

Economic inequality and disadvantage lie at the heart of the core-periphery relationship. From an aspatial (Copus, 2024) structural perspective, peripheral regions tend to be economically specialised in natural resource exploitation, extraction of raw materials, assembly, or other labour-intensive activities. Classic works (Prebisch, 1949; 1972; Furtado, 1964; Gereffi, 1999) noted that this peripheral specialisation leads to uneven trade relationships, tending to export non-complex goods or cheap labour (Ziesemer, 1994) and import higher-value products from the core (Toye and Toye, 2003; Prebisch, 1952), creating a drain of surplus and a reliance on external technologies, capital and markets (Rae, 2017). This means the periphery's accumulation processes are largely determined by their interactions

with other regions, and especially with the core (e.g., influencing commodity price setting, investment flows, corporate strategies, government decisions, political lobbying, and governance), rather than by local actors. Core accumulation and wealth, in this sense, is often associated with lower levels than the core and with a systematic and historically constructed submission to other regions (Baer, 1962).

According to this view, poorer regions are not merely "left behind" by historical accidents or a failure to catch up with developmental trajectories (Rostow, 1985). Instead, they are often rendered poor and unequal through socio-economic relations rooted in their integration into modern capitalism. This process stems from factors such as how, when, and why these regions were incorporated into global capitalist systems, their internal socio-economic and institutional configurations (both pre and post-integration), their enduring trade and exchange linkages with other regions, and the resulting accumulation processes, which are weaker than those in core areas (Frank, 1979; Roberts, 2013; Wilmsmeier and Monios, 2013). Over time, these dynamics manifest as chronic underinvestment, limited industrial diversification, low economic complexity, and – in many cases – brain drain, as skilled workers migrate to core regions for better opportunities (Docquier and Rapoport, 2012; Ameel *et al*., 2015). The concept of uneven development encapsulates this phenomenon, wherein capital and growth concentrate in "central" regions, while peripheral areas face systemic resource constraints, internal inequalities and specialisation lock-in (Meeker, 1984).

The emergence of new economic geography has contributed further insights into the dynamics of core-periphery divisions (Krugman, 1991; Capello and Cerisola, 2020). The concentration of economic activity in central areas is reinforced by economies of scale, knowledge spillovers, and factor mobility, creating a self-reinforcing cycle of agglomeration (Fitjar and Rodríguez-Pose, 2011). Peripheral regions, by contrast, suffer from higher production and transaction costs, lower innovation diffusion, and weaker labour markets (Baumgartner *et al*., 2013; Eder and Trippl, 2019). However, peripherality is not solely a function of physical distance; it is also determined by the degree to which a region is embedded within global value chains, entrepreneurial networks, and knowledge-intensive sectors (Bentivogli *et al*., 2018; Baumgartner *et al*., 2013). Relational remoteness (Kühn, 2015), rather than simple geographic isolation, plays a crucial role in defining the constraints and opportunities available to peripheral economies (Rodríguez-Pose, 2018; Stöhr, 1978).

Yet, it is important to note that these patterns are not permanent. They can be mitigated through deliberate interventions (Stöhr, 1978; Wilmsmeier and Monios, 2013; Rae, 2017) – such as industrial policies, investments in local capacity, or integration into new markets – that aim to transform the unequal relations shaping a region's role (Blomgren and Sørensen, 1998). Contemporary discussions about "places that don't matter" (Rodríguez-Pose, 2018) highlight how prolonged neglect of marginalized regions can exacerbate social discontent, underscoring the

need for proactive investments to rebalance development (Crone, 2012; Grabher, 2018) by fostering integration into larger economic systems (Eder, 2019; Oppido *et al*., 2023). Nevertheless, the execution of such investments hinges on socioeconomic stability, technological capabilities, macroeconomic conditions, and institutional frameworks, which often perpetuate cycles of decline and reinforce peripheral status over time (Hojman and Szeidl, 2008; Street, 1987; Servillo *et al*., 2016).

Within the centre-periphery framework, the nature of relations plays a critical role, as political affinity, regional dynamics, and strategic interests significantly shape interactions (Copus, 2009). For example, focusing on the first two factors, regions with closer ties to core areas often face fewer cycles of economic decline – simplified here as social instabilities arising from inequalities that indirectly destabilise the core. Crucially, closeness in this context transcends geographic proximity (Copus, 2024). Instead, it reflects a region's integration into networks of capital, knowledge, political influence, cultural exchange, and institutional access that underpin core economies. Excluded regions that strengthen these linkages – through strategic economic positioning, policy alignment, or institutional cooperation – may experience less severe economic downturns and greater capacity to reposition themselves within global hierarchies (Stöhr, 1978). This phenomenon may raise important implications on the comparison of two peripheral regions that belong to different continents. Strategies such as the creation of special economic zones, targeted industrial promotion, and investments in connectivity can alter regional dynamics by fostering integration into larger economic systems and, in some cases, extreme peripheral locations can even be transformed into competitive advantages, particularly when linked to strategic assets such as natural resources, tourism, or geopolitical positioning.

However, the result of interventions may not be uniform across different contexts, as their effectiveness is mediated by preexisting frameworks, governance structures, and historical trajectories. Policies that successfully promote economic integration and development in one peripheral region may yield limited or even adverse effects in another, depending on factors such as local capacities, path dependent patterns, and the broader geopolitical environment (Kühn, 2015; Rodríguez-Pose, 2018). Thus, while targeted interventions can facilitate upward mobility within global or regional hierarchies, their outcomes remain contingent on a complex interplay of endogenous and exogenous forces, making direct policy transfers between regions highly uncertain (Blowers and Leroy, 1994; Fischer-Tahir and Naumann, 2013; Kataishi and Morero, 2020).

The persistence of peripherality is shaped not only by economic structures but also by political and institutional asymmetries (Jessop, 2016). Marginalised regions often face constraints stemming from decision-making processes dominated by central actors, reinforcing their reliance on external resources and influence (Ameel *et al*., 2015). This constitutes a multi-scalar dynamic in which global, national, and local forces intersect, conditioning the capacity of peripheral areas to autonomous-

ly alter their structural position (Sibley, 1986; Prebisch, 1972). While integration into multi-level decision-making networks can provide pathways for relative mobility (Servillo *et al*., 2016), the degree to which regions leverage these connections depends on their ability to negotiate favourable terms within internal and external power structures (Meeker, 1984). Consequently, peripheral regions often depend on policies and administrative frameworks misaligned with local needs (Rivera León and Kataishi, 2010), creating a disconnect between formal governance, institutional agency, and situated strategic goals (Fischer-Tahir and Naumann, 2013).

Additionally, social and cultural dimensions represent a critical dimension to emphasise in peripheral constructs. Structural heterogeneity, as theorised by Prebisch (1949), reflects the coexistence of inequalities not only in economic and institutional systems but also in societal development trajectories. Peripheral regions are often poorer and more unequal than core areas, experiencing demographic decline as result (Barlösius, 2023). Deficiencies in infrastructure, healthcare, and education exacerbate these challenges (Paasi, 1995), perpetuating cycles of disadvantage. Beyond material conditions, symbolic hierarchies and discursive constructs also play a role. Fischer-Tahir and Naumann (2013) observe that peripheral regions are frequently framed as "backward" or "remote" within national and global imaginaries, shaping local idiosyncrasies and self-perceptions (Opie, 2010). These narratives influence investment decisions (Musolino *et al*., 2020), policy priorities, and the aspirations of residents, reinforcing patterns of inequality (McDonald *et al*., 2018). However, some scholars argue that adversity fosters resilience, with peripheral communities cultivating robust mutual support networks and distinct cultural identities (Amin, 1976). In this sense, structural heterogeneity transcends economics, reflecting a broader process that shapes how regions are perceived, interconnected, and valued within larger systems (Blowers and Leroy, 1994; Fornes and Mendez, 2018).

3. CONTEXTUALIZATION

3.1. Why Tierra del Fuego and Calabria? The case study regions

Tierra del Fuego and Calabria share a condition of geographic peripherality within their respective national and continental contexts. However, their economic and demographic trajectories diverge significantly due to differences in institutional frameworks, policy interventions, and sectoral specialisation. Over the past decades, Tierra del Fuego has experienced rapid population growth and economic expansion, largely driven by its strategic positioning in national industrial policy. In contrast, Calabria has faced persistent demographic decline and economic stagnation despite continuous public interventions. Understanding the factors shaping

these divergent paths requires a closer look at their historical and economic evolution before delving into their structural characteristics and development models.

The choice of study areas – Tierra del Fuego in Argentina and Calabria in Italy – is driven by several factors. Both are highly peripheral regions. Firstly, in relation to their respective countries: Calabria is the southernmost 'tip of the boot,' while Tierra del Fuego is located at the extreme south of Argentina. Secondly, in relation to their respective continents, Europe and South America. Both regions are thus characterised by low levels of accessibility compared to the central areas of their respective countries and continents.

Tierra del Fuego remained largely uninhabited until the late 19th century, when Argentina began consolidating its national territory through military expeditions and settlement policies. Its early economy was based on fishing, livestock, and oil extraction, but its extreme remoteness limited significant development. A turning point came with the introduction of Law 19.640 in 1972, which created a special economic and fiscal regime to promote industrialisation through tax and customs incentives. This transformed Tierra del Fuego into Argentina's most industrialised province, attracting large-scale internal migration and fostering a manufacturing sector focused on electronics, household appliances, and hydrocarbons. However, this growth model remains highly dependent on national policies and external inputs, rather than on the development of local production networks or export-oriented industries.

Calabria, by contrast, has a much longer history of human settlement, with economic structures dating back to ancient Mediterranean trade routes. Historically an agrarian region, its economic base remained centred on small-scale farming and rural economies well into the 20th century. Unlike Tierra del Fuego, Calabria was deeply affected by waves of outmigration, particularly during the industrialisation of northern Italy, which further weakened its labour force and economic prospects. Despite continuous public interventions – including national subsidies and European Union structural funds aimed at fostering convergence – Calabria remains one of the poorest regions in Italy, struggling with high unemployment, low industrial diversification, and a fragmented business landscape. Unlike Tierra del Fuego, which was transformed through targeted industrial policy, Calabria's reliance on infrastructure investments and financial aid has not resulted in sustained economic transformation.

Although both regions are considered peripheral within their national and continental contexts, their positions shift when viewed on a broader scale. Calabria, often seen as distant from Italy's economic core, occupies a strategic position within the Mediterranean, historically serving as a crossroads of trade and migration. Similarly, Tierra del Fuego, while the southernmost province of Argentina, gains prominence when considered in relation to Antarctica, positioning itself as a logistical hub between Buenos Aires and the southern polar region.

Beyond their geographical location, Tierra del Fuego and Calabria share notable physical features. Both are mountainous, a characteristic that offers potential

for tourism but also presents infrastructural and economic challenges. Their extensive coastal access further shapes their development: Tierra del Fuego, as an archipelago, is deeply linked to maritime industries, while Calabria, despite being surrounded by sea on three sides, has struggled to fully integrate its coastal economy into broader trade and tourism networks.

However, the two regions differ significantly in climate. Tierra del Fuego transitions from cold temperate steppes in the north to oceanic climates in the south, marked by strong winds and harsh conditions. Calabria, in contrast, enjoys a Mediterranean climate, with mild winters and hot summers, where temperatures along the coast range between 10°C and 40°C, occasionally exceeding 44°C during extreme heat waves.

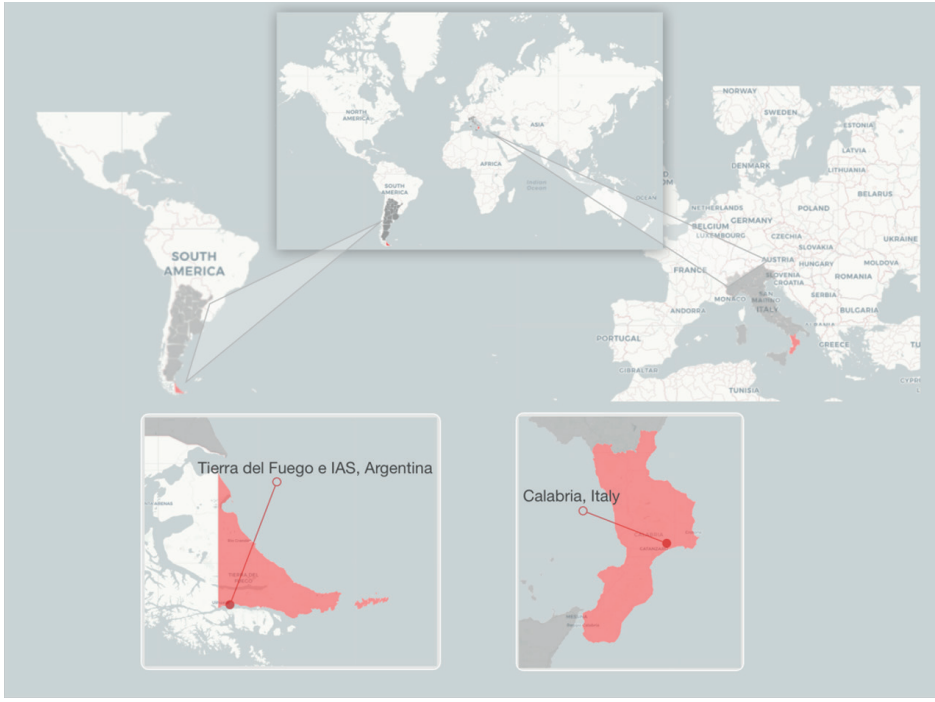

Fig. 1. Geographical location of Calabria and Tierra del Fuego

Source: own work.

Additionally, over the years, as mentioned before, both regions have been the focus of significant policy interventions at the central government and supranational levels (e.g., the European Union), which have profoundly shaped their development trajectories. On the one hand, Tierra del Fuego's economic growth has been policy-driven, with state intervention playing a decisive role in its industrialisation. Calabria, on the other, has been the recipient of EU cohesion policies, yet these interventions have failed to generate long-term economic dynamism. The

comparison of these two cases allows us to explore how different policy models, one based on direct industrial promotion and the other on regional assistance and infrastructure investment, impact peripheral regions in radically different ways.

3.2. Demographic and socioeconomic characteristics: Two diverging models

The two regions have rather different socio-demographic and economic characteristics. Based on quantitative data from institutional sources, their demographic and socio-economic profiles differ significantly.

3.2.1. Population and demographic trend

First, the two regions diverge in terms of population. Tierra del Fuego has a much smaller population compared to Calabria. In 2022, the population of Tierra del Fuego was approximately 186,000 inhabitants, while Calabria had 1,855,000 in the same year. However, Tierra del Fuego experienced a rapid demographic growth (Fig. 2), increasing its population sixfold over the last forty years (whereas Argentina's population grew by only 64% in the same period). This did not happen in Calabria, which has lost about 230,000 people (approximately 11% of its population) since the late 1980s. Its demographic decline is more pronounced than that recorded for Italy as a whole.

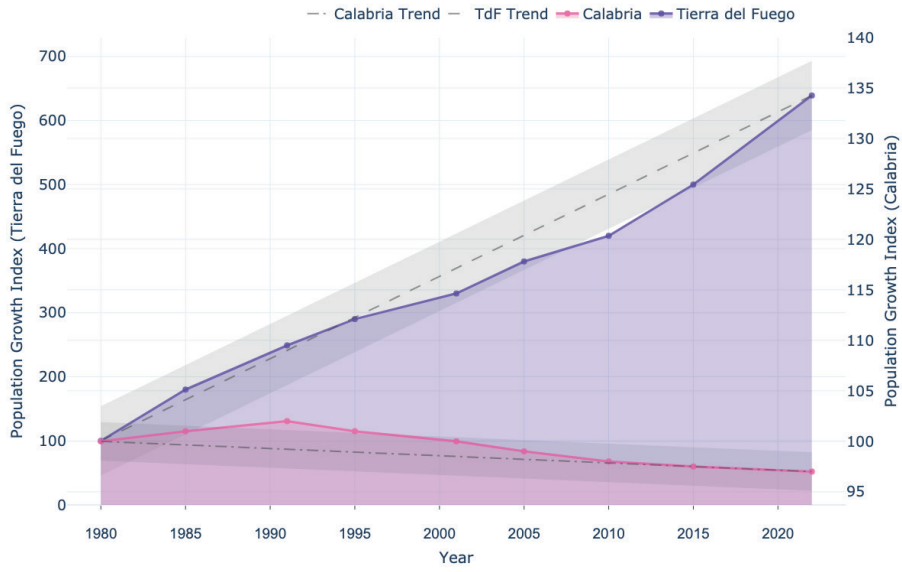

Fig. 2. Demographic change in Tierra del Fuego and Calabria (1980–2022: 1980 = 100)
Source: own work based on data from INDEC and ISTAT.

On the one hand, the expansive demographic trend in Tierra del Fuego was mainly due to positive net migration, linked to the industrial expansion which attracted there a considerable number of people. The declining trend in Calabria, on the other, has been the result of both negative net migration and negative natural change, evidently linked to stagnation or even a relative decline in the level of development.

3.2.2. Economic performance

The analysis of economic performance in the two regions was conducted based on official sources such as the Italian National Institute of Statistics (ISTAT), the Argentine National Institute of Statistics and Censuses (INDEC), and the Provincial Institute of Analysis, Research, Statistics, and Censuses of Tierra del Fuego (IPIEC).

A crucial indicator for comparing development levels in the two regions is GDP per capita (Table 1). To this end, monetary values from Argentina and Tierra del Fuego were converted into Euros at current prices. It emerges that Tierra del Fuego, with its €23,597.98, is the Argentine province with the highest GDP per capita. Calabria has a GDP per capita of €17,087.30, one of the lowest in Italy. Comparing the GDP per capita for the two regions in current Euros is evidently not a completely accurate exercise; one should consider the GDP per capita in Purchasing Power Parity (PPP) for both regions – that is, its real value. Thanks to World Bank data[2], we were able to estimate it (see Table 1). We found that the "nominal gap" between the GDP per capita of the two regions is significantly larger, almost tripling, when expressed in real terms.

Table 1. Indicators of economic development (2017)

Indicators	Calabria	Italy	Tierra del Fuego	Argentina
GDP (million euros)	33,435	1,724,955	3,793	442,598
% GDP out of country GDP	1.94%		0.86%	
GDP per capita (euros)	17,087	28,519	23,598	10,043
GDP per capita (euros; PPP)	21,923		38,087	
Businesses	108,336	4,390,911	6,082	853,886
Entrepreneurial density (businesses / population)	5.5%	7.3%	3.8%	2.0%
Employees	537,000	23,023,000	67,000	12,079,070
Employment rate (population over 15)	31.8%	44.2%	54.0%	36.2%

Source: own work based on data from ISTAT, INDEC, IPIEC and World Bank.

[2] World Bank data was used to compare Italy's and Argentina's per capita GDP in PPP with their nominal values (USD) and to estimate regional per capita GDP in PPP.

Another relevant indicator concerns the development of the entrepreneurial system (Table 1). Calabria shows a picture of greater entrepreneurial vitality (5.5%) than Tierra del Fuego (3.8%), although the latter shows a higher propensity for entrepreneurship than Argentina. This is a figure that could certainly be interpreted positively for Calabria, but not necessarily, considering that it could mean a lower presence of medium and large size enterprises.

Relevant differences between the two regions also emerge in relation to employment. Tierra del Fuego clearly outrivals Calabria both in a direct comparison (the employment rate is 54% in Tierra del Fuego versus 32% in Calabria) and in an indirect comparison, where the employment rate in Tierra del Fuego is about 18 percentage points higher than the Argentine rate, while the Calabrian rate is significantly lower than the Italian rate.

3.2.3. Internationalisation

Another key economic dimension is the level of internationalisation, i.e., the export performance and the attraction of Foreign Direct Investments (FDI).

Data on exports highlight a clear difference between Tierra del Fuego and Calabria. The latter is less competitive in international markets. Although increased from 325 million to 879 million euros over the last decade, Calabria's exports in 2023 accounted for just over 0.1% of the total national exports (Fig. 3). Tierra del Fuego similarly shows a growing trend in exports; however, unlike Calabria, the weight of its exports on the national total is higher (0.55%) and increasing, indicating a superior performance over time compared to its country. In 2023, Tierra del Fuego exported goods worth USD 366 million.

Notably, in 2017, the degree of openness (sum of exports and imports as a percentage of GDP) of Tierra del Fuego was 9%, a figure significantly higher than that of Calabria (3%).

Calabria is a region largely disconnected from global value chains (see also Bentivogli *et al*., 2018). On the contrary, Tierra del Fuego appears much more integrated into global value chains, although its linkage is predominantly of the 'forward' type. This is because its exports are exclusively derived from the exploitation of local natural resources, primarily hydrocarbons and fishery. In contrast, the electronics sector, which is a key part of Tierra del Fuego's industrial activity, does not participate in exports and is entirely directed towards the domestic market.

As far as the attraction of FDI is concerned, the low level of internationalisation particularly of Calabria emerges as well, confirming the findings of previous studies (Musolino, 2016; Musolino *et al.*, 2020). According to the latest data from ICE-ISTAT[3], just 0.1% of the total national FDI stock is destined to Calabria. Em-

[3] https://www.ice.it/it/statistiche/Ide.aspx [accessed on: 31.05.2025].

ployees in foreign-owned enterprises in Calabria amounted to just over 1,600 in 2017, representing about 0.3% of the total regional workforce, and were mainly concentrated in the transportation and logistics sector (followed by utilities). As far as Tierra del Fuego is concerned (ECLAC, 2024), data from CEPAL shows that 4% of all FDIs registered in Argentina is concentrated in Tierra del Fuego. Over 80% of employees in foreign-controlled enterprises in Tierra del Fuego belong to the extractive or oil sector, while less than 10% refer to the mechanical sector.

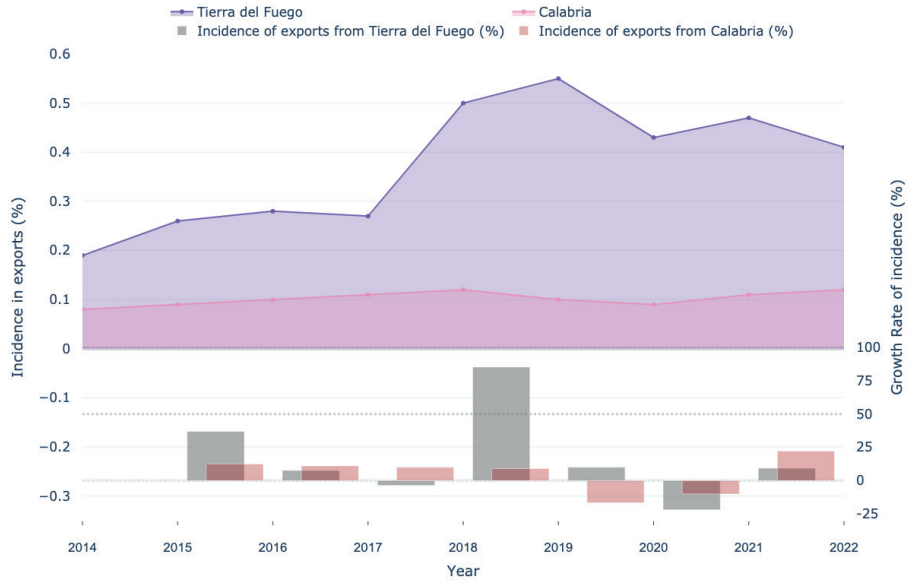

Fig. 3. Incidence of exports from Tierra del Fuego and Calabria, on Argentine and Italian exports respectively (%; current USD and Euro; 2014–2022)

Source: own work based on data from ISTAT and INDEC.

3.2.4. Sectoral composition

The analysis of the sectoral composition also shows two rather different models. The analysis which follows here is based on data about employment and added value at the sectoral level.

As far as the employment data are concerned (Fig. 4), Tierra del Fuego stands as a highly industrialised region compared to Calabria, and even in the Argentine context. In Tierra del Fuego, in fact, manufacturing accounts for 36% of the total regional employment (20.2% in Argentina) while in Calabria accounts for 5% (less than one third of the Italian average, which is 16%). In Calabria, the primary sector and the services sector, particularly the public sector, still play a crucial role. 15% of the employees in Calabria works in the agricultural sector; a percentage

much higher than Tierra del Fuego (2.6%) and Italy in the whole (4%). The Calabrian public sector (including sectors predominantly public, like health and education) account for 24% of the total, whereas in Tierra del Fuego is less than 8%. As far as tourism is concerned (hospitality and restaurants), Tierra del Fuego sounds more developed. While the incidence in Calabria is 5% (less than Italian average, 6%) in Tierra del Fuego is 7.8%, higher than the Argentine average (3.3%).

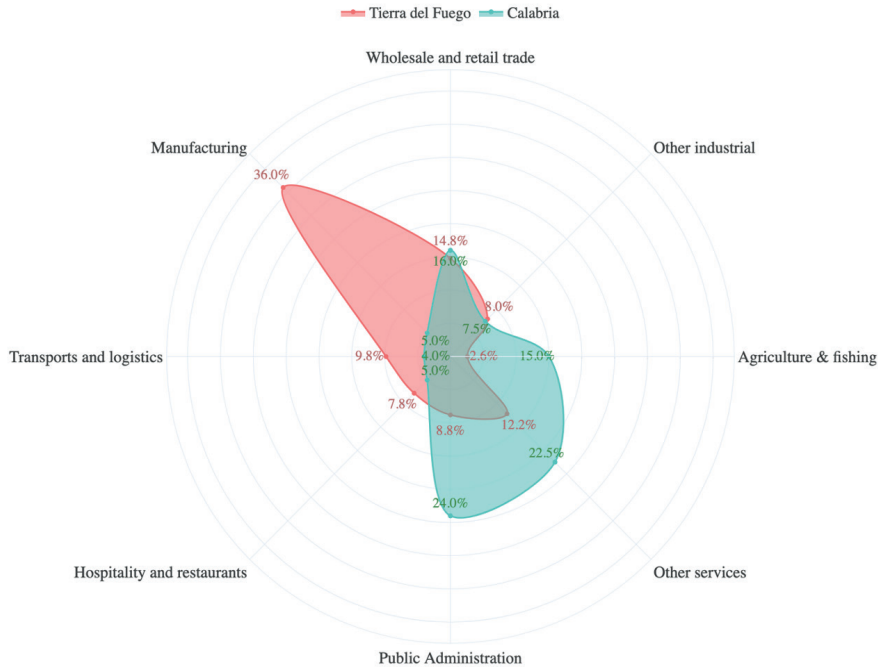

Fig. 4. Employment by sector in Tierra del Fuego and Calabria (2016; %)

Source: own work based on data from INDEC and ISTAT.

The data about added value confirms the relevance of manufacturing in Tierra del Fuego compared to Calabria.[4] The manufacturing share of added value in Tierra del Fuego is 17.5%, while in Calabria is 3.8%. Interestingly, the extractive industry also accounts for a high share of the added value in Tierra del Fuego (26.8%), being evidently a highly capital-intensive sector.[5] In Calabria, instead,

[4] The share of value added by sector for Tierra del Fuego is calculated based on 2007 (for Calabria, it is again 2016), due to the lack of more up-to-date data from the Argentine National Institute of Statistics. The comparison, while asynchronous, nevertheless provides, in our opinion, significant and useful information for the analysis.

[5] The Austral Basin, a key extractive region, produced 9.5% of Argentina's gas in 2018. Its hydrocarbon reserves, expanding through exploration, cover ~6,100 sq. km.

agriculture accounts for a low percentage of the value added, meaning that it is a sector where the productivity is low.[6] As a result, in Calabria the share of value added of tourism activities and other services sector is high.

3.2.5. The development of manufacturing in Tierra del Fuego

Given these specialisations, what is most interesting and surprising is the relevant development of manufacturing in Tierra del Fuego. Therefore, it deserves to be analysed in greater depth.

The Fuegian manufacturing sector is primarily based on electronic and electromechanical production, which has benefited from the impetus provided by public policies, specifically Law 19.640 of 1972. This law, by providing tax and customs incentives, led to the establishment of exogenous industrial activities.[7]

The main products on which electronics and electromechanical companies in Tierra del Fuego have specialised since the 1980s are televisions, domestic air conditioning systems, and microwave ovens. Audio systems for home use, small appliances, washing machines, and some car parts, such as stereos, control units, and car air conditioning systems, however have also played an important role. Since 1986, the production of televisions has increased following the World Cup. In a later stage, the production of mobile phones and notebooks was also started.[8] Production is mainly concentrated in the city of Rio Grande, which has an industrial park of 122 hectares, and to a lesser extent in the city of Ushuaia.

The electronics and electromechanical sector consist of about 30 companies, highly dependent on the importation of external inputs, a circumstance this has not favoured the development of a local productive fabric of small and medium-sized enterprises. The largest companies in the sector are the Newsan group, the Mirgor group, and BGH. These three are multiproduct companies, as they combine the production of consumer electronics and household appliances (such as microwaves, air conditioners, and other home appliances). Newsan is a multisector conglomerate that expanded even into fishing, food processing industry, and financial services, while Mirgor focuses on the production of electronic goods. Following the acquisition of another local company (FAMAR) in 2019, it has become the only one in the province

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[6] Calabrian agriculture is highly fragmented, with 42% of farms under one hectare and a strong specialisation. Three crops dominate 78% of marketable production: olives (24.25%), citrus (23.43%), and horticulture (17.25%). New crops, like peaches in the Sibari plain and kiwis in Gioia Tauro, have been introduced. About a quarter of the agricultural area follows organic practices, mainly for oil production. However, the sector remains low in technological innovation and productivity.

[7] Law 19.640, enacted in 1972, aimed to strengthen Argentine sovereignty over Tierra del Fuego amid concerns the Chilean majority in the region. It promoted Argentine immigration and economic development through tax exemptions (corporate income tax, VAT) and wage incentives. Despite debates on fiscal costs and industrial concentration, the law has been crucial in expanding the region's manufacturing and technological base, driving its industrialisation.

[8] In February 2022, Xiaomi announced a partnership with Etercor-Solnik to produce cell phones in Tierra del Fuego.

specialised in supplying electronic inputs (control computers, displays and screens, and dashboard elements) for the automotive industry. BGH, meanwhile, has a profile more oriented toward household appliances compared to the other two, and associates this production with that of mobile phones and other electronic products.

In these productions, Tierra del Fuego plays the role of a passive receiver of technologies developed somewhere else, limiting itself to the performance of final manufacturing activities. Fuegian companies, therefore, do not intervene in the design and research and development processes of the products. This applies to all electronic goods, except for the vehicle sector where there is a role of co-production/co-design. One of the major problems encountered is that consumer final products manufactured in Tierra del Fuego have as their market only the national territory, while intermediate goods can be sold abroad or placed in other national markets, having then export as their final destination.

Thus, despite their shared peripherality, it is quite clear that Tierra del Fuego and Calabria have followed markedly different development trajectories. While Tierra del Fuego has seen industrial expansion driven by national incentives and sustained population growth, Calabria has struggled with demographic decline and persistent economic stagnation despite decades of public interventions. These differences reflect not only structural constraints but also the varying effectiveness of policy approaches in shaping regional development.

To move beyond macro-level indicators and historical trends, a qualitative field survey was conducted to capture the perspectives of key local actors – policymakers, entrepreneurs, and public officials – on the opportunities and challenges faced by each region. The following section presents insights from 15 semi-structured interviews, focusing on regional development models, policy outcomes, and sectoral competitiveness, offering a comparative perspective on Tierra del Fuego and Calabria.

4. FIELD SURVEY WITH KEY INFORMANTS

To delve deeply into the interpretation of development models of the two regions, a qualitative survey was conducted, featuring 15 semi-structured direct interviews with key informants (Corbetta, 2015), 10 for Calabria and 5 for Tierra del Fuego.[9]

To ensure a sufficient variety of perspectives and expertise, we identified and selected key informants with diverse backgrounds and positions. Among the interviewees were officials or executives of public entities or institutions, provincial legislators, representatives of trade associations, economists, and entrepreneurs. Additionally, several interviewees had technical profiles and played key roles in

[9] This a non-interventional study, where ethical approval is not required according to the national laws (Italy and Argentina).

local initiatives related to development, production, entrepreneurship, public policy, and legislation.

Almost all interviews, conducted between June 2019 and February 2020, were carried out via Skype and lasted about an hour. With the interviewees' consent, they were recorded and transcribed to best process the information.

Since these were semi-structured interviews, an outline was followed in both Italian and Spanish. The questions focused on five key topics identified as central to this survey: socioeconomic characteristics and development model; development policies; competitiveness and attractiveness (competitive and locational advantages); infrastructure and services; tourism development. We analysed the transcripts of the interviews by means of two techniques: a quantitative semantic analysis, specifically frequency based descriptive analysis, and a thematic analysis.

4.1. The crucial words and topics addressed by key informants: A quantitative semantic approach

Frequency-based descriptive analysis is a fundamental technique in the quantitative semantic approach. It involves examining the occurrence and distribution of individual words within a text corpus (Luhn, 1958) based on the assumption that the frequency of a word reflects its importance and centrality to the themes discussed in the text (Zipf, 1949). By identifying the most frequently used words and phrases in interview transcripts, researchers can detect salient themes, shared experiences, and common perspectives among participants.

This approach enables a systematic and data-driven exploration of large volumes of qualitative data, complementing traditional manual coding methods (Namey *et al.*, 2008). The analysis is two-fold. The first part involves a bigram analysis, while the second focuses on correspondences related to correlation matrices derived from the textual corpus and interviews. The bigram analysis examines the co-occurrence of word pairs, uncovering common phrases and associations within the text (Biber *et al*., 1998; Manning and Schütze, 1999; Evert, 2005). This method provides a balanced unit of analysis, capturing both specific root meanings and broader semantic senses of the text, offering more coherent and interpretable topics by considering the co-occurrence of related words (Blei and Lafferty, 2009).

Complementing the bigram analysis, correlation matrices explore the relationships and similarities between interviews and the co-occurrence of topics across the text corpus. These matrices visualise and quantify associations within the data, allowing the identification of patterns and connections that illustrate underlying correspondences across groups in the fieldwork (Friendly, 2002). By constructing correlation matrices, where each cell represents the correlation coefficient between two interviews, we aim to uncover patterns and connections that reveal

shared narratives and common experiences, both within and between locations (Tierra del Fuego and Calabria). Additionally, examining the correlation matrix of topics across interviews provides a detailed view of underlying differences, highlighting idiosyncratic patterns in bigram relevance. The correlation coefficient measures the similarity or dissimilarity of the content discussed in each pair of interviews (Ahlgren *et al*., 2003; Namey *et al*., 2008). By visualising the interview correlation matrix using techniques such as heatmaps or clustered matrices, we can identify clusters or groups of interviews that exhibit strong similarities, potentially revealing shared narratives or common experiences among participants (Perer and Shneiderman, 2008).

The analysis of the general bigrams reveals several key topics central to discussions across the entire dataset (Fig. 5). Among the most prominent are 'Peripheral Area,' 'Development Model,' and 'Port Gioia Tauro.' These terms reflect a multidimensional approach to regional development, incorporating economic, policy, and resource management perspectives. The emphasis on 'Peripheral Area' underscores concerns about geographic marginalisation, while 'Development Model' points to ongoing debates on effective frameworks for fostering growth.

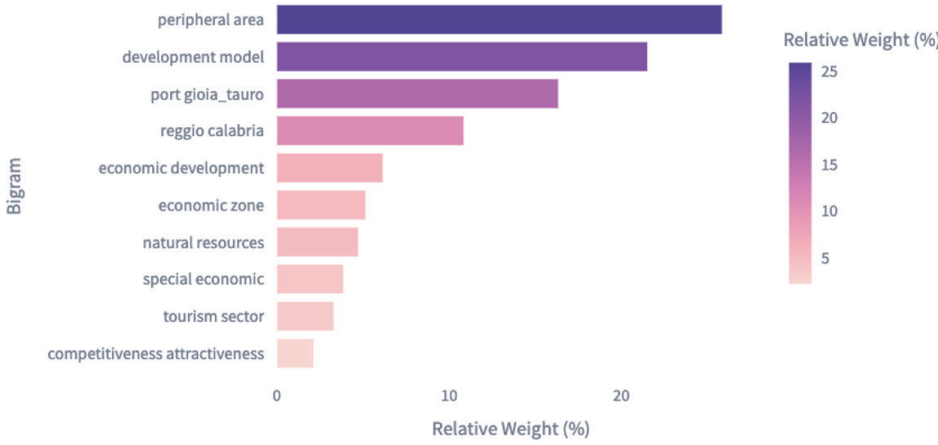

Fig. 5. Overall Bigram Frequencies (Top 10 Relevance: 21.84%)
Source: own work based on the interviews' texts.

Figure 5 presents the aggregated frequency of all fieldwork data, offering insights distinct from the region-specific analyses. Although there is a bias due to the greater number of interviews conducted in Calabria, the results still reveal notable variations between the two cases. This aggregated view contributes to a broader understanding of the overall perspective, which differs from the perspectives emerging from each region's interviews individually. The

most significant terms, such as 'Peripheral Area' and 'Development Model,' carry substantial semantic weight. The prominence of 'Development Model' across narratives suggests a critical examination of alternative economic and social frameworks aimed at fostering regional growth. In this context, the discussion of 'Peripheral Area' reflects concerns about marginalisation and the need for inclusive strategies tailored to regions on the periphery of economic development.

Comparing Calabria and Tierra del Fuego (Fig. 6), several common themes emerge in their bigrams. Both regions emphasise the relevance of "Development Model", highlighting mutual interests in improving economic conditions and exploring various frameworks for growth in their narratives. The shared concern with 'Peripheral Area' underscores the common challenges of addressing marginalised regions. Although there are differences among interviews and groups of interviews, these two topics emerge as the most important topic pairs of the entire fieldwork and within each group.

Despite these commonalities, there are notable differences between the two regions. Calabria's focus on 'Port Gioia Tauro' and 'Reggio Calabria' reflects the strategic importance of these locations in its regional development. In contrast, Tierra del Fuego places a stronger emphasis on 'Sustainable Development' and 'Quality Life,' indicating a greater focus on sustainability and cultural aspects. Additionally, 'Natural Resources' has a higher relative weight in Tierra del Fuego, suggesting a more significant focus on resource management. These differences highlight the unique regional characteristics and priorities in development strategies for each area.

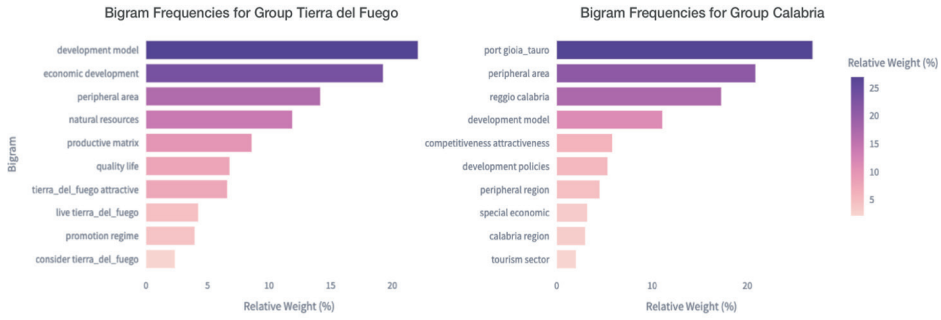

Fig. 6. Bigram Frequencies for groups: Tierra del Fuego and Calabria

Source: own work based on the interviews' texts.

Figure 7 below displays the correlations among various interviews conducted in Calabria and Tierra del Fuego. As a type of graph that uses colour to represent data values, the heatmap effectively visualises the degree of similarity between

different interviews according to their overall correlation. Accordingly, each cell represents the correlation coefficient between the content of two interviews, with darker shades indicating higher correlations, providing insights into how closely related the discussions are across different interviews. The general overview of the heatmap shows that the correlations among the interviews vary significantly, indicating that not all interviews share the same themes and emphases. Certain pairs of interviews exhibit high correlations, suggesting that they cover similar topics or perspectives. Conversely, lower correlations indicate that the interviews diverge in their focus or content.

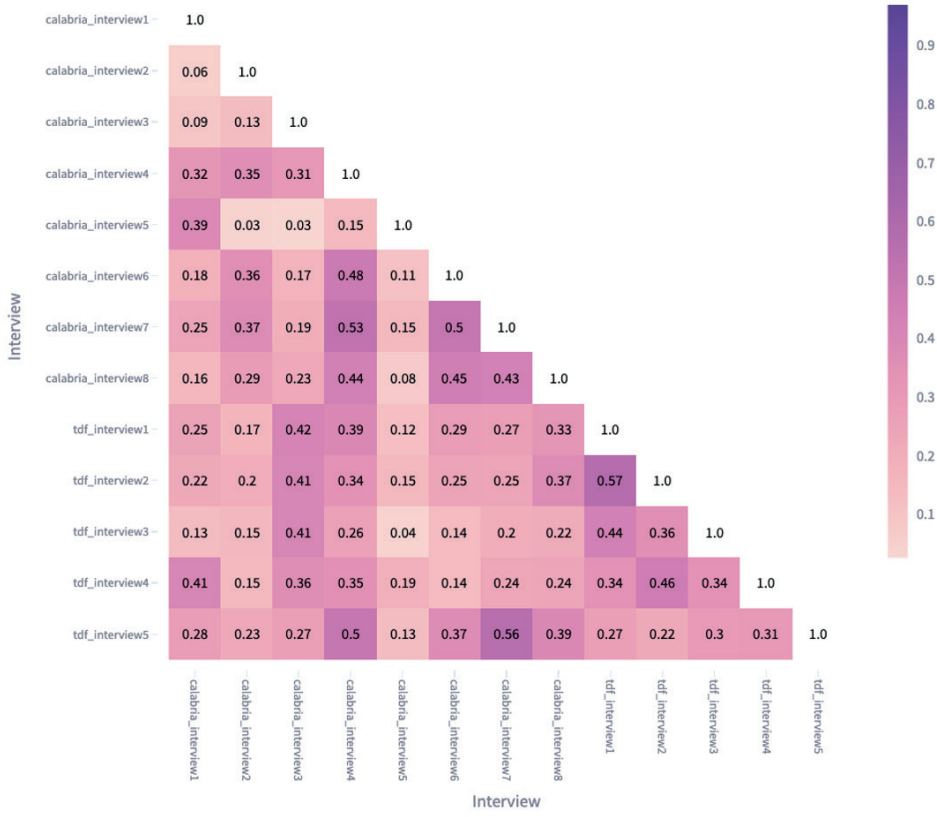

Fig. 7. Correlations among interviews

Source: own work based on the interviews' texts.

In the Calabria interviews, we observe that some interviews have stronger correlations with each other. For example, Calabria Interview 4 and Calabria Interview 7 show a relatively high correlation of 0.53, suggesting a significant overlap in the themes discussed. These high correlations suggest that certain interviews

within Calabria share common narratives or focus areas, possibly reflecting regional priorities or shared concerns. For the Tierra del Fuego interviews, we also observe varying degrees of correlation. Tierra del Fuego Interview 2 and Tierra del Fuego Interview 5 exhibit a relatively high correlation of 0.56, as well as Interview 4 and 5 (corr.: 0,46), indicating strong thematic similarities between these interviews. However, not all Tierra del Fuego interviews are closely related. For example, Interview 3 and Interview 4, and 1 and 3, have a low correlation indicating divergent themes or perspectives in the narratives.

When comparing the two regions, some cross-regional correlations were also noticed. For instance, Calabria Interview 8 and Tierra del Fuego Interview 5 exhibit a strong correlation of 0.56. This suggests that certain discussions transcend regional boundaries and highlight common issues or perspectives.

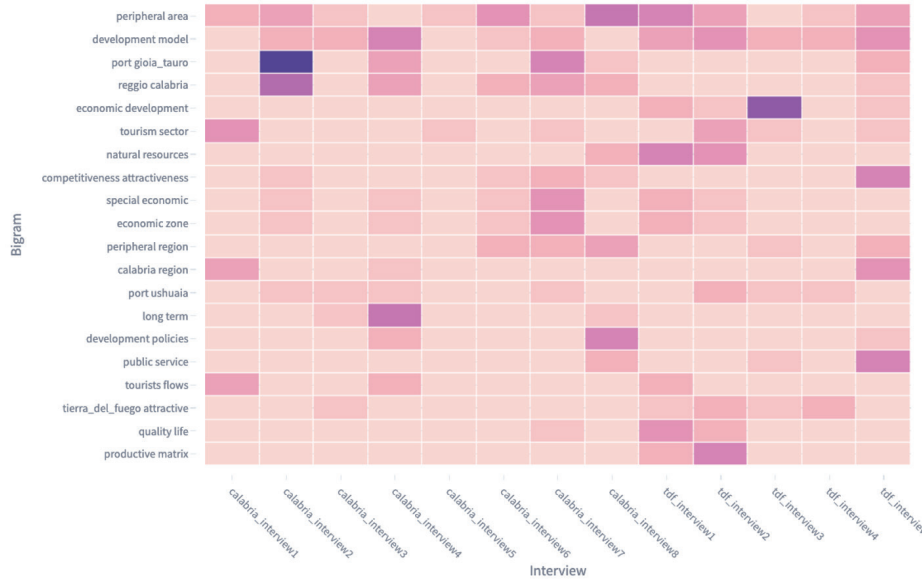

Fig. 8. Correlations among the content of the interviews in relation to each interviewee
Source: own work based on the interviews' texts.

The last figure 8 displays the correlations among the content of the interviews in relation to each interviewee. This initial analysis elaborates the assessment of thematic overlaps and divergences across the interviews, highlighting the complexity and variety of regional development discourses.

Thus, the initial heatmap sets the stage for the more granular examination of specific bigrams and their distribution across the interviews.

Notably, the high correlation between Calabria Interview 4 and Calabria Interview 7 can be further understood by looking at the specific bigrams they em-

phasise, such as 'Development Model' and 'Development Policies.' Similarly, the correlation between Tierra del Fuego Interview 2 and Tierra del Fuego Interview 5 can be explored through their shared focus on bigrams like 'Natural Resources' and 'Sustainable Development.' This detailed visualisation reveals the dispersion of topics and the thematic focus of each interview, confirming earlier findings that 'Peripheral Area' and 'Development Model' are central themes in the overall discussion.

In Tierra del Fuego, the interviews reveal a strong emphasis on tourism and the attractiveness of the destination as primary drivers for economic development. This focus is evident in the frequent mention of terms like 'Tourism Sector,' 'Tourists Flows,' and 'Tierra_del_Fuego Attractive.' However, this tourism-centric approach coexists with discussions about industrial specialisation, particularly in sectors like natural resources. The key challenge identified is balancing diversification and specialisation to create sustainable development opportunities. This dual focus underscores the region's efforts to leverage its tourism potential while also strengthening its industrial base to ensure long-term economic resilience.

In contrast, Calabria's interviews centre around strategic economic hubs and the implementation of development policies. Terms like 'Port Gioia Tauro' and 'Reggio Calabria' are frequently mentioned, highlighting the importance of these locations in the regional economy. The interviews reflect a keen interest in leveraging these hubs for broader economic growth. Additionally, 'Development Policies' and 'Productive Matrix' are significant themes, indicating a focus on policymaking and the structural organisation of productive sectors. The discussions in Calabria point to a concerted effort to use policy and strategic locations to drive development, emphasising the need for effective frameworks and economic zones to foster growth and innovation.

4.2. Views of the key informants: Evidence from the thematic analysis

Thematic analysis is a fundamental technique in applied research for processing qualitative data (Braun and Clarke, 2006; Nowell *et al*., 2017), particularly verbal expressions derived from open interviews, focusing on recognising, examining, and interpreting recurring themes and sub-themes within the data (Braun and Clarke, 2006). The identification of the relevant key themes depends on the judgement of the researcher, "in terms of whether it captures something important in relation to the overall research question," (Braun and Clarke, 2006, p. 10). Therefore, it is not associated with any quantifiable measures. In our analysis, we identified recurrent themes and sub-themes (not necessarily linked to the outline of the interviews). We frequently used direct quotations in the text to provide clear evidence about the relevance of a theme.

4.2.1. Tierra del Fuego: Government intervention, economic uncertainty, potentials, and constraints

Tierra del Fuego's economic trajectory has been fundamentally shaped by the Argentine central government, with state intervention playing a decisive role in structuring its industrial system and demographic trends. The industrial promotion regime (Law 19.640), established in the 1970s, created a Special Economic Zone (SEZ) that provided tax incentives and import benefits to attract investment. This model transformed Tierra del Fuego from a sparsely populated province into an industrial hub, where large-scale manufacturing became the backbone of employment and economic activity.

Informants widely acknowledged that without these incentives, private investment would have been minimal, given the island's peripheral location and high logistics costs. As testimonies state:

> In the 1970s, Tierra del Fuego began hosting factories and industries through the industrial promotion regime, attracting hi-tech industries like TV, washing machine, and later computer and cell phone manufacturing.
>
> The SEZ's role allowed businesses to receive the necessary benefits to locate on the island, enabling the island's growth, community growth, population increase, and improved quality of life.

However, despite the economic stability that this model has provided, informants also expressed concerns over the long-term sustainability of such a structure. While industrial activity remains the primary economic engine of the province, it is highly dependent on the continuation of tax exemptions. One interviewee highlighted:

> The central government's role was crucial for shaping the current production and employment landscape in the province… Industry remains the main sector generating employment and will continue to be the main pillar of the province's productive activity for at least the next ten years.

This informant underlines a key issue regarding the region's economy, which is not only state-dependent but also structurally limited in terms of diversification. The current industrial model is centred on assembling imported components, rather than fostering local supply chains or encouraging technological innovation. The risk is that any changes to the industrial promotion regime could significantly disrupt employment and economic stability.

Beyond its industrial framework, Tierra del Fuego has leveraged its extreme geographical position to develop a secondary economic driver: tourism. Its branding as the 'End of the World' and its proximity to Antarctica have been central to this strategy. This branding has been reinforced through substantial investments in infrastructure. The expansion of the Ushuaia port, the development of an interna-

tional airport, and the creation of a world-class ski resort have strengthened Tierra del Fuego's position as a gateway to both Antarctica and adventure tourism. As other interviewees pointed out:

> Being the 'end of the world' makes many people want to visit the 'last corner' of the planet, which we capitalize on by developing a brand associated with nature, a wild reality, and the end of the world.

> When the State invested in port capacity expansion, the provincial government invested in an international airport, and the provincial government invested in a world-renowned ski resort.

However, tourism remains a secondary sector, largely constrained by seasonality and limited air connectivity. The core issue at stake is the uncertainty derived from the strong specialisation in the electronics industry, which raises concerns about the region's capacity for productive diversification. While the industrial promotion regime has sustained economic growth, its long-term implications remain uncertain, as the province's economic structure is heavily reliant on a single sector.

Furthermore, the co-existence of industrial and tourism-oriented development has not fully resolved some of the island's most pressing structural constraints. One of the most persistent challenges highlighted by informants is the high cost of logistics, primarily due to the mandatory routing of goods through Buenos Aires. By the will of the Argentine government, all maritime routes – both national and international – must obligatorily stop at the port of Buenos Aires for customs and bureaucratic procedures. This mandatory stop evidently has a negative impact on both the time and cost of maritime freight transport directed to (and coming from) Ushuaia. For example, trans-Pacific routes connecting Asian countries to Tierra del Fuego must necessarily stop in Buenos Aires. This dependency on centralised logistics increases operational expenses and creates significant delays. One interviewee said:

> This means that logistics are partly characterized by high costs and significant delays… because it stopped in Buenos Aires and all the bureaucratic issues arrive here. This significantly increases costs.

Beyond logistical constraints, energy infrastructure represents another fundamental challenge. Tierra del Fuego remains disconnected from the national electricity grid, limiting the feasibility of large-scale renewable energy projects despite the region's significant potential for wind power. One informant highlighted that the lack of interconnection not only restricts local energy development but also increases dependency on costly and less sustainable energy sources:

> The potential for wind energy here is vast, but being a peripheral territory, it's difficult to amortize large investments… The province is not connected to the national grid, making a wind energy system dependent on a much larger market to be economically sustainable.

These structural constraints reinforce a broader paradox: while Tierra del Fuego has successfully developed under a state-driven industrialisation model, its economic trajectory remains highly dependent on external decision-making. Informants recognised the importance of the industrial promotion regime in fostering regional growth but also acknowledged that the province has not developed sufficient endogenous capabilities to sustain itself in the absence of these policies. Despite the fact that the unique competitive advantages, linked to its geographical peculiarity and its natural assets, are not lacking:

> Thanks to our peripheral condition, the phytosanitary isolation is a great opportunity... Environmental conditions are an opportunity... The characteristics of the water and natural spaces are special because the level of isolation and remoteness from major consumption centres of the world helps maintain a much more natural and unaltered state.

At the heart of the ongoing debate over the region's future lies a fundamental tension between competing development models. While long-established industrial interests remain committed to the continuation of the industrial promotion regime, emerging sectors – particularly tourism – are pushing for a reconfiguration of Tierra del Fuego's economic strategy. The province is at a crossroads, as shifting economic priorities and policy discussions reflect contrasting visions for regional development. Whether the future will be shaped by reforms to industrial incentives, infrastructure modernisation, or a more deliberate push toward diversification remains an open question.

4.2.2. Calabria: Institutional weakness, structural barriers, and some assets

Calabria's economic development has been shaped by state intervention, but inconsistent policies and governance challenges have resulted in fragmented economic outcomes. Various national and European Union programs have sought to address regional disparities, yet their implementation has often lacked long-term strategic direction. Informants highlighted that while public funds have flowed into the region, they have not translated into sustained industrial growth or economic diversification.

Historically, efforts to stimulate industrialisation included direct subsidies and infrastructure investments, but many of these initiatives have struggled to create a stable path of structural change. Informants indicated that industrial areas have been developed but remain underutilised or abandoned due to inadequate planning and bureaucratic issues, signalling that government policies, rather than fostering industrialisation or regional integration, have often resulted in missed opportunities:

> In Calabria, unfortunately, interventions to aid businesses have been not entirely unsuccessful, but a lot of resources have been wasted… There are entire industrial areas, like San Ferdinando near Gioia Tauro, with warehouses that were built but never went into production because they did not have the time to stand alone on the market.

> From a national perspective, it remains a marginal region, politically underrepresented, and virtually absent from the Government's agenda.

> Interventions to aid businesses have not been entirely unsuccessful… I believe that out of 10 production facilities, maybe one works.

Weak institutional coordination and inconsistent planning have led to fragmented resource allocation, limiting the long-term impact of industrial incentives. Without a clear and consistent productive strategy, investments have struggled to generate sustained economic activity. Informants pointed to a persistent lack of coherence between development policies and their implementation, leading to inefficient allocation of resources:

> There is little coherence between programming instruments and actions taken with cohesion policies. That is, if you don't have a clear, long-term development model, when financial resources are allocated, there's a risk that it won't be used to pursue those long-term guidelines. This would result in wasteful investments such as poorly executed infrastructural projects that remain underutilized and hence represent a waste of resources, a net loss.

The infrastructure deficiencies further hinder economic performance. The lack of adequate transport networks and logistical support has made the region less attractive for private investment, as manufacturing projects often relocate to areas with better connectivity, reinforcing Calabria's economic challenges. A testimony remarked that:

> the location of manufacturing investments is penalized, mainly due to inadequate infrastructure… those who decide whether to locate a production plant in Calabria or in Marche, will most likely choose Marche today.

One of the most persistent critical issues in Calabria is the state of its infrastructure, particularly the transport systems supporting logistics. Road and rail networks remain outdated, limiting mobility and increasing transport costs. These limitations also impact in regional diversification towards tourism activities. Informants emphasised that these deficiencies create bottlenecks that hinder economic expansion and investment:

> The roads are old, there is only one highway… train connections are stuck in the 1970s… there is no high-speed line, and sea connections are very few, virtually no maritime connections except with Sicily.

Informants noted that air travel options are limited, and internal transportation networks do not adequately support tourism flows.

> Air infrastructure is scarcely available in Calabria, and it wouldn't take much to enhance it. However, much is needed to strengthen internal transport services: consider that if you arrive at Lamezia Airport, there is no shuttle immediately available to take you to the main hubs of local public transport…

The challenges extend to maritime transports and port logistics, where despite the presence of Gioia Tauro – one of the Mediterranean's major transshipment hubs – regional industries have struggled to benefit from its operations. Informants indicated that while the port handles international cargo, it remains disconnected from local production networks, reducing its role as a driver of regional development.

> Even the logistics sector is penalized, despite having a very important port, Gioia Tauro… it is a port that almost exclusively handles transshipment; large container ships unload and reload onto smaller ships, but only a very small percentage of those goods continue by land.

One interviewee emphasised the lack of intermodal connections and of a railway infrastructure linking the port to the national railway network:

> We are very lacking in infrastructure, just think that a container to arrive from China spends less than sending it from Gioia Tauro to Milan, that is, I pay more to do Reggio – Milan than Shanghai – Gioia Tauro.

Another one, operating in the logistics sector, sees the Port of Gioia Tauro as a hidden advantage that could propel the regional economy. They argue that the port enjoys significant locational advantages: it is centrally located in the Mediterranean, which for maritime operators means not only time advantages but also cost savings:

> Beyond what everyone may say that Livorno is the centre of the Mediterranean, if we take a geographical map, from the Suez Canal to Gioia Tauro, we can perfectly draw a straight line... Now for a ship that needs to follow a route, what happens? If the line is straight, the consumption is minimal, but a ship that needs to turn a few degrees above, below, implies management costs, fuel costs, economic costs, while Gioia Tauro is practically on the axis, in the heart of Europe.

Additionally, organised crime and corruption have been identified as factors that distort economic incentives and limit the effectiveness of public policies. Informants noted that financial incentives often fail to reach legitimate businesses, instead being captured by groups that prioritise short-term gains over long-term economic sustainability:

> The issue of organized crime and corruption also impacts, because often where there are financial incentives, organized crime's interests are also present… Resources are then concentrated on them rather than on healthier businesses that could stand more strongly in the market.

While industrial development has been insufficient, tourism and cultural heritage still represent key economic assets. Calabria possesses an extensive coastline, national parks, and historical sites, which have the potential to drive economic

activity. Informants stressed that the region's natural and cultural resources are underutilised, as a lack of investment in tourism infrastructure has limited its growth.

> The monumental, historical, cultural heritage… kilometres of coastline which allow the development of coastal activities, beach tourism, but also fishing, sports fishing, and mountain tourism… could really be attractors, even internationally, if used and exploited correctly.

Finally, one should consider an ongoing debate about Calabria's economic future among testimonies, with different actors advocating for a variety of competing strategies. While some emphasise the need for further state support to strengthen industrial and infrastructure development, others argue for a shift toward tourism and cultural industries as the primary drivers of regional growth. However, the challenge remains that neither sector has yet reached a level of maturity that ensures long-term stability. The region continues to face fundamental questions regarding its development trajectory. Whether solutions will come from targeted investments in infrastructure, improvements in governance, or a broader reconfiguration of economic priorities remains uncertain.

4.2.3. Comparative insights: Structural change, intervention, and strategic positioning

The comparative analysis of Tierra del Fuego and Calabria reveals distinct regional trajectories, both profoundly shaped by their peripheral status, yet manifesting in contrasting ways due to differing historical policies, institutional frameworks, and economic structures. Peripherality, in both cases, emerges not as a fixed, immutable condition, but rather as a relational status, constantly negotiated through governance, sectoral specialisation, and the nature of their external dependencies. While both regions grapple with significant structural challenges, the character of those challenges, and the strategies employed to address them, differ markedly.

In Tierra del Fuego, state intervention, specifically the industrial promotion regime, has been the primary driver of economic growth. This has created employment opportunities and fostered a degree of industrial specialisation, particularly in electronics manufacturing. However, this model simultaneously creates a long-term dependency on national policies, which are subject to change and political influence. This dependence introduces an element of economic uncertainty. The need to balance industrial activity with a growing tourism sector, and the reliance on natural resource extraction, further highlight the complex challenges of diversification and sustainable development in a context of limited local control.

The comparison should not be framed as a matter of one region being more or less advantaged than the other. Rather, it highlights how peripherality takes different forms depending on the specific context. Tierra del Fuego's challenges arise from its reliance on targeted state policies and the need for greater economic diversification, whereas Calabria's stem from institutional weaknesses and an ina-

bility to fully capitalise on its potential advantages. Nonetheless, both regions employ innovative and diverse strategies to address their constraints, underscoring the complex and dynamic nature of peripheral development. This comparison reinforces the need for tailored, context-specific development policies that account for the intricate interplay of internal and external forces shaping each region's trajectory. Peripherality is not a uniform condition but a spectrum of experiences shaped by distinct histories and power relations.

5. DISCUSSION

The comparative analysis of Tierra del Fuego and Calabria challenges deterministic views of peripherality as an inevitable economic disadvantage, illustrating instead how it manifests in different forms depending on institutional configurations, policy frameworks, and sectoral specialisation (Kühn, 2015; Oppido *et al*., 2023). While both regions exhibit geographic remoteness at national and continental scales, their development trajectories reveal divergent patterns shaped by state intervention, global economic linkages, and sectoral positioning within the broader economic system (Fitjar and Rodriguez-Pose, 2011; Rodríguez-Pose, 2018). These differences are not simply the result of structural constraints but emerge from historically embedded governance mechanisms and the capacity – or lack thereof – of local institutions to leverage peripherality into development opportunities (Cardoso and Faletto, 1969; Blowers and Leroy, 1994). Understanding these dynamics requires an exploration of the institutional role in shaping economic models, the impact of sectoral specialisation, the extent of international integration, and the broader conceptualization of peripherality as a relational rather than purely geographic condition.

The role of institutions emerges as a central determinant of regional development in both cases, albeit through distinct mechanisms. In Tierra del Fuego, the industrial promotion regime established under Law 19.640 has provided the institutional framework for a sustained manufacturing sector, fostering demographic expansion and economic activity beyond what would be expected given its geographic isolation (Deluca and Kataishi, 2023). However, this model is characterised by significant dependence on periodic state revisions and political negotiations, making its continuity a recurring source of uncertainty (Kataishi and Brixner, 2024; FUNDAR, 2023; Romano, Kataishi, and Durán, 2018). In contrast, Calabria has been the recipient of European Union cohesion funds and national development programs, yet it has struggled to translate these financial resources into a coherent, long-term economic strategy (Musolino and Panuccio, 2022; Ferdinando, Mariarosaria, and Luigi, 2023). The absence of a strong regional industrial

base and the fragmentation of governance structures have hindered the region's ability to capitalise on external interventions, reinforcing a pattern of economic stagnation despite continued public investment (Musolino, 2018). These contrasting institutional arrangements highlight how policy frameworks mediate the capacity of peripheral regions to engage in productive transformation, challenging the notion that peripherality alone dictates development outcomes (Hirschman, 1958; Amin, 1976; Rodríguez-Pose, 2018).

Sectoral specialisation further illustrates the differentiated impact of policy interventions on peripheral development. Tierra del Fuego's manufacturing sector, based on medium and big size firms, while established through fiscal incentives remains largely exogenous in its technological and productive foundations, with firms operating as assemblers within a highly protected domestic market (Kataishi and Morero, 2020). This dependence on external inputs and policy stability limits endogenous innovation and backward integration into global value chains. Calabria, by contrast, exhibits a more fragmented economic structure, where small-scale entrepreneurship and agriculture remain dominant but fail to generate the necessary scale or specialisation for sustained competitiveness (Musolino *et al*., 2020). Despite the presence of the Gioia Tauro port, which serves as a major transshipment hub, the lack of regional industrial integration prevents its potential benefits from spilling over into the local economy (Daniele and Marani, 2011; Wilmsmeier and Monios, 2013). The contrasting trajectories of these two cases reinforce the argument that sectoral composition is not merely an outcome of geographic constraints but is actively shaped by policy choices, institutional structures, and historical development patterns (Baumgartner, Puetz and Seidl, 2013; Capello and Cerisola, 2020).

Another key dimension shaping regional trajectories is the extent of international connectivity and participation in global economic circuits. While both Tierra del Fuego and Calabria are peripheral in relation to their national economies, their linkages to external markets differ significantly. Tierra del Fuego's integration into global trade is primarily tied to its role in the extractive and electronics sectors, although these industries are highly dependent on national policy-driven incentives and foreign technological configurations (Kataishi and Brixner, 2024; Kataishi, 2016). Its export performance, although higher relative to Argentina's total trade volume, remains concentrated in a few key sectors based on the exploitation of natural resources, reflecting a limited diversification strategy and strong limitations in their production strategy. Calabria, however, exhibits a paradoxical situation: despite its geographic proximity to European markets and its strategic maritime position, it remains largely disconnected from global production networks, with low levels of foreign direct investment and an export sector that plays an insignificant role in its economic structure (Bentivogli *et al.*, 2018; Musolino, 2016). This contrast underscores the idea that physical remoteness does not necessarily determine economic marginalisation;

rather, it is the degree of functional integration into global systems that defines a region's economic position (Gereffi, 1999; Rae, 2017; Rodríguez-Pose, 2018).

Beyond institutional and economic factors, local agency and strategic positioning play a crucial role in shaping how peripherality is experienced and managed (Rivera León and Kataishi, 2010). Tierra del Fuego has leveraged its extreme location as a branding tool, positioning itself as the 'End of the World' and a gateway to Antarctica, thereby enhancing its tourism sector (Kataishi *et al*., 2023; Hall *et al*., 2013). This strategy has been reinforced by investments in infrastructure and international connectivity, making Ushuaia a key node for Antarctic expeditions and eco-tourism (Gobierno de Tierra del Fuego, 2018). Calabria, despite its rich cultural and natural assets, has struggled to establish a similarly effective tourism model, with its industry remaining seasonal and lacking cohesive branding strategies (Istat, 2019; Censis, 2023). This discrepancy highlights the role of narrative construction and place-based strategies in transforming peripheral conditions into competitive advantages (Blomgren and Sørensen, 1998; McDonald *et al*., 2018). However, it also points to the tensions inherent in regional economic planning: in Tierra del Fuego, tourism and industrial policies often compete for prioritisation, revealing an unresolved debate about the region's long-term development path (Kataishi and Ortiz, 2024).

Ultimately, these findings suggest that peripherality should be understood as a relational rather than a static condition, shaped by historical trajectories, institutional frameworks, and strategic economic positioning (Blowers and Leroy, 1994; Eder, 2019). While both Tierra del Fuego and Calabria share a marginal status, their levels of integration into broader economic and geopolitical networks vary significantly. Calabria, despite being closer to major European economic centres, remains structurally disconnected, while Tierra del Fuego, despite its extreme geographic location, has cultivated economic roles that extend beyond its national borders, particularly in tourism and resource extraction (Kühn, 2015; Rodríguez-Pose, 2018). Moreover, the geopolitical significance of Tierra del Fuego – situated between Argentina and Antarctica – contrasts with Calabria's relatively marginal role in the Mediterranean economy, further reinforcing the argument that peripherality is not merely a function of distance but of strategic positioning within global economic hierarchies (Di Liddo and Manenti, 2017; Fornes and Mendez, 2018).

These insights call for a re-evaluation of traditional frameworks that equate peripherality with economic disadvantage, emphasising instead the dynamic interplay between institutional agency, economic specialisation, and global connectivity. The contrasting cases of Tierra del Fuego and Calabria illustrate how peripheral status is not a uniform condition but manifests in diverse forms depending on the structural and policy contexts in which it is embedded. Understanding these variations provides a more nuanced perspective on regional disparities and offers valuable lessons for development strategies in other highly peripheral areas across different national and continental settings.

6. CONCLUSIONS

This work contributes to the ongoing debate on peripherality by reconsidering its nature beyond geographic determinism. Rather than treating peripherality as an inherent disadvantage, the comparative analysis of Tierra del Fuego and Calabria underscores how regional trajectories are shaped by complex and multi-level configurations, economic structures, and historical contingencies. These cases illustrate that peripheral regions do not follow a uniform path; instead, they embody distinct forms of integration into national and international circuits, mediated by governance frameworks, sectoral specialisation, and, particularly, a variety of external dependencies. The evidence suggests that peripherality is not a static condition but a relational status, determined by the degree of agency local actors can exert over political, institutional, and economic processes.

A key insight emerging from this study concerns the role of institutions in structuring economic outcomes. In Tierra del Fuego, the industrial promotion regime has fostered a manufacturing base that has driven population growth and relative economic expansion. However, this model remains heavily dependent on fiscal incentives and exhibits a weak and marginal integration into global value chains, making its long-term sustainability uncertain. In Calabria, institutional fragmentation and the absence of a consolidated industrial policy have hindered the effectiveness of development strategies, despite continuous external financial support. Both cases illustrate how institutions mediate and configure the impact of peripherality, shaping patterns of subordination or reinforcing the role of external actors in determining local and regional structural changes. The evidence indicates that neither case represents a success story or a failure per se but rather different manifestations of peripheral insertion, each with its own advantages, vulnerabilities, and limitations.

Sectoral specialisation emerges as a crucial factor in shaping how these economies integrate into national and international circuits. Tierra del Fuego's economic structure is characterised by a high degree of concentration, with an industrial base dominated by electronics manufacturing under a state-led framework, alongside a significant reliance on natural resource exploitation, while tourism has developed and grown as a complementary and consolidated strategy. Calabria presents a more fragmented economic landscape, with small-scale entrepreneurship, low-productivity agriculture, and a tourism sector that remains underdeveloped. Both regions exhibit forms of dependence: in Tierra del Fuego, electronics production and natural resources exploitation are largely configured by national decisions, while in Calabria economic stagnation reflects a persistent lack of strategic coordination among local, regional, and national actors. What unites these cases is the low capacity of local stakeholders to influence structural economic changes on their territory, as major decisions on investment, industrial policy, and sectoral diversification are primarily led by external actors.

The relationship between peripherality and global economic integration is equally complex. Our analysis indicates that neither Tierra del Fuego nor Calabria operate as autonomous regional economies; instead, both are inserted into broader frameworks through mechanisms that reinforce asymmetric dependencies. Tierra del Fuego's integration is structured around its electronic manufacturing sector, where multinational corporations operate under a regulatory framework that limits the region's role within global value chains. Additionally, its extractive industries, while generating economic activity, are embedded in dynamics that prioritise external interests. Tourism stands as an exception, where the local sector has been able to consolidate sustained growth with meaningful local linkages. Calabria, despite its geographic proximity to European markets and its strategic position in the Mediterranean, remains marginal within global production circuits. The Gioia Tauro port, one of the largest transshipment hubs in the region, operates as an enclave, facilitating trade without generating significant local spillovers. These cases highlight that integration into global markets does not necessarily translate into economic autonomy or sustained development; rather, it can reinforce conditions of subordination, limiting the capacity of local actors to shape economic trajectories.

Our findings also emphasise the relational nature of peripherality, shaped by power asymmetries in the decision-making processes within peripheral regions. In both cases, socio-economic transformations have occurred with local institutions playing a complementary role rather than a leading one. This highlights a structural challenge common to many remote regions: the difficulty of establishing endogenous development strategies that are not contingent on political, financial, or economic decisions made at higher levels of governance. The nature of these relations varies – whether through reliance on fiscal policies, as in Tierra del Fuego, or on European cohesion funds, as in Calabria – but the underlying issue remains the same: the limited or diluted agency of actors in defining their own development trajectories.

In Tierra del Fuego, stakeholders recognise the significance of the promotion regime in initiating and sustaining economic growth and stress the role of institutions in shaping the development model of the province. The current debate extends beyond the continuation of this policy to exploring additional strategies that could enhance long-term autonomy. As the analysis revealed, the Fuegian model faces three critical challenges that could compromise its viability: the insufficient integration of the local community in manufacturing activities, the overexploitation of natural resources without a sustainable framework, and the lack of a coordinated strategy to balance industrial development and tourism at both practical and strategic levels. Furthermore, the future of this development model faces additional challenges due to Argentina's volatile political landscape. Frequent government shifts create a high degree of uncertainty, posing particular risks for Tierra del Fuego given its distinctive role within the national economy.

As a result, any major policy changes could profoundly impact the province's economic trajectory, potentially undermining the foundations of its current strategic model. This situation underscores a key vulnerability associated with peripherality: the dependency on centralised decision-making and the limited capacity of local actors to influence structural changes. Addressing these challenges requires the development of robust, locally driven strategies capable of mitigating the effects of national political fluctuations.

In Calabria, our analysis highlighted that stakeholders prioritise policies aimed at fostering economic growth, particularly through infrastructure development, and the positioning of novel business models. The focus on initiatives such as the Special Economic Zone (SEZ) and the strategic positioning of the Port of Gioia Tauro highlights a concerted effort to integrate the region more effectively into national and international economic circuits. However, despite these interventions, Calabria faces persistent structural challenges that may hinder the effectiveness of such strategies. The analysis identified three critical factors that constrain its development trajectory: the fragmented coordination between actors, the underutilisation of key infrastructure in fostering local economic spillovers, and the absence of a cohesive approach to leveraging tourism as a driver of growth.

Tourism, in particular, represents a sector with considerable potential, yet institutional inefficiencies have limited its ability to generate sustained benefits for the region. The lack of coordinated governance among public and private stakeholders has resulted in a disjointed tourism strategy, preventing Calabria from capitalising on its cultural and natural assets in a competitive manner. Unlike Tierra del Fuego, which has successfully constructed a strong tourism identity through the 'End of the World' brand, Calabria struggles to establish a unified narrative that enhances its appeal to international markets.

Beyond sectoral considerations, Calabria's long-term development also faces uncertainties stemming from governance fragmentation and the broader political and economic context within Italy and the European Union. While access to EU structural funds represents a crucial opportunity, the effective deployment of these resources remains a challenge due to bureaucratic inefficiencies and inconsistent policy execution. Furthermore, external decision-making processes often shape the region's economic prospects, reinforcing its dependency on centralised governance structures. As in the case of Tierra del Fuego, this reliance on external actors limits the ability of local stakeholders to define and implement long-term strategies tailored to regional needs.

Future research on these topics could take different directions. Further efforts might focus on surveys of businesses in the two regions to examine their operational models in greater detail. Additionally, studies on the development policies implemented by various territorial levels of government, their historical evolution, and their long-term impacts would provide valuable insights. Another avenue for future research could involve conducting case studies of highly peripheral regions

in other parts of the world – such as Asia, Oceania, or North America – applying the same methodological approach. This would expand the empirical evidence on development models in geographically remote regions and deepen our understanding of the structural conditions shaping their economic trajectories.

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AT THE BOTTOM AND TOP OF THE EDUCATIONAL SYSTEM: SPATIAL PATTERNS OF HIGHEST EDUCATIONAL ATTAINMENT BASED ON THE HUNGARIAN CENSUS OF 2022

Abstract. This study examines the spatial patterns of educational attainment in Hungary using settlement-level data from the 2022 census, focusing on individuals with at most lower secondary (ISCED 0–2) and tertiary education (ISCED 5–8). A two-stage analysis – bivariate choropleth mapping and Optimised Hot Spot Analysis – revealed pronounced regional inequalities. A comparison of the 2011 and 2022 census data shows a nationwide decline in low attainment and growth in tertiary education, especially in urban areas. However, peripheral regions remain disadvantaged. These findings highlight the uneven spatial effects of educational expansion, reinforcing the need for territorial-specific education and development policies.

Key words: educational attainment, spatial inequality, Hot Spot analysis, Hungarian census, geography of education, spatial statistics.

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1. INTRODUCTION

The spatial distribution of educational attainment raises crucial social and economic issues, underlying numerous societal phenomena and determining various economic opportunities. Investigating spatial disparities in education enables a deeper understanding of the connections between social mobility, labour market dynamics, and regional development. The spatial patterns of educational attainment facilitate the examination of factors such as local human capital development, labour supply structures, and the resulting local economic potential; this paper endeavours to provide a detailed analysis of these factors.

The interrelations of the above factors can indirectly influence demographic trends (Bella and Charbit, 2022; Janssen *et al*., 2024), local economic activities, and long-term sustainability of settlements (Lucas, 1988). Based on the spatial distribution of various educational levels, we can infer the capacity of a region to attract and retain skilled labour, as well as its available economic development opportunities. Based on Hungarian data from the ISSP 2019 survey (Medgyesi and Tóth, 2022), educational attainment is a significant factor in relation to wages (Pearson's $r = .439$, $p < .001$), while certain mediating factors, such as increased participation rates in higher education and openness to international trade, significantly reduce inequalities (Pop, 2023). However, in only a few cases did the proportion of higher educated inhabitants increase in peripheral areas, and even in such instances, it did not reinforce the local economy or social cohesion. Examples of counterurbanisation show that the relatively high immobility of intellectuals in rural peripheries often results in a more fragmented society, rather than stimulating local economic capital (Halfacree, 2006). Moreover, the lack of opportunity and increasing isolation in these regions mean that certain groups – especially the youth – are more likely to migrate from the countryside (Yarwood, 2023), as many young people are leaving rural areas to find jobs, go to school, and have new cultural experiences (Haugen and Villa, 2006; Stockdale, 2004). Numerous factors influence educational attainment, among which four stand out: socio-economic background, individual capabilities (cognitive abilities and interests), family environment, and school system-related factors (Guo, 2025; Langensee *et al*., 2024; Liu, 2024; Morris *et al*., 2016; Morris *et al*., 2021; Suleman *et al.*, 2014). In terms of socio-economic background, parental socio-economic status (SES) and socialisation environments are particularly notable, with parental SES having been identified as a significant determinant of educational attainment (van Ewijk and Sleegers, 2010). Even more so, further research indicates that in educational choices, SES has a more decisive influence than individual abilities (Bittmann, 2022; O'Connell and Marks, 2022). Other recent studies have also shown that the father's occupation is one of the strongest predictors (Låftman, 2008; Tsukahara, 2007), and the impact of other factors

(e.g., parental education, number of siblings, and household income) also tends to vary by gender (McIntosh and Munk, 2007). The SES level of the broader environment, not just that of the immediate family, is also significant; students attending high schools with a higher average SES are more likely to attain higher education (Cattaneo *et al*., 2007; Maaz *et al*., 2008; Palardy, 2013; Stäbler *et al*., 2017). However, some studies dispute the role of environmental factors, suggesting that the composition of school populations (average performance or SES) has negligible direct effects on later educational pathways[1] (Vigdor and Ludwig, 2010; von Keyserlingk *et al*., 2020). Beyond parents' educational level, stricter parenting styles and supplementary educational activities are also influential (Hintsanen *et al*., 2017), and cooperation between schools and parents also plays a crucial role. According to Pusztai *et al*. (2025), institutional practices supporting Family-School-Community Partnership (FSCP) significantly influence parental involvement, especially in families with lower SES. Active, targeted school practices can mitigate the disadvantages stemming from social inequalities by sensitively responding to diverse parental needs.

The role of educational systems and policies deserves further attention. Gogescu (2024) employed cluster analysis to examine how educational and vocational training systems across European countries structure student educational trajectories. The analysis identified three distinct groups of countries, each organising educational pathways, vocational training, labour market relationships, and school-to-work transitions differently. Countries in Cluster 2 – including Belgium, Hungary, Latvia, France, Romania, Bulgaria, Italy, Greece, Portugal, and Spain – feature stratified education systems with tracking and streaming at the upper secondary level. Selection occurs at a medium age, with many students predominantly entering school-based initial vocational education and training (iVET). The employment premium for iVET graduates is low, prompting many to pursue further education due to limited job opportunities. Tertiary education also exhibits significant stratification, with many students enrolling in non-bachelor's programmes. High rates of early school leaving – for instance, in Hungary, where the rate is significantly higher even than the EU average (European Commission, 2024) – coexist with intense competition among continuing students, reflecting a tournament-style educational system in which sustained effort is necessary, as success remains uncertain.

Within the European Union, Hungary performs relatively well in terms of its highest educational attainment (Eurostat, 2024b). Figure 1 illustrates the proportion of the population aged 15–64 with educational attainment at most

[1] In Hungary, all children are required to participate in formal education and fulfill their compulsory schooling obligations. Compulsory education begins in the calendar year in which the child turns six by August 31, or no later than the following year. It continues until the end of the academic year in which the student turns sixteen (Act CXC of 2011 on National Public Education, 2025).

International Standard Classification of Education (ISCED) levels 0–2[2] across EU Member States and selected additional European countries. Hungary shares the 12th place among Austria and Switzerland, each at 18.6%. By 2023, this value improved to 18.1%, advancing Hungary to the 11th position among the countries shown in Fig. 1, overtaking Finland among others. Globally, these indicators suggest improved national educational levels. However, Polónyi (2023) and Pop (2023) found that the Kuznets curve applied to Hungary in terms of education, implying reduced inequality with increasing educational attainment. However, some authors view the Hungarian educational system as perpetuating spatial and social inequalities (Velkey, 2020). Regarding ISCED levels 5–8[3], Hungary ranked 16th among the countries mentioned above in 2023, sharing similar values with the Czech Republic and Iceland (Eurostat, 2024a).

Hungary offers a particularly compelling case for examining the spatial dimensions of educational inequality due to its unique historical and institutional trajectory. As a post-socialist Central European country, Hungary has undergone significant socio-economic transformations over the past three decades, accompanied by structural reforms in its education system. Despite notable improvements in average educational attainment, the country continues to exhibit pronounced regional disparities that are deeply rooted in historical legacies, patterns of urbanisation, and uneven economic development (Lux, 2019; Szakálné Kanó *et al.*, 2017). Moreover, Hungary's education system is characterised by early tracking, limited vertical permeability, and stratified tertiary institutions, which may reinforce spatial and social inequalities (Hordósy and Szanyi-F, 2020; Horn, 2013; Pénzes *et al.*, 2018; Velkey, 2022). Previous studies have shown that regions with greater economic potential and initially low levels of higher education attainment have experienced the most growth, while areas lacking economic dynamism show minimal change, which highlights that in declining industrial centres, the relative-

[2] ISCED 1 (Primary Education) typically lasts six years, starting between ages 5–7, and focuses on foundational skills in literacy, numeracy, and basic knowledge in subjects like history, geography, natural sciences, social sciences, arts, music, and sometimes religious education. ISCED 2 (Lower Secondary Education) builds on ISCED 1, consolidating essential skills, supporting lifelong learning and personal development. Education at this level is usually subject-specific with multiple specialized teachers per class and typically concludes compulsory schooling. In Hungary, ISCED 1 corresponds to grades 1–4 of general education (általános iskola alsó tagozat), while ISCED 2 typically covers grades 5–8 of general education (általános iskola felső tagozat), with compulsory education ending at the age of 16 in most cases (European Union, 2024; Hungarian Central Statistical Office (n.d.)).

[3] ISCED 5 (Short-cycle Tertiary Education) includes practically oriented programmes that prepare students for the labour market or further study. ISCED 6 (Bachelor or equivalent level – "alapképzés"), ISCED 7 (Master or equivalent level – "Mesterképzés"), and ISCED 8 (Doctoral or equivalent level – "Doktori képzés" [PhD/DLA]) represent progressively advanced stages of higher education, culminating in research qualifications or advanced professional credentials (European Union, 2024; Hungarian Central Statistical Office (n.d.)).

ly high number of degree holders is concentrated in the oldest age cohorts (Forray and Híves, 2011; Pénzes *et al*., 2018). Understanding the spatial distribution of educational outcomes in such a context provides valuable insights not only for national policy but also for international comparative research on education, inequality, and regional development.

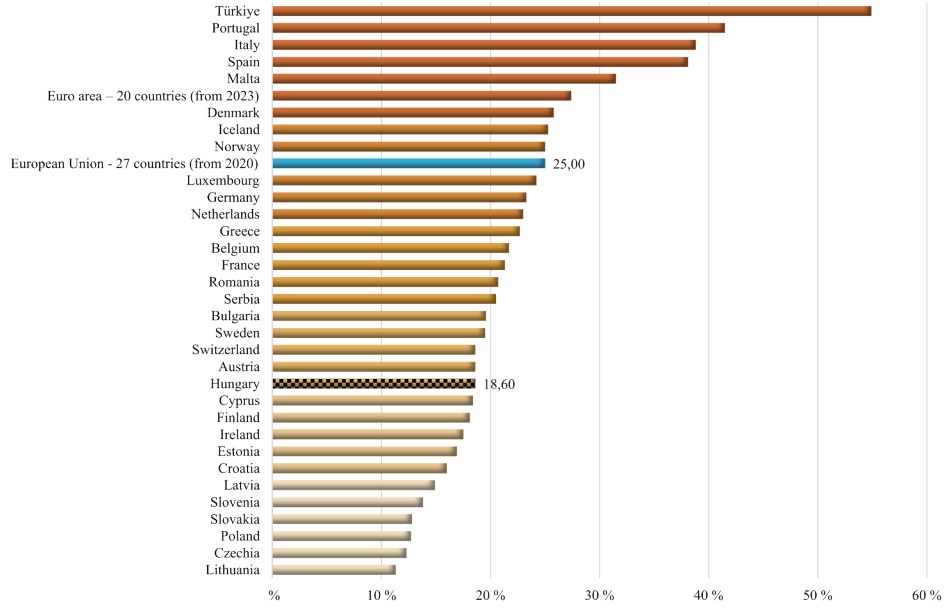

Fig. 1. ISCED 2 as the highest educational attainment by country in 2022

Source: own work based on Eurostat (2024b).

The primary objective of this study is to examine and analyse the spatial patterns of educational attainment at both ends of the Hungarian educational spectrum, based on data from the 2022 national census. Specifically, the research focuses on two distinct educational categories: individuals whose highest level of educational attainment is ISCED level 2 or below (lower secondary education), and those who have attained ISCED levels 5–8 (tertiary education).

Studies in the fields of geography of education and educational ecology have repeatedly shown that educational opportunities are significantly shaped by spatial structures, most notably through urban–rural divides and centre–periphery polarisation (Cao and Huo, 2025; Graham, 2024; Holloway and Jöns, 2012; Million *et al*., 2017). Earlier studies in Hungary had also shown how the stratified and selective school system reinforces territorial inequalities (Horn, 2013; Velkey, 2020, 2022). However, most of these analyses have been conducted at the regional or institutional level, providing only a partial picture of the settlement-level dynamics

of educational attainment (Forray and Híves, 2011). The present study addresses this gap by applying bivariate choropleth mapping and Optimised Hot Spot Analysis to the 2022 census data, offering a fine-grain view of educational polarisation that reveals sharp contrasts between Budapest and peripheral rural areas. By uncovering statistically significant clusters at the lowest and highest attainment levels, this study not only advances methodological approaches within the Hungarian context but also contributes to international debates on spatial educational inequalities and the policy need for place-sensitive interventions (Polónyi, 2023; Pop, 2023).

To achieve this, we employed a two-stage analytical approach. Initially, a bivariate choropleth mapping technique was used to visualise and compare the spatial distribution of these two educational groups, highlighting areas of overlap and divergence in their relative proportions. Although this visual representation effectively illustrates broad spatial relationships, it is insufficient for establishing statistically significant spatial clusters in the data.

Therefore, the second stage utilised spatial statistical analysis, specifically the Getis–Ord Gi* clustering method, to statistically identify and assess areas with significantly high (Hot Spots) or low (Cold Spots) proportions for each educational attainment category. By combining these spatial analytic methods, this study aims to uncover detailed spatial relationships and regional disparities in educational attainment levels across Hungarian settlements. Ultimately, this study contributes insights into the spatial dimensions of Hungary's educational system and identifies regions characterised by educational inequalities.

2. MATERIALS AND METHODS

This study used data from Hungary's 2022 national census. Conducted every ten years using standardised methodology and uniform content, as is generally the case across Europe in alignment with the EU's census regulation framework, Hungary's census methodology ensures a comprehensive and precise representation of the country's demographic, economic, and social characteristics, including educational attainment. The 2022 census was unique in that the respondents had the option to complete the survey online within an 18-day window. Those who did not participate online were subsequently visited by the census enumerators. Under current legislation, participation in the Hungarian census is mandatory for all residents (*Act CI of 2018 on the 2021 Census*, 2021). The unit of observation in this study is at the settlement level, and given the extensive coverage of the census, the dataset can be considered near-population level (Dusek, 2004). The polygon dataset of settlement boundaries used for the spatial representation and analysis was

sourced from OpenStreetMap. Data organisation and processing were performed using Microsoft Excel (Microsoft Corporation, 2025) to ensure the integration of settlement-level information. The dataset contained no missing values, and data filtering was also conducted within Excel, leveraging the census database's completeness. OpenStreetMap polygon data were manually verified for consistency in settlement counts and naming conventions.

In this analysis, the International Standard Classification of Education (ISCED) was used to ensure the international comparability of educational attainment data. Developed by UNESCO and revised in 2011, the ISCED provides a standardised framework for classifying educational levels, programme orientations, and progression opportunities. The 2011 revision introduced a more detailed three-digit coding system and, for the first time, included a classification for educational attainment (ISCED-A) to enhance analytical precision. The shift from ISCED 1997 to ISCED 2011 is particularly relevant in the Hungarian context, where not all secondary programmes guarantee access to higher education. The revised system more finely differentiates general and vocational pathways and marks whether programmes are progression-enabling or terminal upon completion. For example, short-cycle tertiary programmes (ISCED 5), bachelor's (ISCED 6), master's (ISCED 7), and doctoral degrees (ISCED 8) are now clearly differentiated by their length, orientation, and level. This structure offers a more accurate reflection of Hungary's education system and supports a deeper analysis of educational mobility (Hungarian Central Statistical Office, n.d.).

A spatial analysis was conducted using ArcGIS Pro (Esri Inc., 2024) by applying multiple geostatistical methods. The study first employed a bivariate choropleth mapping technique which allowed for the simultaneous visualisation of two quantitative variables within a single map layer. This approach facilitates the comparison and distinction of educational attainment patterns across spaces. Similar to the graduated colour method, bivariate choropleth mapping divides variables into classes and assigns specific colour combinations to represent their values (ESRI, n.d.-a). The categorisation followed Jenks's natural breaks classification, ensuring meaningful group segmentation:

– For ISCED 2 or lower (lower secondary education), the three bins were: 0–21%, 21–30%, and above 30%;

– For ISCED 5–8 (tertiary education), the three bins were: 0–14%, 14–28%, and above 28%.

Combining these two variables into a 3×3 matrix results in a total of nine unique colour categories, thus providing a nuanced spatial depiction of educational disparities.

To account for potential cognitive biases in visual interpretation, this study integrated spatial statistical methods to objectively assess the clustering patterns. Unlike traditional statistical approaches that often overlook spatial dependencies, geostatistical methods address the complexity introduced by social and natural

spatial structures (Dusek and Kotosz, 2017). This study employs Optimised Hot Spot Analysis using the Getis–Ord Gi* statistic to detect statistically significant clusters of educational attainment levels.

Optimised Hot Spot Analysis in ArcGIS Pro applies the Getis–Ord Gi* statistics by automatically adjusting parameters based on input data characteristics. Much like a camera auto-adjusts settings for optimal results, this tool first assesses data adequacy (minimum of 30 features), variation, and locational outliers. Point data aggregates incidents into weighted features using grid cells or polygons. The appropriate scale of analysis is determined using Incremental Spatial Autocorrelation (Global Moran's I) or by calculating the average distances to neighbours. Subsequently, the Gi* test identifies significant hot and cold spots, adjusting for significance levels using False Discovery Rate (FDR) correction. The output includes z-scores, p-values, Gi Bin classifications, and neighbourhood statistics, providing a robust basis for interpreting spatial patterns (ESRI, n.d.-b; Getis and Ord, 1992; Ord and Getis, 1995).

The results of the Optimised Hot Spot Analysis are visualised using Gi Bin categories, which classify areas based on statistical significance. Hot Spots (statistically significantly high values) are displayed in shades of red, whereas cold spots (statistically significantly low values) appear in shades of blue. The intensity of these colours corresponds to the statistical confidence level (z-score and p-value); darker and more vivid colours indicate stronger statistical significance and spatial concentration. Areas that were not statistically significant are represented by neutral or light colours (e.g., grey or pale shades).

In this context, a hot spot indicates a cluster of neighbouring settlements where the proportion of residents with a given level of educational attainment is consistently and significantly higher than the national average. Conversely, a cold spot reflects a spatial concentration of significantly lower-than-average values. Thus, these clusters reveal regional patterns – such as areas with relatively highly educated populations and, by contrast, regions with persistently low attainment – and thereby enhance the interpretation of spatial inequalities in education across Hungarian settlements.

3. RESULTS AND DISCUSSION

3.1. National-level correlations and socio-economic influences

The spatial analysis of educational attainment in Hungary revealed significant regional disparities at both the lower and higher ends of the educational spectrum, highlighting distinct clustering patterns shaped by broader socio-economic and

historical processes. In line with McIntosh and Munk (2007), and van Ewijk and Sleegers (2010), the highest level of educational attainment in Hungarian society is also influenced by parental SES. Based on data from the 11th round of the European Social Survey (ESS), the father's level of education appeared to have a more pronounced effect, although both parents played a significant role in shaping educational outcomes (father: Pearson's $r = .476$, $p < .001$; mother: Pearson's $r = .440$, $p < .001$). Furthermore, educational attainment also plays a key role in partner selection, thereby influencing the next generation as well (partner's highest level of education: Pearson's $r = .671$, $p < .001$).

These patterns suggest that regional disparities in educational attainment may be further reinforced through self-fulfilling mechanisms, which is consistent with the Golem effect. In areas where educational achievement has for a long time been low, institutional and societal expectations may reflect and perpetuate these patterns, thus contributing to the intergenerational transmission of disadvantages. Rather than countering inequalities, such expectations reinforce them, as students from less-educated backgrounds may internalise limited aspirations, which in turn constrain their educational trajectories. As such, this dynamic may intensify the spatial polarisation over time.

Figure 2 illustrates a clear generational shift in educational attainment in Hungary, reflecting the effects of educational expansion since the late 20th century. Older age cohorts were predominantly represented in the lowest attainment category (ISCED 1–2), indicating limited access to extended schooling in earlier decades. In contrast, middle-aged groups (particularly those aged 40–49) show a peak representation at the upper-secondary level (ISCED 3–4), corresponding to the massification of secondary education during the 1980s and the 1990s (Arató and Lavicza, 2015; Kozma, 2016). In addition to state-run institutions, church-controlled schools have expanded considerably since the 2000s, with rapid growth after 2010. Their role, traditionally strong in grammar schools, has extended to primary and vocational education, and by the mid-2010s they became the sole providers of primary education in some settlements. Their role is particularly strong in small towns, where they often attract students from more advantaged family backgrounds, thereby reinforcing local patterns of educational selection and segregation (Papp, 2022; Tomasz, 2017).

Notably, the highest proportion of tertiary graduates (ISCED 5–8) appears among younger cohorts, especially those aged 30–39, underscoring the substantial growth in higher education since the democratic transition. Additionally, the data revealed a gendered dimension of expansion, with women surpassing men in tertiary attainment among younger age groups. These patterns collectively highlight the long-term impact of educational reforms and the broadened access to Hungary's population structure.

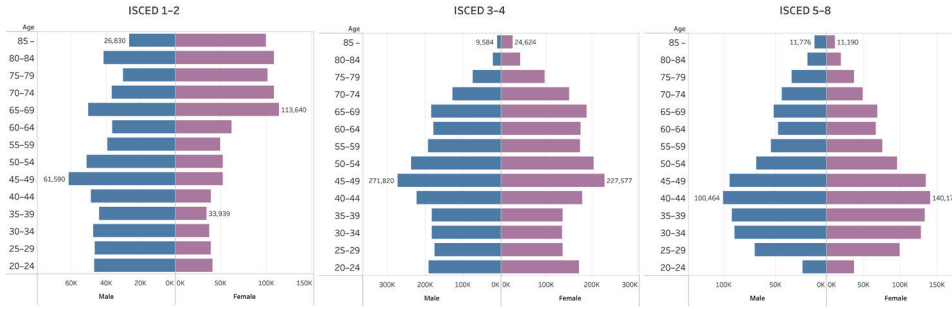

Fig. 2. Highest educational attainment by ISCED level, gender and age group in Hungary, 2022
Source: own work based on data from the Hungarian Central Statistical Office (2023).

3.2. Regional trends in educational attainment (2011–2022)

Based on census data from 2011 and 2022 (Fig. 3), the distribution of the highest educational attainment among the population group aged 15 and above in Hungary has undergone significant regional shifts, reflecting broader patterns of educational expansion and persistent territorial disparities.

The number of individuals with the lowest educational attainment (ISCED 1) decreased markedly in every region, with the most substantial declines observed in Northern Hungary (−38,539 persons), the Northern Great Plain (−53,597), and the Southern Great Plain (−37,865). Budapest's ISCED 1 population – already relatively small – declined by 11,460. These reductions suggest gradual educational improvement, even in socioeconomically disadvantaged regions (Northern Hungary, Northern Great Plain, and Southern Transdanubia).

A similar tendency may be observed in ISCED Level 2 (completion of primary education) population data. The largest decreases were observed in Budapest (−75,135) and the Southern Great Plain (−88,626), followed by the Northern Great Plain (−74,469). The continued decline in lower educational levels underscores the ongoing transition towards higher minimum attainment standards across Hungary.

In contrast, ISCED 3C (vocational upper secondary education without a school-leaving certificate) showed heterogeneous trends. Some regions experienced slight changes (e.g., Central Transdanubia: −4,171; Western Transdanubia: +4,537), whereas others saw small declines (e.g., the Southern Great Plain: −9,731). These mixed patterns indicate region-specific developments in vocational education preferences and opportunities.

Regarding ISCED 3A/3B (general and vocational upper secondary education with a school-leaving certificate [equivalent to the Matura Examination in Hungary]), modest increases were observed across most regions. The most notable growth occurred in Pest County (+21,160) and Budapest (−17,594), although the

decline in the capital may reflect a population shift towards higher tertiary education levels rather than stagnation at the secondary level.

Tertiary education (ISCED 5–8) has experienced a substantial nationwide growth. The number of individuals with ISCED 6 qualifications (bachelor's or equivalent) increased significantly in Budapest (+26,136), Pest (+37,534), and Central Transdanubia (+12,667). The ISCED 7 (master's or equivalent) figures rose across all regions, most strikingly in Budapest (+75,724) and Pest (+53,877). Even less-developed regions saw marked increases, such as +30,566 in the Northern Great Plain.

Finally, the number of individuals with ISCED 8 (doctoral or equivalent) qualifications also increased, particularly in Budapest (+4,398), although the overall figures remained relatively low. This growth reflects Hungary's gradual expansion of advanced academic and research-oriented education.

3.3. Territorial extremes and regional profiles

Beyond the general trend of increasing educational attainment, distinct regional patterns and extremes can be identified in Hungary between 2011 and 2022. These findings highlight both the uneven spatial dynamics of educational development and the influence of broader socio-economic and demographic factors.

Budapest has emerged as the epicentre of tertiary education expansion. It experienced the largest absolute increase in ISCED Level 7 qualifications (+75,724) and notable gains in both ISCED 6 and ISCED 8 levels, reinforcing its role as the national academic and research hub. At the same time, it was the only region to witness a decline in ISCED 3A/3B, suggesting that more residents now bypass upper secondary education as their highest level of attainment in favour of higher education credentials.

In contrast, the Northern Great Plain, traditionally a socioeconomically disadvantaged area, has demonstrated broad-based educational improvement. The region saw large declines in ISCED 2 attainment (−74,469), alongside significant growth in ISCED 3A/3B (+17,723) and ISCED 7 (+30,566). However, it still retains some of the highest absolute numbers of residents with ISCED 1 and 2 as their highest qualifications, indicating that, despite progress, legacy inequalities remain.

Similarly, the Southern Great Plain showed substantial reductions in lower attainment levels (−88,626 in ISCED 2 and −37,865 in ISCED 1) and impressive gains in tertiary education. However, unlike most other regions, it also maintained one of the largest increases in ISCED 3C, suggesting the enduring importance of vocational pathways in the region.

Central and Western Transdanubia exhibited a relatively balanced development, with moderate gains across most educational levels. Western Transdanubia was one of the few regions where ISCED 3C grew slightly, indicating a stable vocational track, whereas Central Transdanubia's figures remained steady without major shifts. These patterns may indicate a more stable educational structure in economically stronger regions.

Conversely, Northern Hungary has lagged in educational advancement. The region registered the smallest increase in ISCED 6 (+2,531) and one of the lowest gains in ISCED 7 (+20,241) while still showing relatively high levels of low attainment. These figures reflect both structural constraints and the slow progress in overcoming long-standing educational disadvantages.

Finally, Pest County – surrounding Budapest – displayed strong growth across nearly all levels of educational attainment, particularly tertiary education (ISCED 6: +37,534; ISCED 7: +53,877). This suggests that the trend of suburbanisation and the expected economic gravity of the capital drive broad educational gains in the region.

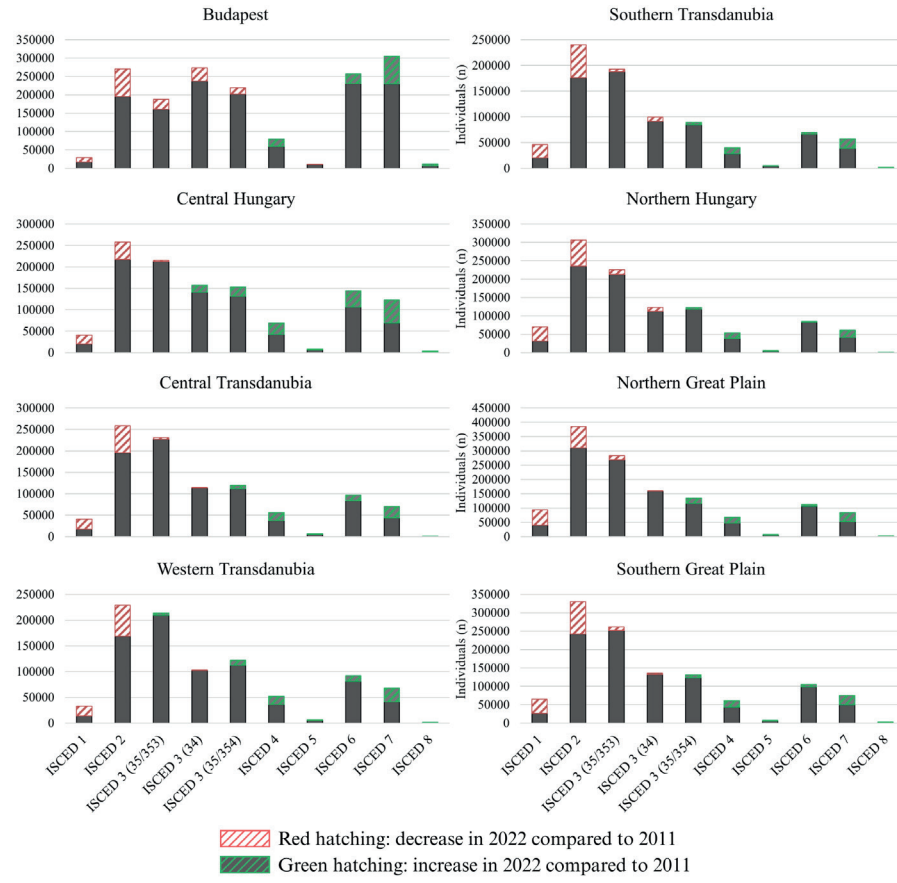

Fig. 3. Absolute number of individuals by educational attainment levels (ISCED 1–8) across Hungarian regions (NUTS 2), based on 2011 and 2022 census data (aged 7 and above)
Notes: Solid bars represent 2022 census data; red hatching indicates a decrease since 2011, while green hatching marks an increase

Source: own work based on data from the Hungarian Central Statistical Office (2013, 2023).

3.4. Polarisation of educational attainment

Having examined the overall distribution across all educational levels, the analysis shifted to the two extremes of the educational spectrum, focusing on the lowest and highest attainment levels. Figure 4 displays a bivariate choropleth map comparing the proportion of individuals with ISCED level 2 or below and those with ISCED levels 5–8 as their highest educational attainment. Examination of the two poles of the scale revealed several notable spatial trends.

At the lower end of the scale, populations with at most ISCED 0–2 attainment are primarily concentrated in the peripheral regions of the country. These include Northern Hungary, Southern Transdanubia, and parts of the Northern Great Plain, where disadvantaged socio-economic structures, small-village settlement patterns, and higher proportions of Roma population are characteristic. In these areas, the share of residents with only primary or lower secondary education significantly exceeds the national average, reinforcing long-standing centre–periphery divides.

At the upper end of the scale, tertiary educational attainment (ISCED 5–8) is strongly concentrated in Hungary's major urban centres and their suburbs. These areas benefit not only from the presence of universities but also from related sectors – public services, healthcare, and knowledge-intensive industries – that attract and retain highly educated populations. The capital city, Budapest, along with its surrounding area in Pest County, stands out because of the overrepresentation of tertiary-educated individuals. This marked polarisation between the capital city, regional university centres, and peripheral areas is consistent with previous research that has highlighted significant inequalities in higher educational attainment across Hungary (Sánta *et al.*, 2015). In addition, elevated proportions of higher education attainment are observed around major tourist destinations, such as Lake Balaton, Lake Velence, and other recreational regions. While the concentration in Pest County can be explained by the suburbanisation of diploma-holding populations originally from Budapest – a trend that accelerated after 2020 in the wake of the COVID-19 pandemic (Bajmócy and Jakus, 2023) – the patterns around Lake Balaton and Lake Velence are more closely related to lifestyle migration, tourism, and the presence of secondary residences rather than metropolitan suburbanisation.

Additionally, county seats and other major regional cities have prominently emerged with higher rates of tertiary education. In contrast, across much of rural Hungary, when comparing the highest and lowest levels of educational attainment, settlements tend to exhibit higher proportions of individuals with only ISCED level 1–2 education, suggesting a concentration of lower educational outcomes in less urbanised areas. The strong correlation between parents' educational attainment and income poverty must be emphasised within the complex set of problems connected to this issue in the Hungarian context. In 2022, 25–35% of children with parents with ISCED 0–2 attainment levels lived in income poverty, while in the case of ISCED 3–4 parents, this rate fell to 7–8%, with the lowest

rate (1–2%) of income poverty occurring in households with ISCED 5–8 parents (Hajdu *et al*., 2024).

Although the expansion of educational opportunities in Hungary has been substantial in recent decades, spatial mobility remains severely constrained for many students. As Forray and Híves (2009) observed, commuting to school was primarily feasible for those with higher educational qualifications and stronger social capital. In contrast, disadvantaged groups – particularly in peripheral rural areas – were often excluded from basic mobility due to transportation costs, infrastructural limits, or institutional barriers. Ovenden-Hope *et al.* (2023) have similarly emphasised how the geography of access can undermine formal rights to education. Velkey (2020) has argued that the state's educational services often reproduce territorial inequalities rather than compensate for them, making mobility a mechanism of exclusion rather than a means for increasing equity.

Taken together, these patterns reveal a sharp polarisation: low educational attainment remains dominant in rural and peripheral regions, while tertiary education is concentrated in urban and suburban centres. This duality underscores the long-standing territorial inequalities in the Hungarian educational system, which are further elaborated in the subsequent Hot Spot Analysis.

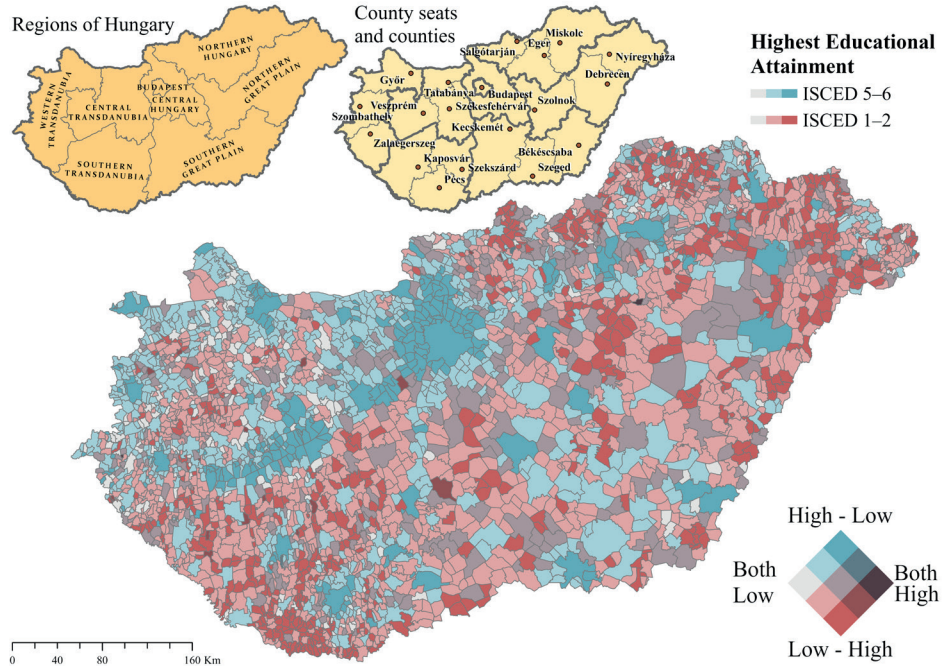

Fig. 4. Bivariate choropleth of highest educational attainment levels (ISCED 2 and ISCED 5–8)
Source: own work based on data from the Hungarian Central Statistical Office (2023).

3.5. Spatial Hot and Cold Spots of low educational attainment (ISCED 0–2)

Given the potential for cognitive bias in the visual interpretation of spatial data, as outlined in the methodology section, we now proceed with a detailed spatial pattern analysis of the two distinct ends of educational attainment.

Figure 5 presents a comprehensive spatial analysis of the population with at most ISCED level 2 education (lower secondary education or below) across Hungarian settlements, based on an Optimised Hot Spot analysis using the Getis-Ord Gi* statistic (Table 1). The map reveals pronounced territorial disparities in low educational attainment, with statistically significant patterns that align with Hungary's historical development trajectories and socio-economic divisions. The analysis identifies seven major Hot Spot clusters (displayed in red shades), representing areas with statistically significant concentrations of individuals whose highest educational attainment is lower secondary education or below.

A well-defined western cluster extends from the eastern part of the Vasvár district to the Devecser district, covering parts of the counties of Vas and Veszprém. This compact cluster primarily encompasses rural settlements, with historical agricultural economies and limited industrial development.

A large, spatially coherent cluster dominates Southern Transdanubia, which is particularly pronounced across the counties of Somogy and Baranya. This region represents one of Hungary's most disadvantaged areas and is characterised by small villages, ageing populations, and limited economic opportunities. Within this extensive Hot Spot, only Pécs (the regional centre with a major university) and its immediate suburban ring emerged as significant cold spots, illustrating the stark urban-rural educational divide. The city of Kaposvár appears as an educational "island" classified as non-significant, suggesting that it neither significantly outperforms nor underperforms relative to national averages (Alpek *et al*., 2018; Balogh *et al*., 2018).

A substantial cluster spanning the northern counties of Heves, Nógrád, and parts of Borsod-Abaúj-Zemplén, an area that experienced significant economic decline following the collapse of heavy industries in the socialist era. The challenging topography of this region coupled with its poor transportation infrastructure and limited employment opportunities has contributed to persistent educational disadvantages (Kiss, 2012; Kocziszky and Szendi, 2021).

An extensive cluster along Hungary's northeastern border (particularly in the Szabolcs-Szatmár-Bereg County) and eastern regions (parts of the counties of Hajdú-Bihar and Békés), areas with historically high poverty rates, Roma populations, and distance from major economic centres. These peripheral regions face significant challenges in terms of educational development and economic integration (György, 2014; Kovács *et al*., 2024; Tagai *et al*., 2018). Similar patterns linked to high rates of Roma population can also be observed in Northern Hungary and Southern Transdanubia (Hungarian Central Statistical Office (2023); Pénzes

et al., 2018, 2019). In addition, border regions also face challenges in educational attainment, as demonstrated by Pénzes *et al*. (2023).

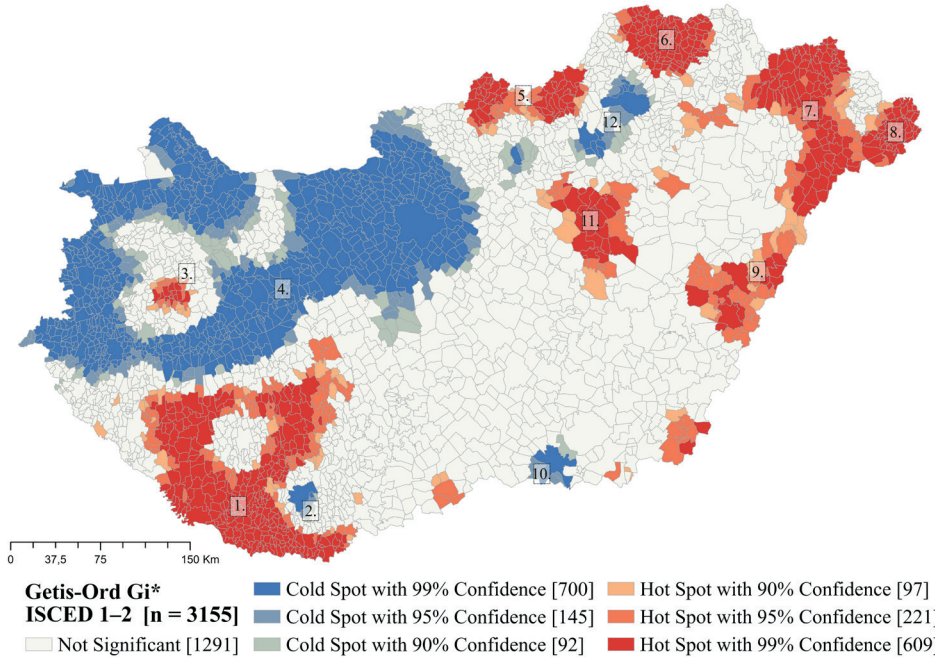

Fig. 5. Spatial pattern of the share of individuals with at most ISCED 2 educational attainment
Source: own work based on data from the Hungarian Central Statistical Office (2023).

Several smaller but statistically significant Hot Spots appear scattered across central and eastern Hungary, often corresponding to microregions characterised by small settlement structures and limited access to educational facilities.

In stark contrast, northwestern Hungary (particularly the Győr-Moson-Sopron County, and parts of the counties of Vas and Komárom-Esztergom) emerged as significant cold spots (displayed in blue shading). This region benefits from its proximity to Western European markets, substantial foreign direct investment, and robust industrial development, resulting in stronger educational outcomes and lower proportions of individuals with only lower educational attainment level (Pénzes *et al*., 2018).

The map also highlights the educational polarisation between urban and rural settlements. Major regional centres and university towns – Eger, Miskolc, Szeged, and Pécs – stand out as distinct Cold Spots within otherwise disadvantaged regions, exhibiting significantly lower proportions of residents with minimal educational attainment. This pattern demonstrates how urban centres function as educational oases, attracting and retaining more educated populations, while potentially

drawing human capital away from the surrounding rural areas. These findings are consistent with previous analyses that also identified a strong spatial concentration of tertiary educational attainment in Hungary (Dövényi and Németh, 2018).

Budapest and its immediate surroundings also display consistently low proportions of minimal educational attainment, reflecting the concentration of educational and employment opportunities in the country's primary metropolitan area.

These spatial patterns align closely with Hungary's broader socio-economic divisions and highlight how educational disadvantage is geographically structured, with clear east-west and centre-periphery gradients that have persisted despite overall educational improvements nationwide. School closures in rural Hungary have not only reduced physical access to education but have also triggered long-term community disintegration. As several authors have highlighted, shutting down schools – especially in marginalised areas – often leads to depopulation, intensifies social isolation, and increases ethnic segregation (Andl, 2021, 2023; Fejes and Szűcs, 2018; Kroismayr, 2019; Mutgan and Tapia, 2025; Sageman, 2022). These closures represent not only an infrastructural setback but also a symbolic loss of communal vitality and local identity. Particularly in villages with ageing population and scarce resources, the disappearance of educational infrastructure reinforces structural exclusion and limits the prospects of intergenerational mobility.

Table 1. Share of population with primary education only (ISCED 1–2) in clusters and at the national level (clusters correspond to those in Fig. 5)

ID	Number of settlements (N)	Mean [%]	Std. dev. [%]
1	266	49.66	13.27
2	2	22.59	1.49
3	13	45.53	7.34
4	673	28.13	7.45
5	46	48.45	11.86
6	97	51.06	18.03
7	102	48.50	10.76
8	50	48.52	10.19
9	12	48.14	9.97
10	1	18.74	0.00
11	20	54.15	16.07
12	12	29.05	8.60
National average	3155	35.75	9.49

Note: The IDs correspond to the clusters indicated on the map (Fig. 5.). The number of settlements (N) refers only to those within each cluster where the 99% significance level could be measured.

Source: own work based on data from the Hungarian Central Statistical Office (2023).

3.6. Spatial Hot and Cold Spots of tertiary education (ISCED 5–8)

Figure 6 presents a sophisticated spatial analysis of the population with tertiary education (ISCED Levels 5–8) across Hungarian settlements, revealing distinct patterns that illuminate the geography of higher educational attainment in the country (Table 2). While these patterns generally contrast with those of lower educational attainment shown in Fig. 5, they do not form a perfect inverse relationship, suggesting complex underlying socio-spatial dynamics.

Budapest and its metropolitan region emerged as the dominant Hot Spot for tertiary education, displaying the highest concentration of university graduates in the country. This primacy reflects the capital's historical role as Hungary's principal educational, economic, and cultural centre, hosting several prestigious universities and offering diverse employment opportunities for highly qualified professionals. The Hot Spot extends well beyond the administrative boundaries of Budapest into its surrounding agglomeration zone, particularly towards the western and northern suburban areas (Budaörs, Szentendre, Dunakeszi) (Varga *et al*., 2020). This pattern captures the post-socialist suburbanisation process, which accelerated after 2000 and intensified following the COVID-19 pandemic as highly educated urban professionals sought larger homes and better environmental conditions while maintaining access to employment in the capital (Bajmócy and Jakus, 2023; Sulyok *et al*., 2024).

The analysis identifies several secondary Hot Spots centred on regional university cities that form a polycentric network of higher educational attainment across the country. Debrecen, Hungary's second-largest city and the home to the University of Debrecen in the Eastern Great Plain, shows a pronounced concentration of tertiary-educated residents that extend to its immediate suburban zone (Pénzes *et al.*, 2023). Beyond the university, Debrecen's role as a regional centre of public administration, healthcare, and its rapidly growing IT and pharmaceutical sectors also contribute significantly to this concentration (Molnár and Kozma, 2019; Tarnóczi and Bauerné Gáthy, 2024).

Szeged, the regional centre of the Southern Great Plain and the host of the University of Szeged, forms another significant Hot Spot, benefiting from its role as a major research centre and its proximity to the Serbian border. Similarly, the city's concentration of public services and healthcare institutions, along with expanding knowledge-intensive industries, reinforces its high levels of tertiary educational attainment (Gyurkovics and Juhász, 2018; Molnár *et al*., 2018).

Pécs in Southern Transdanubia constitutes a striking educational island within an otherwise disadvantaged region; this is due to the presence of the University of Pécs and its historical role as a regional cultural centre (Tóth and Farkas, 2019; Varjú and Óvári, 2024).

The northwestern axis of Győr-Sopron-Szombathely forms an interconnected cluster of high educational attainment, supported by economic prosperity from the automotive and electronics industries, cross-border connections with Austria, and

the presence of vibrant regional universities (Molnár *et al*., 2020; Németh *et al*., 2023; Rechnitzer, 2015).

Eger in Northern Hungary represents a smaller but statistically significant Hot Spot which also extends to Miskolc. While Eger's educational profile is enhanced by Eszterházy Károly Catholic University and tourism-related development, Miskolc contributes to the Hot Spot as a regional centre with its university, industrial heritage, and public service institutions (Kristóf, 2017, 2018; Schuchmann, 2022).

Particularly noteworthy is the Őrség microregion near the Austrian and Slovenian borders, appearing as an unexpected Hot Spot despite its peripheral location and rural character. This anomaly likely reflects amenity migration – the settlement of highly educated professionals and retirees attracted by the region's natural beauty, cultural heritage, and tranquillity. The Őrség case demonstrates how certain rural areas can develop distinctive educational profiles through selective in-migration, challenging the conventional urban-rural educational divide.

The spatial distribution of tertiary education reflects Hungary's post-socialist transition and subsequent economic restructuring. Areas that are successfully integrated into knowledge-based and service economies show higher concentrations of university graduates, whereas regions that are dependent on declining traditional industries or agriculture demonstrate persistent educational disadvantages. This pattern has been reinforced by the uneven distribution of higher education institutions – the doctoral programmes are mostly concentrated in four cities (Budapest, Debrecen, Szeged, and Pécs) – creating "educational deserts" in peripheral regions (Hungarian Educational Authority, n.d.).

The patterns observed align with international literature on the geography of human capital, thus emphasising how skilled labour tends to concentrate in urban agglomerations that offer diverse employment opportunities, knowledge spillovers, and quality amenities (Puškárová and Piribauer, 2016; Thisse, 2018; Wibisono, 2022). In the Hungarian context, these patterns have been shaped by historical development trajectories, socialist era industrial and educational policies, post-socialist economic restructuring, and more recent European integration processes.

The spatial concentration of highly educated populations creates self-reinforcing cycles of advantages and disadvantages. Hot Spot regions benefit from increased innovation capacity, higher productivity, and greater attractiveness for knowledge-intensive investments, while Cold Spot areas face challenges in economic diversification, innovation adoption, and the retention of young talent. The resulting educational polarisation contributes significantly to broader regional development disparities across Hungary. Even where tertiary qualifications have expanded, spatial variation in their economic and social returns remains substantial. As Polónyi (2023) argues, the labour market value of formal educational credentials is increasingly shaped by the geographic context and institutional prestige. In many peripheral regions, higher qualifications do not necessarily lead to upward mobility or improved socio-economic outcome. This underscores how

educational expansion alone does not guarantee territorial convergence, because returns to education remain strongly conditioned by local opportunity structures and regional labour market dynamics.

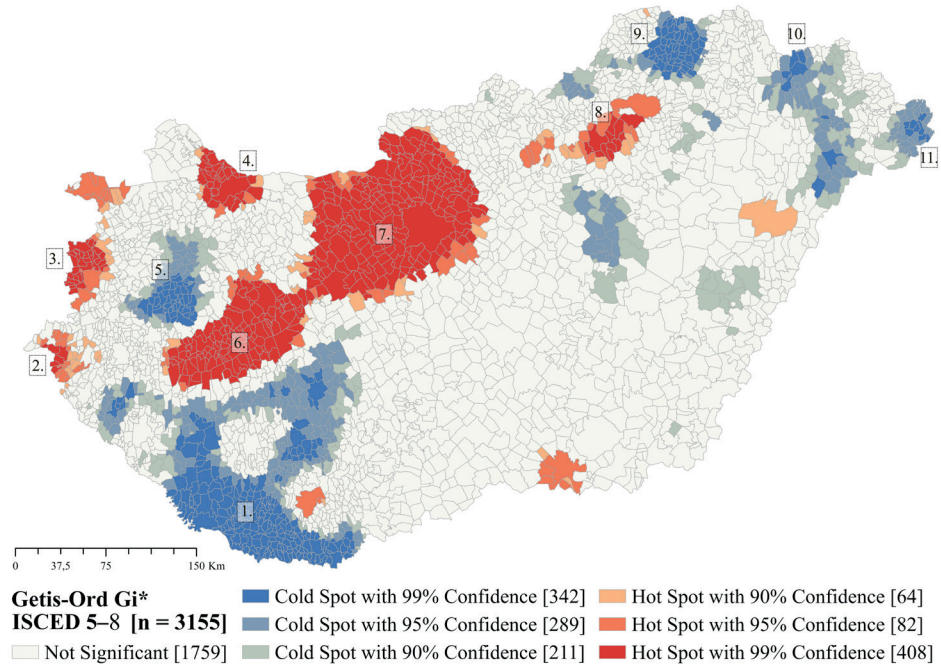

Fig. 6. Spatial pattern of the share of individuals with ISCED 5–8 educational attainment
Source: own work based on data from the Hungarian Central Statistical Office (2023).

Table 2. Share of population with ISCED 5–8 educational attainment in clusters and at the national level (clusters correspond to those in Fig. 6)

ID	Number of settlements (N)	Mean [%]	Std. dev. [%]
1	189	6.84	5.05
2	6	21.61	6.11
3	31	22.12	7.06
4	27	25.94	8.90
5	47	8.82	4.54
6	119	26.55	11.37
7	207	27.82	12.01
8	12	24.70	9.89
9	59	7.27	6.79

ID	Number of settlements (N)	Mean [%]	Std. dev. [%]
10	5	8.66	2.96
11	8	7.98	3.86
National average	3155	9.88	6.18

Note: The IDs correspond to the clusters indicated on the map (Fig. 6.). The number of settlements (N) refers only to those within each cluster where the 99% significance level could be measured.

Source: own work based on data from the Hungarian Central Statistical Office (2023).

4. CONCLUSION

This study explored the spatial disparities in educational attainment across Hungarian settlements by focusing on the extremes of the educational spectrum – individuals with lower secondary education (ISCED 2 or below) and those with tertiary education (ISCED 5–8) – based on data from the 2022 national census. The integration of bivariate choropleth mapping and Optimised Hot Spot analysis allowed for a nuanced understanding of spatial clusters and patterns, enhancing the interpretability of territorial inequalities.

The EU has set ambitious educational goals, including reducing low achievement by 15% by country (Hanushek and Woessmann, 2020). Between 2011 and 2022, Hungary experienced substantial educational shifts across all its regions. The number of individuals with only ISCED 1 or 2 qualifications declined markedly nationwide, with the most significant changes occurring in the traditionally disadvantaged northeastern and southeastern regions. Nationally, the share of individuals with at most ISCED 1–2 level education has dropped from 32% in 2011 to 23% by 2022. In parallel, tertiary education (ISCED 5–8) expanded considerably, particularly in Budapest and in the Pest County, as well as in regional university centres such as Debrecen, Szeged, and Pécs. Even the peripheral regions recorded measurable gains, although the disparities persisted.

The spatial distribution of educational attainment reveals pronounced territorial polarisation. High shares of low educational attainment continue to characterise rural and economically lagging areas – especially in Southern Transdanubia and northeastern Hungary – while urban and suburban zones increasingly concentrate on the highly educated. This duality underscores a structural divide, with access to higher education shaped by settlement size, institutional presence, and the regional socio-economic trajectory.

Although educational expansion is evident nationwide, the effects are uneven. The rise in tertiary qualifications reflects both increased access to and a growing valuation of higher education, yet it also accentuates spatial inequalities where oppor-

tunities remain limited. These trends suggest that, without territorially differentiated policy responses, educational divergence may persist or deepen over time.

Theoretically, the results support the spatial dimension of educational inequality and align with the perspective that educational systems can both reproduce and mitigate territorial disparities (Pop, 2023; Velkey, 2020). The observed clusters reinforce the notion of educational Kuznets curves in post-socialist contexts, in which increasing national education levels may not uniformly reduce spatial inequalities (Polónyi, 2023).

These results have important policy implications. They underscore the need for territorially differentiated educational and developmental strategies that address the specific challenges faced by regions with persistently low educational attainment. Strengthening regional universities, creating rural innovation hubs, and implementing targeted educational interventions could help retain graduates locally, stimulate regional development, and reduce educational inequality (Gunasekara, 2006; Neszmélyi *et al*., 2022; Uyarra, 2010; Wibisono, 2022). As Schnabel (2025) argues, mitigating territorial inequalities in education requires not only centralised redistribution, but also renewed forms of decentralisation and regional planning. Multilevel governance structures that empower local stakeholders to design inclusive, context-sensitive educational environments are essential to advancing spatial justice.

Despite the robust nature of the spatial analysis, certain limitations must be acknowledged. The study relies on cross-sectional census data, which captures a snapshot in time and does not account for temporal dynamics, such as recent migration or educational reforms. Additionally, while settlement-level data offer high granularity, individual-level factors such as SES or migration trajectories cannot be incorporated. It is also important to note that our findings align with those of Forray and Híves (2009), who more than fifteen years ago observed a persistent overlap between higher levels of educational attainment and more disadvantaged regions – areas that appear to have remained unable to alter their structural position since then.

Future research should integrate longitudinal data and individual-level variables to better understand the causal mechanisms of spatial educational inequalities. Furthermore, comparative analyses with previous census data can reveal the evolution of these patterns and the effectiveness of past policy interventions. One of the key mechanisms behind the persistence of spatial educational disparities is the increasing centralisation of educational governance in Hungary. Following the nationalisation of previously municipally maintained schools, the decision-making authority became heavily centralised (Sáska, 2013; Kozma, 2015). This restructuring, as Velkey (2019a, b) notes, relieved local actors from responsibility while also introducing new asymmetries, especially in areas where public institutions were transferred to church control (Polónyi, 2005). These shifts have constrained territorial responsiveness, further deepening spatial inequalities in both access and institutional diversity.

In conclusion, this study makes a significant contribution to the growing literature on the territorial embeddedness of educational outcomes in post-socialist contexts. By revealing distinct spatial clusters of educational attainment across Hungary, we highlight how educational inequality manifests geographically and persists despite the overall improvement in national educational levels. These findings emphasise the importance of place-sensitive educational policies that address long-standing regional inequalities and foster inclusive development across all territories.

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HALFWAY BETWEEN LONDON AND ANKARA: THE ROLE OF MIGRATION IN THE GLOBAL INTEGRATION OF BUDAPEST

Abstract. Budapest's global city network integration determines its future social and economic development regarding every related dimensions. This position is based on its international labour market flows in a specific way. While unskilled labour provides essential but changeable resources, highly skilled labour has much higher added value and create liveable social and cultural environments. Local regulation tries to balance domestic market needs and deeper economic integration by eliminating low skilled workers in vain according to existing experiences. Their spatial concentration, deeper integration and the diversified sources of immigration both contribute to Budapest strengthening global city connectedness. Our aim is to show and analyse these processes.

Key words: global Budapest, international migration, globalisation, contest of cities, international labour markets.

1. INTRODUCTION

In the contemporary global urban competition scene (Bertaud 2018; Koudela, 2024) labour markets play a crucial role (Wills *et al*., 2010). Understanding international labour market integration needs an analytical approach by separat-

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ing the two opposing segments of the market, the low skilled labourers and the highly skilled professionals and the ways in which they develop their networks (Hüwelmeier, 2015) and alter the environments. Our first aim is to differentiate these immigrant groups in Hungary by analysing the work permits issued to foreign nationals.

Table 1. The basic characteristics of Hungary (GDP, population size, including the number of foreigners)

	2013	**2014**	**2015**	**2016**	**2017**	**2018**
GDP PPP (million EUR)	175 246,1	181 808,3	189 772,5	191 046,8	198 616,2	212 322,8
Population	9,895,250	9,850,217	9,815,858	9,779,652	9,739,857	9,713,655
Foreigners	141,357	140,536	145,968	156,606	151,132	161,809

	2019	**2020**	**2021**	**2022**	**2023**
GDP PPP (million EUR)	224 620,3	219 806,3	238 893,7	264 995,2	282 349,5
Population	9,700,272	9,689,376	9,651,461	9,610,403	9,599,744
Foreigners	180,773	199,957	194,491	202,525	226,267

Source: own work based on HCSO 21.1.1.4. Value of gross domestic product in HUF, EUR, USD, and in purchasing power parity https://www.ksh.hu/stadat_files/gdp/en/gdp0004.html; HCSO 22.1.1.1. Main indicators of population and vital events https://www.ksh.hu/stadat_files/nep/en/nep0001.html; HCSO 22.1.1.23. Foreign citizens residing in Hungary by country of citizenship and sex https://www.ksh.hu/stadat_files/nep/en/nep0023.html data.

In the case of Budapest, it is also important to separate traditional migrations, which can be interpreted in different historical and cultural contexts and explained by different foreign policy and policy strategies, strictly speaking, from the migration industry. While the former primarily refers to the economy and economic geography and foreign policy context affecting Hungarians beyond the border (Péti *et al*., 2021; Rusu, 2010), it also includes immigrants from neighbouring countries, who were prompted by different reasons and driven by different goals in different eras, even though later regulation facilitated it by similar means. While in the years following the Revolution of 1989, cross-border commuter immigration was due to higher wages, the cross-border resettlement (Berceanu *et al*., 2023) of the past decade could also be attributed to low real estate prices in Hungary. In part, even the immigration of highly qualified people from EU member States can be classified here, but the appearance of guest workers filling the labour market gap, the impact of investor visas, and the highly qualified immigration from more distant countries associated with global value chain integration are fundamentally

different. At the same time, their characteristics and globalisation effect partially coincide with the effects caused by the influx of skilled workers from the EU and third countries, so the precise demarcation is difficult, since the migration industry can only be placed purely in theory within the framework of supply and demand. Our second research question aims to scrutinise the geographical changes of source countries among the migration influxes over the years examined.

Table 2. The basic characteristics of Budapest (GDP, population size, including the number of foreigners)

	2013	**2014**	**2015**	**2016**	**2017**	**2018**
GDP PPP (million EUR)	75 372,87	62 361,73	57 243,73	51 589,03	55 467,55	49 694,69
Population	799,282	801,738	806,199	805,733	801,943	801,218
Foreigners	60,535	61,219	67,253	72,136	72,945	76,824

	2019	**2020**	**2021**	**2022**	**2023**
GDP PPP (million EUR)	46 302,45	41 993,27	40 717,87	39 366,13	37 296,4
Population	803,939	802,837	790,343	782,132	782,385
Foreigners	85,089	91,540	86,930	88,251	97,470

Source: own work based on Eurostat Regional gross domestic product by NUTS 2 region – million EUR https://ec.europa.eu/eurostat/databrowser/view/tgs00003/default/table?lang=en; HCSO 22.1.2.1. Resident population by sex, county and region https://www.ksh.hu/stadat_files/nep/en/nep0034.html; HCSO 22.1.2.17. Foreign citizens residing in Hungary by county and region https://www.ksh.hu/stadat_files/nep/en/nep0050.html data.

All of this has an impact on employment and migration, and through this also on the position within the global city network. Guest workers in such an isolated and limited situation also create a kind of institutionalisation, they perpetuate the necessary products of the migration industry (Matuszczyk and Bujarczuk, 2024): language schools, grocery stores, restaurants, social and legal institutions, trade unions, and other activities that support their stay. An integration of this kind clearly comes with risks of wider economic and social impact. Our third goal is to discuss how Hungarian regulation intends to avoid the inherent tension between facilitating economic utilisation and limiting social integration (Bal *et al.*, 2024). For this reason, to explore the geographical distribution of immigrants is also important. The loudly communicated dispersal of isolated and closed working communities suggest easiness in elimination, however, concentration in a large city might come with unintentional consequences within the Hungarian social fabric.

In the case of highly educated immigrants, a close social network is not common, they typically move along business networks (Girling, 2024), so they do not create ethnic or other local communities, and they are not characterised by the institutionalisation observed at the other pole, but they are also connected to the global situation of the city by an institution on their side (e.g., elite clubs, elite schools or any high-quality service (Czerska-Shaw and Kubicki, 2023)), which is also an environment-shaping factor, and this increases the host city's competitiveness for human capital. Since their work represents significantly greater added value, in their case global integration is created by the host markets: they are needed, so their involvement is a direct market interest, which is supported by the locality (including the city administration and the companies present in the given city). The fifth goal of this study is to understand how the highly skilled workers and professionals create creative environments, alter the image of Budapest in the global labour market scene and contribute to its competitiveness along with it?

While in the case of the first group, immigrants themselves transform the city for their own benefit, in the case of the latter, the city transforms itself for the benefit of immigrants. From the point of view of global integration – which is the overarching and main objective of the article – the latter traditionally follows transnational corporate structures, and this determines the global situation of the given city; conversely, cities themselves do everything to integrate in order to attract globally mobile human capital. As a result, individual decisions are valued, labour market factors are overridden by the characteristics of the locality, and the highly qualified workforce begins to take control. In this regard, in addition to the policy environment and the role of the state, local actors are becoming increasingly stronger – assuming that local and national interests and regulations do not conflict. The impact of market competition on the city ranges from meeting direct needs (construction of housing estates) to increasing general competitiveness (cultural or environmental development).

The role of the urban environment has now become decisive with digital development, the increasing value of remote work and a general generational change in values, one of its best-known contexts being the creative class and the mobility and spatial competition associated with it. All of this, in addition to the mobility occurring in the corporate structure, also enhances the role of individual decisions on the international scene, which creates a specific market situation. Eventually, all these changes can contribute to move Budapest forward from its decade-long stagnating global position.

In order to achieve our goals and find answers to the questions, we follow the theoretical framework set by Saskia Sassen, we analyse the current regulations and data on immigration and foreign labour provided by the Hungarian Central Statistical Office and the National Employment Service, referring the spatial distribution to demographic variables and their changes over the discussed period.

The results of the analysis follows the chronological changes in market regulations, while discussion adds those new insights that connect our perspective to the fields of immigration studies.

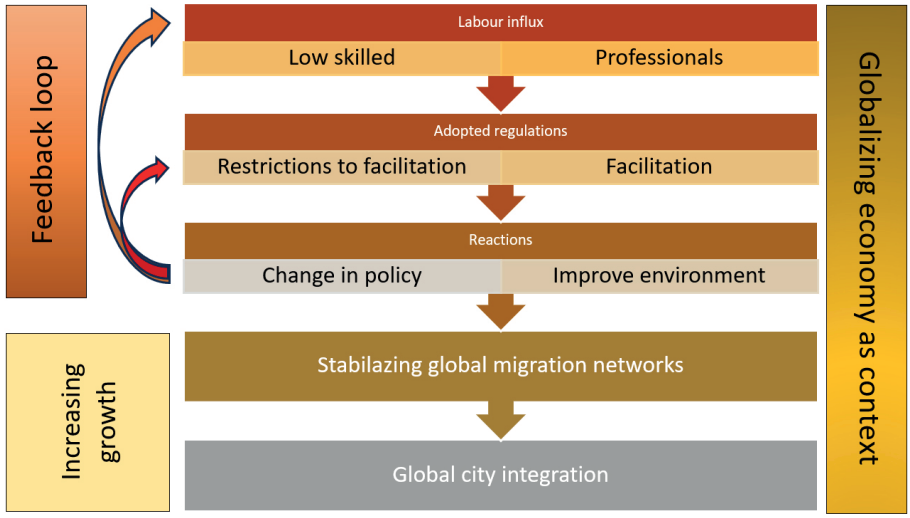

Fig. 1. The migration subsystem of global city integration

Source: own work.

2. THEORETICAL BACKGROUND

Today, one of the universally accepted dimensions of globalisation is the flow of labour (Amin, 2008), that is, in addition to the internationalisation of capital flow and trade, the broadening of the international markets of labour and liberalisation of labour market relations. The most important spatial system of this is the network of global cities – our main theoretical framework – we describe in the following. The extent to which a city is connected to the international labour markets clearly determines its global position. In 1986, John Friedmann saw the prominent role of world cities in migration based on the world system approach. The developed economy of the core countries creates concentration and hubs, so production and services in these areas both have the highest labour market demand, which the domestic markets are unable to replace. This approach is based not only on Friedmann and Wallerstein's (2004) centre-periphery model, but also on Piore's (2001) dual workforce approach.

Immigration, which is inevitable for growth (Borjas, 2021; De Haas, 2021), creates huge socio-territorial tensions (Brunarska, 2022), territorial and class segmentation in the city, and different migration policies are formed to deal with them. In this view, immigration takes a macroeconomic approach; it stems from the contradiction between expansion supported by growing economic competition and the limited resources of domestic labour markets, and the whole process is typically limited to low-skilled people. As a result, only the declining demand associated with the modernisation of the domestic economy and the forced adaptation of the remaining masses cause some development (Friedmann, 1986).

For Saskia Sassen, migrant economic networks represent one of the defining dimensions of the international networks of cities. According to her, along with the shrinking role of the state, global cities are becoming strategic centres of global capital and transnational labour. All this creates trans-local communities and identity and a new form of "citizenship" and strengthens the power of local actors, although Sassen does not ignore the immigration of a large mass of unskilled labour as a factor that polarises income and employment. In regards of identities, a 2023 study (O'Brien *et al.*, 2023) show how migrants get stigmatised by rural native people. Sassen's most important theoretical contribution is perhaps the formation of transnational networks. In addition to stabilising international labour market relations, political, cultural, and even criminal networks are also formed, which – apart from the latter – have a positive effect on economic activity. The most important driving force behind this process is communication and the result is spatially spreading social networks, which leads to the formation of international nodes (Sassen, 1991, 2005). It is only an endowment that large cities, which for historical reasons already play a central role, largely (but not necessarily) serve as the basis for these nodes that play a new role.

However, none of them distinguish the role of education in differential integration between global cities. Sassen also writes only in general about the outstanding importance of migration, raising it to the same level as international capital flows, and only emphasising the importance of locality. Even though she considers the highly educated to be the defining stratum of post-industrial society and urbanity, she assigns them a prominent role in gentrification and social segmentation. While Friedmann's and Piore's approaches are demand-based, Sassen's principle is based on supply, and she characterises local markets with a split in consumption. The increase in the number of immigrants in global cities leads to the flourishing of small producers who can effectively compete with large retail chains and supermarkets because consumers are unable to pay those prices and find their specific needs. This market segment has a very low return, which leads to an increase in demand for additional low-wage labour. We also have comparable knowledge of the urban development of recently

emerged destination countries due to immigration in Central Europe (Křížková and Ouředníček, 2020).

This logic still reminds us of Piore's argument, although the subject is not the company wage structure and the domestic labour market supply constraints, but the specific needs and demand force of guest workers employed on one or two-year contracts who otherwise do not wish to integrate. Both aspects can be relevant in Hungary, especially in Budapest, which is the primary focus of bipolar immigration. Employers will certainly not be able to satisfy all emerging needs in the long term, the remaining existing and then newly emerging needs will create market gaps to which the supply will respond.[1]

All this does not necessarily imply a shift to the illegal employment or the informal economy, even though the example of Poland shows this (Korys and Weinar, 2005). Conversely, the global criminal networks introduced by Saskia Sassen logically follow from the concept of global city networks, and immigration is often included in such a context in political rhetoric, real data do not prove its existence (Samers, 2002). The same is true for the mass marginalisation that, in principle, necessarily appears on the labour market. Although both the dual labour market and the global city hypothesis assume all this effect from cheap and massive vulnerable foreign labour; according to experience, the decreasing efficiency of state labour regulation, the growing market power of concentrated retail, and the increasing competition caused by cheap imported goods play at least as much a role (Stanford and Vosko, 2004).

Although professionalisation is characteristic of most global cities, there is little evidence of the proletarianisation raised as a central point by Sassen and that polarisation is a necessary consequence of the perpetuation of low-skilled immigration (Hamnet, 2021). In fact, the whole migration industry and the issue of global cities are in a peculiar situation. Although it is a central element of the global city concept, and countless theoretical works related to it have been published in the last three decades (Findlay *et al.*, 1996; Cohen *et al*., 2022; Yamamura, 2022), there is no longer such an abundance of empirical analyses. The lack is particularly acute when it comes to the dual nature of labour market flows, the mass of low-educated people and the related polarisation, labour market dependence, and the connection between the added value of the highly-educated and the positioning of the value chain or the investor environment, which were also determining motives from the beginning (Friedmann and Wolff, 1982; Sassen, 1988), or the related economic policy.

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[1] Both industrial decentralisation and urban sprawl resulted in higher socio-economic integration of the Pest county agglomeration to Budapest, increasing its metropolitan area function. Other constraints might be also interesting, e.g. the use of English among the population in general and the MNC environments in particular. The former shows a significant growth in census data since 1990, the latter goes hand in hand with their increasing role in the domestic market.

3. METHODOLOGY AND DATA

The goals of the study:

1. Our first aim is to differentiate these immigrant groups in Hungary by analysing the work permits issued to foreign nationals.
2. Our second research question aims to scrutinise the geographical changes of source countries among the migration influxes over the years examined.
3. Our third goal is to discuss how Hungarian regulation intends to avoid the inherent tension between facilitating economic utilisation and limiting social integration (Bal *et al.*, 2024).
4. For this reason, to explore the geographical distribution of immigrants is also important.
5. The fifth goal of this study is to understand how the highly skilled workers and professionals create creative environments, alter the image of Budapest in the global labour market scene and contribute to its competitiveness along with it.

We consider the development of the number and proportion of unskilled and highly skilled workers, as well as the prospects for changes in the related policy. For this, we use the annual time series data of the National Employment Service (NES) and the Hungarian Central Statistical Office (HCSO), as well as the relevant policy regulators and guidelines for the indicated period, which are *the Government decree 445/2013. (XI. 28.) on the authorisation of the employment of third-country nationals in Hungary based on a non-consolidated application procedure, on exemption from the licensing obligation, on the cooperation of the labour centre of the capital and county government office in the combined application procedure, and on the notification of the employment of third-country nationals who can be employed in Hungary without a permit in Hungary, and compensation of wages*, and also *the Government decree 462/2023. (X. 5.) on emergency measures for the protection of Hungary's labour market and population (HG, 2013; HG, 2023)*. The examination and temporal overview of the source countries of international migration, the socio-economic composition, the territorial distribution of immigrants and the related regulations enables the dynamic monitoring of Budapest's global position from the perspective of international labour flows.

Data derived from the Hungarian Central Statistical Office (HCSO) database and the National Employment Service (NES) is purely descriptive and contain only numbers. For our purposes we combined the different data sources, selected and arranged data by indicators relevant to the research goals, i.e., the territorial, educational, and occupational differences in immigrant stocks and flows. We also calculated population rates and rates within different proportions of immigrant groups, however, the characteristics of the available data has not enabled the calculation of trend indicators, constraining us to interpret changes within the set of time series alone and interpret prospects out of them. Available data provided by

the HCSO and NES limits our understanding of the migration related urban development phenomena, still helps us to understand the capital city's global labour market integrations process to achieve our goals, by revealing a dominant dimension "*of coordination of complex economic activities at a global scale*" (Bourdeau-Lepage, 2007, p. 1).

4. RESULTS

4.1. The role of migration in Budapest's global position

The regional functional concentration in Hungary is a historical fact that determines the economic and social spatial structure of the entire country. Due to its population and economic predominance, and its domestic and foreign economic role, Budapest Primate City far exceeds that of any other city in the country. Its predominant role in domestic economic geography partly determines its global urban position from the outset. However, it is not necessary that the prominent national role of the capital city and the country's role in the international economic system move along the same path, and especially not that they strengthen each other.

Based on the production services and their connection to the global network, Globalization and World Cities (GaWC) classified Budapest in the gamma category in the 1990s, while by the beginning of the 2000s it was already in the beta + category and has occupied the same position ever since (more precisely fluctuated between beta and alpha –). This clearly shows that the capital's international role changed radically in the first decade after 1990, Budapest became an environment where labour market embeddedness was accompanied by an increase in the number of foreign direct investments and corporate centres. The stock of FDI in Hungary increased nearly eightfold in the 1990s and quadrupled again in the following decade, decreased somewhat after 2012 (UNCTAD, 2018, 2019), then started to increase again after 2017 (HCSO, 4.21).

In 2000, the number of enterprises with foreign interests in Hungary was 26,634, the majority of which, as of ten years later, operated in Budapest. However, in the decade following 2013, the composition of companies with foreign interests in Hungary changed sharply. Among enterprises employing between 10 and 249 people, the foreign share has decreased by more than 6 per cent since 2010, but it has increased to the same extent among enterprises employing 250 or more people (OPTEN, 2021; HCSO, 2020a). In the field of high-level business services, by the 2010s, Budapest had risen to third place in the Central European region, after Warsaw and Vienna, (Döbrente, 2018), according to Lisa Bourdeau-Lepage (2007), its global functions had lagged behind Prague ten years earlier. Although

Budapest's financial controlling and central role declined somewhat in the 2000s, it began to take shape in the two decades following the fall of Communism in 1989 as a whole (Gál, 2015).

After the turn of the millennium, the growth of the role of other centres in addition to Budapest, mainly in Western Hungary, induced a significant shift in foreign capital investments, but this did not fundamentally change the process of Budapest's integration into the global city network. Regarding immigrants, the majority of them currently come from outside Europe for employment purposes and settle in Budapest. Between 2000 and 2023, the number of immigrating citizens of Asian countries increased from 2,217 to 37,720 in Hungary, but the number of American and African citizens, which were relatively small in the 1990s, also increased by two or three times respectively; while the number of citizens of European countries, despite some fluctuations, decreased in the same period (HCSO, 22.1.1.28.). 82 per cent of Chinese immigrants live in Budapest (Irimiás, 2009). The number of immigrants from Asia and Africa shows a particularly high growth, behind which education is an important factor. Between 2010 and 2020, the number of foreign students in higher education increased from 15,000 to 32,000 (HCSO, 2021).

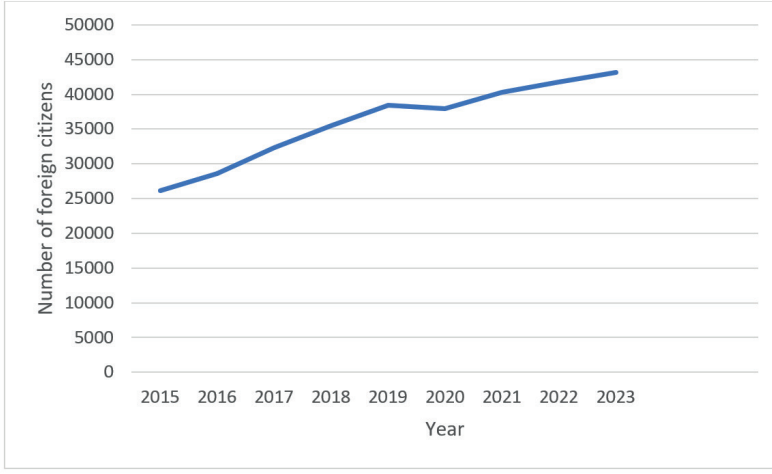

Fig. 2. The number of foreign citizens immigrating to Hungary from certain priority areas between 2015–2023

Source: own work based on HCSO 22.1.1.28 data.

Higher education has played and may continue to play a prominent role in the labour markets, on the one hand, because the perspective of university students studying in Hungary is fundamentally changed by the time they spend here, and, on the other, because they are entitled to undertake internships during their stu-

dent status (HG, 2013). The added value generated by foreign students studying in Hungary to the national economy is significant. The most important factor is studentification, which covers the impact of consumption on the market. However, the impact of this on regional development is different, and it is not surprising that Budapest also has the greatest weight here (Császár *et al*., 2023, Alpek *et al*., 2022). In addition, the social role of university students and their impact on the locality coincides with that of the social group generally regarded as the creative class, the university plays a prominent role as the social base of the creative economy (Florida, 2005, p. 151). The majority of foreign students who come to Hungary live and study in Budapest, which contributes to its prominent role both domestically and regionally.

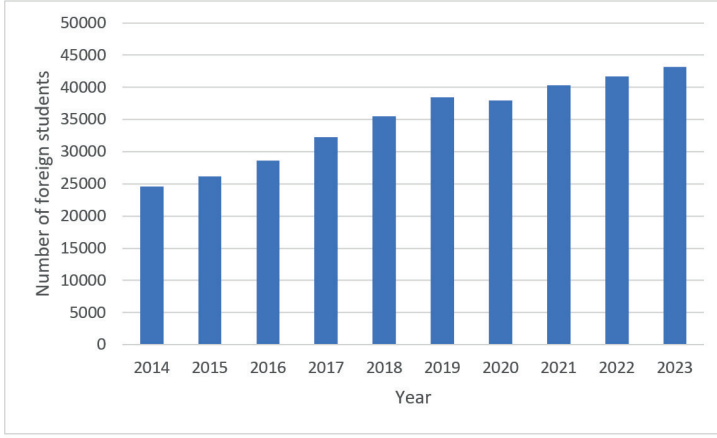

Fig. 3. The number of foreign students studying in higher education in Hungary, 2014–2023
Source: own work based on HCSO (2019, 2020a, 2021, 2023, 2024) data.

4.2. Budapest's global role in relation to foreign workers

After 2004, the conditions for employment in Hungary changed for the employees of the countries that joined the EU at the time, the permit requirement was abolished, the reporting obligation remained. As of 1 January 2008, the license requirement was completely/partially abolished in the case of several European Union Member States. After joining the EU, Hungary's role in the regional labour market decreased, and the number of issued permits and notifications also fell. The ten-year period after 2013 was therefore characterised by the stabilisation of regulation, in which the change of the regional role and the spatial reorganisation of the labour market integration can be clearly separated. In 2013, workers from non-EU and non-neighbouring countries already accounted for nearly 60 per cent

of the domestic foreign labour market, most of them from East Asian countries, half from China (NES, 2013).

Table. 3. Territorial distribution of foreign work permits and notifications 2016–2019, Budapest and county data

Counties/Years	2016	2017	2018	2019
Budapest	8,678	12,051	26,852	36,551
Pest	775	1,629	7,190	11,472
Baranya	64	123	265	254
Bács-Kiskun	1,173	712	2,760	3,903
Békés	539	781	1,029	867
Borsod-Abaúj-Zemplén	739	1,343	2,345	2,445
Csongrád	534	672	1810	1,748
Fejér	396	631	3902	4,788
Győr-Moson-Sopron	284	455	2330	2,814
Hajdú-Bihar	303	254	562	1,060
Heves	96	163	671	1,169
Komárom-Esztergom	659	697	3,126	3,872
Nógrád	72	164	489	582
Somogy	65	292	1,106	1,208
Szabolcs-Szatmár-Bereg	531	177	485	1,761
Jász-Nagykun-Szolnok	200	463	4,043	4,690
Tolna	124	132	467	576
Vas	466	615	2,351	1,411
Veszprém	396	247	2,692	3,538
Zala	752	725	2,721	3,744
All	16,846	22,326	67,196	88,453

Source: own work based on NES (2016, 2017, 2018, 2019) data.

By 2020, Budapest had become dominant (68.5 per cent) in the employment of foreigners. The weight of Budapest has increased tremendously compared to 2019 and the previous years: in 2019, only 31.6 per cent of declared foreign citizens were in Budapest. In 2022, 48.4 per cent of all employees with valid permits were employed in the Hungarian capital. The second largest number of foreign nationals with valid permits worked in the Pest county, where 14.2 per cent of all foreign workers with valid permits were registered. National data show a trend-like increase in the proportion of the highly educated.

Table. 4. Number and proportion of work permits issued in Hungary by educational level between 2013–2023

	YEAR										
	2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
Elementary or less	4,485 40,7	1,454 31,1	1,550 29,6	1,664 26,4	2,454 26,5	13,274 35,7	5,655 44,0	7,890 51,8	10,788 46,4	16,904 51,8	25,059 59,4
Vocational school, vocational training	2,283 20,7	895 19,2	857 16,3	970 15,4	1,663 17,9	2,296 6,2	2,050 14,5	1,362 9,0	2,227 9,6	2,268 7,0	3,052 7,3
Vocational secondary school	585 5,3	334 7,2	362 6,9	359 5,7	809 8,7	947 2,5	841 5,9	682 4,5	911 3,9	957 2,9	953 2,3
Secondary School	329 3,0	148 3,2	201 3,8	244 3,9	502 5,4	880 2,4	764 5,4	725 4,8	1,101 4,7	1,704 5,2	1,673 4,0
Technical school	61 0,6	57 1,2	68 1,3	65 1,0	160 1,7	430 1,2	189 1,3	114 0,7	517 2,2	336 1,0	909 2,2
University (Bachelor and Master)	1,951 17,7	1,347 28,8	1,701 32,4	2,260 35,9	3,293 35,5	3,969 10,7	3,613 25,4	3,993 26,3	6,943 29,8	8,603 26,4	8,321 19,8
Other and unknown	1,319 12,0	436 9,3	506 9,6	741 11,8	393 4,2	15,384 41,4	534 3,8	466 3,1	791 3,4	1,888 5,8	2,196 5,2
All	11,013 100	4,671 100	5,245 100	6,303 100	9,274 100	37,180 100	14,234 100	15,233 100	23,278 100	32,660 100	42,163 100

Source: own work based on NES (2013–2023) data.

In 2020, most workers reported by employers (13,410) came from Ukraine[2]. In 2022 and 2023, most of the reported workers came from the Philippines. In the notice published in the Official Bulletin of the Minister of Foreign Affairs and Trade No. 42 (29 July 2022), 15 countries are listed from which employment can be obtained through a qualified lending company without a labour market examination. In the case of countries outside of Europe, the number of workers coming in from countries in East Asia (e.g., Vietnam, South Korea) has been increasing for years as a result.

Table. 5. The number of foreign citizens residing and working in Hungary and Budapest and the proportion of those residing and working in Budapest within the national data between 2015–2023

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Hungary	145,968	156,606	151,132	161,809	180,773	199,957	194,491	202,525	226,267	250,912
Working	39,058	41,618	38,648	47,924	66,660	77,905	71,297	74,193	85,311	100,818
Budapest	67,253	72,136	72,945	76,824	85,089	91,540	86,930	88,251	97,470	113,964
Working	19,226	20,705	19,943	23,027	29,410	32,714	30,740	31,031	36,131	46,361
Bp. / Hun. %	46,0	46,0	48,3	47,5	47,1	45,8	44,7	43,6	43,1	45,4
Working, Bp. / Hun %	49,2	49,8	51,6	48,0	44,1	42,0	43,1	41,8	42,4	46,0

Source: own work based on HCSO 22.1.2.18 data.

The strengthening of the role of rural employers temporarily played a role in the reduction of the prominent role of Budapest. In addition, in the period 2020–2023, the impact of the COVID-19 pandemic (Reid *et al*., 2021) was felt in the reduction of national numbers. Nevertheless, the data for 2024 already show an increase in the number of workers and the attractiveness of Budapest.

5. DISCUSSION

5.1. The possible and necessary role of migration policy in the globalisation of Budapest

In Hungarian migration policy efforts, the issue of asylum and immigration for the purpose of employment must be separated. While the position against refugees basically serves internal and party-political goals, even when it contains the

[2] In 2022, 3,744 permits were issued to Ukrainians, exempted from labour market testing, on the basis of Government Decree 445/2013 (28.XI.). In 2023, 2,080 permits were issued to Ukrainian citizens exempted from labour market testing, on the basis of Government Decree 445/2013 (28. XI.). (Source: NES 2022; NES 2023).

rejection of the EU framework regulation, policy aspirations are primarily guided by the wishes of the market regarding the employment of foreigners in Hungary. In the present case, we are concerned with the latter, so the selective approach must be interpreted within this. The number of unskilled immigrants aiming to satisfy the high domestic demand is increasing, neither they nor employers currently demand their integration, the policy tries to prevent its possible spontaneous mechanisms with traditional isolation (territorial, employment and legal, such as banning family reunification and settlement). Based on the lessons of European failures in the 20th century (e.g., German Gastarbeiter programs), this strategy has become quite common, it usually covers territorial and workplace restrictions, and in extreme cases it can mean practices that conflict with employment or even personal rights. (For minority and women's rights see: Cioran *et al.*, 2023; Freedman, 2008; Radowicz, 2021). There are no such extremes in Hungary, and the three-year residence limit without forced departure can be considered particularly long in international comparison. The added value of their activities contributes directly to the performance of the domestic economy.

However, a closer relationship can develop between immigrants and the receiving social environment and/or other elements of the locality (local regulators, markets, and institutions) along the lines of the previously formulated mechanisms. There is an observed process of spontaneous institutionalisation of this, through markets created by the newly developing demand, through supporting institutions created by necessity, and there are also processes resulting from possibly exaggerated restrictions (see Slovenian example for securitisation (Malešič, 2017)). In South Korea, manual labourers forced into trainee roles have limited opportunities to change jobs, but Vietnamese workers have typically responded by simply breaking their contractual obligations and moving to an area where the control of employment conditions is less strict or less controllable, such as catering or housework. After Taiwan, in 2012, Korea was also forced to exclude Vietnam from the range of immigration countries, given that most of those who overstayed their visas and worked illegally or left their jobs were among them (Koudela, 2016).

On the other side are the highly educated and the investors. Compared to the former, they represent a smaller group, and in most countries their immigration situation is more favourable (visa, residence, employment, auxiliary provisions). In 2007, the law regulating entry from the third world entered into force in Hungary, which made it possible to settle for investment purposes. In 2013, the so-called Settlement Hungarian State Bonds, of which originally 250,000 euros (raised to 300,000 euros per applicant in 2015) had to be purchased in order to apply for a settlement permit (EMN, 2014). The bond itself could be purchased by companies that issued securities with a maturity of at least five years and held such bonds for at least 5 years at the nominal value above. It was, therefore, a kind of investor visa, 85 per cent of which were purchased by Chinese investors. Over the course

of four years (suspended in 2017), 6,538 foreigners received settlement permits as investors and 13,300 immigrants received Hungarian settlement permits for family reunification (Koudela, 2018).

Highly qualified employees arrive as managers and professionals of multinational companies operating in Hungary on the one hand, and university students on the other as a result of the increasing internationalisation of Hungarian higher education. In the case of the latter, the domestic regulatory environment is only slowly adapting to the changing circumstances, but an EU regulation currently allows them to start work during their higher education studies in Hungary (Bisztrai *et al*., 2020). Of course, the possibility exists, especially if it is not only regulated at the state level.

The current regulation basically prioritises three groups, with the fact that employment is not tied to a permit. (Otherwise, licensing is linked to an examination of the Hungarian labour supply, which is supplemented by a rule on the number of employees). And the three areas, by definition, indicate preferences. The work permit exemption for a third-country national who has been employed in Hungary for at least eight years and a close relative who has lived together in Hungary for at least five years follows a fairly common principle of family reunification.

As of 1 August 2015, a person who can be employed as a public employee does not need a permit to work in the framework of a public employment relationship. This section essentially gave the opportunity to non-Hungarian citizens of the surrounding countries. Of course, in the case of EU member states, the free flow of labour is guaranteed from the outset, so here we are mostly talking about Ukraine and Serbia. In 2013, 558 more immigrants arrived from Ukraine, by 2022 this number had already increased to 14,941, and in 2023 it dropped again to 4,273. In the case of Serbia, we cannot speak of numbers of this magnitude.

In 2010, it became clear that the network of contacts of immigrants from Ukraine is the most extensive in Hungary (Meszmann and Fedyuk, 2019), even surpassing that of Hungarians across the border. In the host country, this is the most important context for the success of integration and the avoidance of isolation. In addition, immigrants from other, more distant countries, such as Vietnamese and Chinese, have also successfully built up their relationship system both in Hungary and with the sending country (Örkény and Székelyi, 2010; Morcanu, 2021). Their network of contacts here was mostly organized from their own ethnic group and determined by personal (relative, friendly) relationships, apart from the Arab immigrants, who had many Hungarians in their network.

The employment of a specific group of foreign workers is only subject to notification. As of 1 January 2009, EEA citizens and their family members can be classified here. Therefore, the employment of foreign workers only needs to be announced, the labour market situation is not examined.

In 2013, the largest group of people with valid notifications came from Romania, followed by Slovakia, and far behind them were Poland, Germany, and the

United Kingdom. In 2015, 11,729 people were reported to be employed, most of them coming from Romania, Slovakia, the United Kingdom, Italy, and Germany. From 2016, Ukraine became the dominant source country among the reported workers, the background of which is the government decree published on 30 April 2016, which allowed the employment of nationals of neighbouring third countries without a permit. In 2022 and 2023, the largest number of notified workers came from the Philippines, more than from neighbouring EU Member States, including Romania and Slovakia. The increase in the number of Filipino workers coming to Hungary is the result of the announcement of the Minister of Foreign Affairs and Trade published in July 2022. The notice names 15 countries from which foreign nationals can be employed without a labour market examination through qualified lending companies (together with neighbouring Ukraine and Serbia, their total number is 17). As a result of the facilitation, the number of workers from the Philippines, Kazakhstan, and Kyrgyzstan also increased.

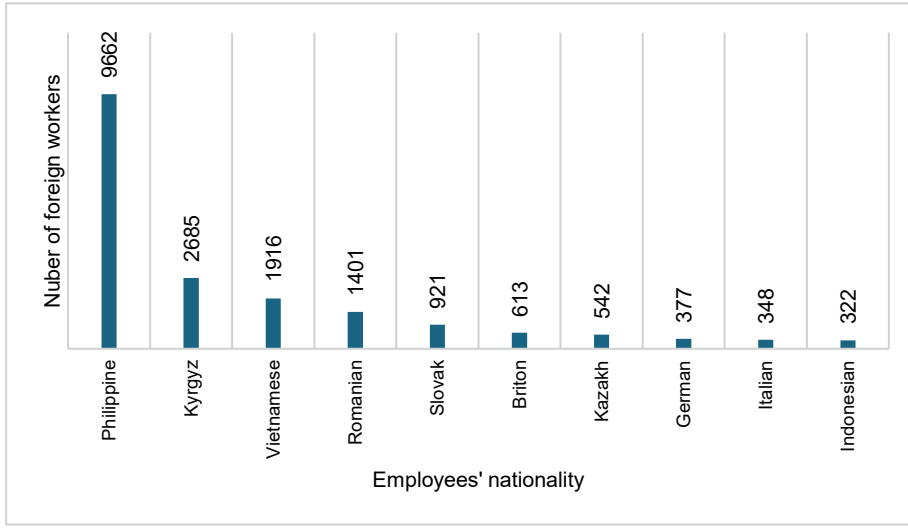

Fig. 4. Number of foreign workers reported by employers by nationality, 2023 TOP 10
Source: own work based on NES (2023) data.

The third beneficiary group, i.e., those to whom the permit must be issued without an examination of the labour market situation, are internationally recognised third-country nationals invited by higher education institutions, scientific research institutions, and public cultural institutions, who perform educational, scientific or artistic work for more than 10 working days per calendar year (HG, 2013). The text of the decree is also clear here: if the added value of the activities of the highly qualified is outstanding, the direct economic return is high, this segment of the incoming workforce must, therefore, be clearly supported.

The impact of the highly educated on locality is perhaps the most important from the point of view of globalisation. Since we are primarily talking about circular migration, and since Budapest is also the most attractive destination for foreign workers, we do not have to count on the environment-shaping and isolating nature characteristic of closed groups, but on the homogenising and standardising form, which is a constantly changing place of residence and workplace, but with a high characteristic of a purposeful innovative group that prefers high-level services and a creative milieu (Levitt, 1998). For intellectuals and highly educated people employed by multinational companies, Budapest may have a special charm and unique features, but this does not change the system of expectations that they represent in their consumption habits. A 2019 research showed this exactly, 89 per cent of highly qualified circular immigrants worked in Budapest, 57 per cent were the employees of a multinational company, and 83 per cent did intellectual work (Cseh Papp *et al*., 2019).

Although most of them worked for multinational companies, they typically found their jobs through advertising or personal contact, which is particularly important as it shows the signs of the formation of transnational networks, replacing traditional corporate-driven labour flows. Their network of contacts in Hungary is extensive, and a significant part does not come from their own environment (ethnicity, workplace). Almost half of them already had a Hungarian friend before their trip, and still have or have made one after their arrival. No wonder their integration and satisfaction are high.

6. CONCLUSIONS

Labour market processes cover many risk factors, e.g., illegal employment, non-contractual wages, overemployment, which are confirmed by numerous international experiences. All of this is accompanied by an increase in the local influence of immigrant groups: an increase in market demand (for specific products and services), institutionalisation (representation of interests, local media) and the strengthening of informal contact networks. And this affects the relevant area and its integration into the global city network, in our case Budapest. Institutionalization makes the connection between the sending and the receiving area even closer, both through retail markets created by specific demand (or even supply) and by organisations that support employment or integration. Trade unions already address potential immigrant workers in the sending countries, thereby increasing trust and a sense of security, thus strengthening immigration. The advertising activity of state-supported intermediary companies (Hegyeshalmi, 2017) has a similar effect, until finally the process of labour migration, or more precisely, circulation, becomes permanent.

In November 2023, the related policy regulation added a general value approach (HG, 2023) and a quota (MED, 2023). Further regulations may tighten the requirements of companies specialising in recruitment, thereby causing either the above-mentioned or other abuses, distorting effects (e.g., disproportionate financial burdens of guest workers) or further travel (reducing the risk of another EU country), and strengthening the role of the immigration police. This answers our third question, which was how Hungarian regulation intended to avoid the inherent tension between facilitating economic utilisation and limiting social integration. The simplifications, such as the three permit exemptions from the beginning of the transformation of the legal environment and the subsequent simplifications, show a clear market-following logic and the direction of stimulating immigration. This is also confirmed by the statements made by the Hungarian government in 2023. Parallel to the increase in the net debt of foreign direct investment, we can expect a further increase in the number of highly educated people and a growing fluctuation – despite the decrease in the number of companies. Labour market tension and demand in general continue to increase. This process would be particularly strengthened by increasing the role of activities with higher added value, in the field of planning, design and research. There is no need to go into detail about the influencing demographic processes in Hungary and Europe.

Changes in regulations and their prevailing facilitating nature indicate rather proactive characteristics in Hungary resulting in a market-dominated industry-policy scene with emerging international labour connectedness for Budapest. The two segments, the low-skilled guest workers and the highly skilled professionals, can help the integration of Budapest into global city networks in different ways. Our first goal was to differentiate these immigrant groups in Hungary. In the case of the latter, the strengthening of the role of decisions based on individual preferences must also be considered. The movement of the highly educated is no longer determined by wage differences on the labour market. The urban milieu has become a key factor, the definition of which is a great challenge even in theory, but it certainly goes beyond the material (salary, infrastructure, business environment, and services) components. Overall, the liveable urban environment is the closest measurable and available dimension to it. In the previous tables, the central role of Budapest in the geographical distribution of migrant workers in Hungary was shown, which was our fourth goal. According to the rankings of the Economist Intelligence Unit, Budapest has been the most liveable city in Eastern Europe for a decade now, beating Prague, Warsaw, and Bratislava (EIU, 2023). Budapest's international competitiveness in this area shows a regional advantage, which has a positive effect on the increase in the number of highly qualified foreign workers, and in the direction of the capital's global integration, which contributes to the fifth goal of the article.

At the same time, the integration of the Hungarian capital into the global city network is shifting from its former western orientation to the east in its labour

segment. Upon entering the European Union, the primary destination of the outgoing labour force was London and the area between Budapest and London, and the incoming highly qualified labour force came to Budapest mainly from Western Europe. Today, immigration in both segments comes mainly from the east, for various reasons this area extends from Ukraine to the Philippines, and Ankara is at the centre of the economic diplomatic relations that have developed in the last decade. This is the result of the second purpose outlined earlier. Compared to Budapest, the two cities are located roughly the same distance and in opposite directions, which vividly illustrates this orientation process.

Table. 6. Number and proportion of registered foreign nationals (employees) in Hungary by educational level between 2013–2023

	YEAR										
	2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
Elementary or less	2,756 34,7	2,331 26,4	4,030 35,7	3,578 33,9	5,606 42,9	17,255 54,2	22,980 55,6	10,267 48,4	7,435 50,0	7,667 52,2	12,635 55,1
Vocational school, vocational training	1,249 15,7	1,737 19,7	2,055 18,2	1,385 13,1	1,230 9,4	3,204 10,1	4,613 11,1	2,539 12,0	768 5,2	630 4,3	943 4,2
Vocational secondary school	691 8,7	823 9,3	897 8,0	818 7,8	882 6,8	3,524 11,1	5,561 13,5	3,889 18,3	921 6,2	696 4,7	2,600 11,3
Secondary School	473 6,0	647 7,3	702 6,2	708 6,7	901 6,9	1,146 3,6	1,388 3,4	662 3,1	813 5,5	1,031 7,0	2,153 9,4
Technical school	0 0,0	0 0,0	0 0,0	0 0,0	0 0,0	– –	– –	– –	– –	– –	– –
University (Bachelor and Master)	2,684 33,8	3,129 35,4	3,506 31,1	3,940 37,3	3,709 28,4	5,648 17,7	5,390 13,0	2,851 13,5	3,218 21,6	4,549 31,0	4,521 19,8
Other and unknown	84 1,1	162 1,8	89 0,8	124 1,2	728 5,6	1,035 3,3	1,403 3,4	987 4,7	1,715 11,5	118 0,8	65 0,3
All	7,937 100	8,829 100	11,279 100	10,553 100	13,056 100	31,812 100	41,335 100	21,195 100	14,870 100	14,691 100	22,917 100

Source: own work based on NES (2013–2023) data.

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EVALUATION OF REGIONAL LOGISTICS PERFORMANCE FOR LAND FREIGHT ALONG THE DEVELOPMENTAL SYRIAN AXIS: TARTOUS – ALFARQULUS

Abstract. The study developed a spatial Decision Support System (DSS) to assess the impact of land freight logistics on regional development and create an evaluation map in a GIS environment. By designing a tri-level conceptual framework and applying the Fuzzy Analytic Hierarchy Process (FAHP), real stakeholders were involved at each evaluation level according to their roles. The system was integrated into GIS for final analysis and applied to the developmental Syrian axis of Tartous–Homs–Al-Farqulus using 2018 data. The results highlighted the importance of the relationships between evaluation criteria in identifying the role of freight logistics in regional planning and achieving broader developmental outcomes.

Key words: effectiveness, efficiency, differentiation, developmental reflections, sustainable development, Decision Support System.

1. INTRODUCTION

Logistics is vital to the value chain, ensuring efficient goods and service flow. Trade facilitation modernises procedures, addressing non-tariff barriers and institutional constraints in transport, energy, and ICT. The quality of logistics

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services, linked to transport infrastructure, directly affects cross-border shipping. Inefficiencies increase costs and hinder trade, underscoring the need to evaluate logistics and trade facilitation reforms in enhancing goods movement and fostering economic and sustainable development (Gul *et al.*, 2024; Kareem, 2025).

Mobility is integral to economic and social development, enhancing accessibility by overcoming spatial constraints. Transportation mitigates physical, human, and administrative barriers through four key elements: modes (vehicles), infrastructure (roads, railways, airports, ports), superstructure (shorter-lifespan components), and networks (spatially structured systems). Flows represent the movement of people, goods, and information across these networks. Land freight, involving goods transport via equipped roads, underpins economic activities (Rodrigue, 2020). Both Kinra and Ülengin (2021) and Halimi *et al.* (2025) highlight the need for policymakers to assess land transport and logistics performance, considering long-term economic and developmental impacts. A comprehensive model is essential to integrate economic, social, and environmental assessments, ensuring equitable resource distribution, poverty alleviation, and sustainable development. Rooted in management, engineering, and operations research, this interdisciplinary framework draws upon social sciences, including economics, political science, and sociology, to foster sustainable and resilient transport systems.

Conversely, logistics planning aims to develop a logistics strategy for transportation, storage, inventory management, and supply chain design, while considering legal, political, economic, social, technological, and resource factors to improve logistics performance (Waters, 2003). Therefore, we can define regional logistics planning as a set of studies related to logistics systems and their associated activities, logistical and natural resources, the spatial distribution of manufacturing and marketing facilities, population, infrastructure, and the various factors influencing them within a region. The goal is to determine the region's potential and exploit it optimally within an appropriate logistical strategy that meets supply objectives, improves performance, stimulates sustainable and balanced development, and deals with the concerns of key stakeholders.

Logistics performance (LP) has been assessed on micro-scales using concepts derived from organisational performance, which cover a wide range of performance factors. It aims to achieve the seven logistics principles. Many researchers have developed conceptual frameworks to evaluate LP. For instance, Mansidão and Coelho (2014) cited the Arayman Model (2007), which had been used to analyse supply chains in food agriculture companies. This model emphasises flexibility (the ability of the supply chain to adapt to environmental changes), quality (ensuring product safety), efficiency (the appropriate use of resources), and responsiveness (meeting customer needs promptly, which implies dependability) (Bakar *et al.*, 2014). Drašković (2009) introduced two models: the first by

Moseng and Bredrup (1993), which focused on effectiveness (the ability to secure resources and achieve goals) and efficiency, and the second by Ferreira *et al.* (2007), which included quality, cost, time, and flexibility. Both studies concluded that effectiveness and efficiency are essential factors in evaluating LP (Fugate *et al.*, 2010) added differentiation, which refers to providing the best net value to customers and is considered the highest level of performance. Furthermore, recent trends in performance evaluation have shifted towards sustainable performance, with strategies that cater to stakeholders and emphasize environmentally friendly logistics (Chardine-Baumann and Botta-Genoulaz, 2014). This shift has introduced new concepts in the field, such as "environment-friendly" logistics (Fig. 1), summarise that.

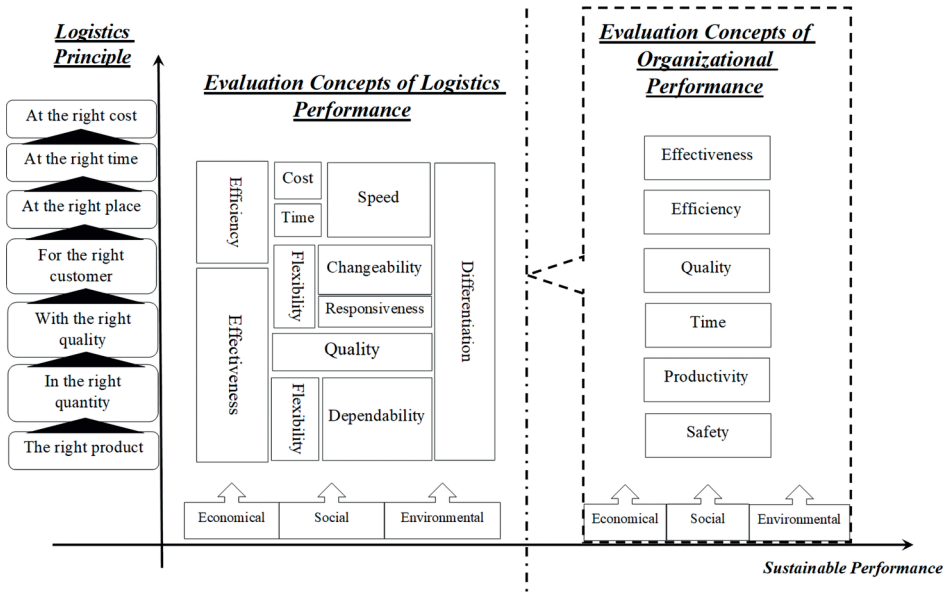

Fig. 1. Methodology of derived concepts of LP from Organizational Performance

Source: own work based on Chardine-Baumann and Botta-Genoulaz (2014), and Fugate *et al.* (2010).

Therefore, at the macro level, evaluating logistics performance (LP) must consider all decisions and challenges related to land freight, which is described as multi-criteria (Żak *et al*., 2017). These challenges include determining the location of infrastructure (terminals, hubs, depots), selecting routes and designing transportation corridors, fleet management (composition, routing, scheduling, assignment, replacement), planning and designing transportation solutions (road/railway segments, elements of a transportation network), traffic control/management, transportation portfolio design and adjustment, transportation process

management, and the assessment and implementation of transportation projects (Tavasszy and de Jong, 2014). All these must be addressed while considering local specificities and their impact on sustainable development, as discussed in numerous references such as Gudmundsson *et al.* (2016), Arvis *et al*. (2016), and Ecorys *et al.* (2015), summarized in Fig. 2. This paper addresses this research gap by applying LP concepts, which are defined as Key Performance Areas (KPAs). These KPAs serve as strategic tools providing the basis for a more detailed analysis of logistics performance at multiple levels, and they are measured using Key Performance Indicators (KPIs).

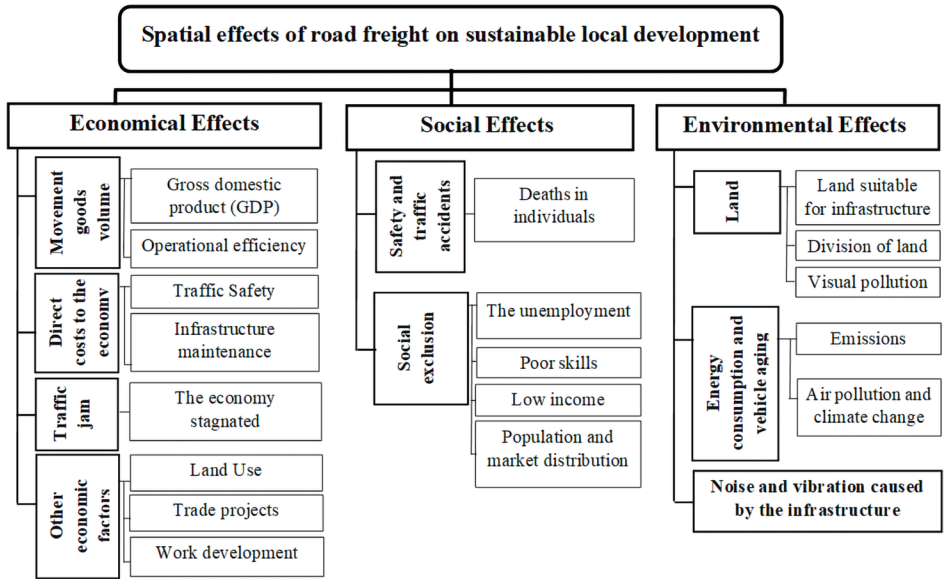

Fig. 2. Matrix of Spatial effects of land freight on sustainable local development

Source: own work based on Gudmundsson *et al*. (2016), Arvis *et al*. (2016), and Ecorys *et al*. (2015).

A Decision Support System (DSS) is a powerful tool that assists planners and decision-makers in analysing and visualising various scenarios to optimise decision-making. Users can import data via a graphical interface, conduct analyses, and compare outcomes through visual outputs. Spatial DSS, often integrated with Geographic Information Systems (GIS), addresses challenges in facility location, logistics, and transportation (Ryu *et al*., 2023). GIS provides a structured framework for acquiring, storing, analysing, and presenting geographic data, establishing a dynamic link between graphical and attribute data. This integration enhances efficiency in managing spatial and non-spatial data, facilitating informed decision-making (Quamar *et al*., 2023).

Consequently, this paper raises the following questions:

1. How can a spatial methodology be developed that considers the spatial and local specificity of land freight hubs?
2. How can this methodology demonstrate the spatial contribution of land freight activities at a regional level to sustainable development goals?
3. How can this methodology provide decision-makers with the appropriate tools to evaluate the role of land freight hub logistics performance in promoting a regional development vision?

This paper aims to:

1. Develop logistics performance evaluation indicators based on a sustainable development framework, and;
2. Develop an analytical tool to produce spatial outputs, including operational indicators, stakeholders, reflections, and potentials, and apply it to the developmental Syrian axis of Tartous-Homs-AlFarqulus.

The importance of this paper stems from the Syrian Arab Republic's low ranking in the World Bank's 2016 Logistics Performance Index, where it was placed last, and the government's efforts to promote the selected axis as a local developmental hub in addition to its trading role.

2. LITERATURE REVIEW

This section reviews studies on logistics performance, analysing the criteria employed in decision support systems (DSS) to assess or enhance logistics efficiency, along with the methodologies used.

The study by Oguz (2023) examined the logistics performance indicators of customs, infrastructure, international shipping, logistics service quality and competence, traceability and tracking, and on-time delivery for the top ten countries in the 2023 Logistics Performance Index (LPI). The goal was to rank these countries using Multi-Criteria Decision-Making (MCDM) methodologies and compare the results with the World Bank's LPI study. The criteria and weights from the World Bank's LPI were incorporated into the analysis. Methods such as the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) and the Evaluation Based on Distance from Average Solution (EDAS) were applied. The results showed that despite using identical criteria and weights, rankings varied across MCDM methods due to differences in computational strategies.

The study by Önden *et al.* (2023) proposed a multi-criteria spatial decision-making model for selecting optimal locations for new logistics centres in metropolitan Istanbul. A survey method was employed to gather insights from experts across various sectors, including Organized Industry Zones, Small

Industry Sites, Major Gas Stations, Ports, Shipyards, Distribution Centres, Bonded Warehouses, Fresh Fruit and Vegetables Wholesale Market Halls, Road Transportation Distribution Warehouses, Container Warehouses, International Transportation Firms, Retail Distribution Centres, Manufacturing Distribution Centres, and Manufacturing Facilities. The study followed two main stages: first, defining and evaluating site selection criteria, which included access to supply and demand points, proximity to transportation networks (highways, railways, ports, and airports), expansion capabilities, geological suitability, infrastructure availability, land cost, and proximity to city centres. Second, alternative scenarios for site selection were analysed. Data were processed using the weighted average method through four scenarios: spatial suitability based solely on spatial criteria, overall suitability based on average expert ratings, and suitability based on different professional perspectives. Finally, the intersection tool was used to integrate the results and produce the final suitability map. The findings emphasize the importance of combining spatial and professional insights to determine optimal logistics centre locations, offering a replicable framework for large urban areas.

The study by Feng *et al.* (2023) developed a novel approach to emergency logistics centre (ELC) site selection by integrating Multi-Criteria Decision-Making (MCDM) methods and Geographic Information Systems (GIS). It identified nine critical criteria affecting ELC site selection: population density, proximity to highways, proximity to railways, proximity to infrastructure location, proximity to colleges and universities, proximity to expressway, proximity to Intersection, stay away from traffic jams, and proximity to Hospital. Spatial data for these criteria were collected, normalised, and analysed using GIS tools. The Entropy and CRITIC methods were employed to determine the weights of the criteria, combining information diversity and inter-criteria correlations. These weights informed the VIKOR method, which ranks potential ELC locations based on their proximity to the ideal solution. A case study in Xi'an, China, revealed population density as the most influential criterion (weight: 0.581). Among 13 alternatives, site A9, near the New City Plaza, ranked as the optimal location. Sensitivity analysis confirmed the stability of the results, while comparative analysis with the TOPSIS method validated the robustness of the proposed model. This study demonstrates the potential of combining GIS and advanced MCDM techniques to optimize emergency logistics planning in urban areas.

The study by Özceylan *et al.* (2016) evaluated logistics performance in Turkish provinces using three groups of criteria. Each group included secondary criteria: the first group, freight transaction factors, encompassed total freight transported by maritime, road, railway, and air; the second group, transportation capability factors, included the number of commercial motor vehicles, total length of highways, and proximity to provincial centres (railways, ports, airports, and border gates); the third group, economic and infrastructure factors, included import and

export values, and proximity to provincial centres (free zones, freight villages, industrial zones). The study applied a multi-criteria decision-making methodology using five scenarios: the analytic hierarchy process (AHP) to calculate the weights of criteria, the analytic network process (ANP) to consider relationships between criteria, and the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) to rank alternatives from worst to best. Variants of AHP-TOPSIS, ANP-TOPSIS, and TOPSIS with equal weights were also used.

The study by Srisawat *et al.* (2017) developed a Decision Support System to evaluate the spatial efficiency of regional transportation logistics. Five main criteria were used, each containing secondary and sub-criteria. The first criterion, location, included landscape (slope, elevation), connection to transportation hubs, and natural disasters. The second criterion, infrastructure, covered road, rail, ship, and air transportation, multimodal transport preparedness, cargo volumes, basic utilities (electricity, water supply), information technology infrastructure, and personnel knowledge. The third criterion, the economic system, included traditional products (Gross Provincial Product, number of factories), land use (urban, forest, agriculture), population, and economic units. The fourth criterion, logistics agencies, addressed the number of logistics agencies, while the fifth criterion, supportive policies and projects, included logistics projects, government and private sector policies, and international cooperation projects. This study used the fuzzy analytic hierarchy process (FAHP) to account for uncertainty when assigning weights to criteria.

As shown in Table 1, the following research gap can be identified from the previous literature:

1. The conceptual frameworks of previous studies lacked the flexibility to encompass all aspects of logistics and sustainable development. This limitation restricted their ability to establish new spatial and local specificity criteria for emerging logistics studies. Furthermore, they overlooked critical dimensions necessary for achieving sustainable performance.

2. Even in studies that incorporated sustainable development criteria, there was no explicit linkage to the Sustainable Development Goals (SDGs), which constrained their ability to align with the global 2030 agenda for sustainable development.

3. Additionally, prior research did not present a clear methodology for engaging all relevant stakeholders or defining their roles in the evaluation and decision-making processes. This omission, whether in conceptual frameworks or applied methodologies, represents a significant gap in regional logistics planning.

4. Although various Multi-Criteria Decision-Making (MCDM) models have been employed, the primary challenge lies in selecting a model capable of addressing the existing limitations, offering a comprehensive understanding of the impacts of logistics performance on development, and ultimately revealing both opportunities and implications.

Table 1. Analysis literature review

		Study	Oguz (2023)	Önden *et al.* (2023)	Feng *et al.*, (2023)	Özceylan *et al.* (2016)	Srisawat *et al.* (2017)
Conceptual Framework	Logistics Concepts	Changeability	-	-	-	-	+
		Reliability	+	-	-	-	+
		Quality	+	+	+	+	+
		Flexibility	+	+	+	+	+
		Effectiveness	+	+	+	+	+
		Efficiency	+	+	+	+	+
		Cost, Time, Speed	+	+	+	+	+
		Differentiation	+	-	-	-	+
	Developmental Concepts	Economic	-	+	+	+	+
		Social	-	-	+	-	+
		Environmental	-	-	+	-	-
		Connections with SDGs	-	-	-	-	-
Methodology	The MCDM using	Weighting of criteria	World Bank	Weighted Average	Entropy	AHP	FAHP
					CRITIC	ANP	
		Preferences	EDAS	-	VIKOR	TOPSIS	-
			TOPSIS				
		Scenarios	-	+	-	+	-
Participation of stakeholders		Service providers	+	+	-	+	-
		Service beneficiaries	-	+	-	-	-
		Experts in Development	-	-	+	+	+

Source: own work.

3. METHODOLOGY

This methodology adopts a structured approach, integrating multi-criteria decision-making with GIS-based spatial analysis in five steps (Fig. 3), ensuring a robust assessment of logistics performance and its impact on regional development.

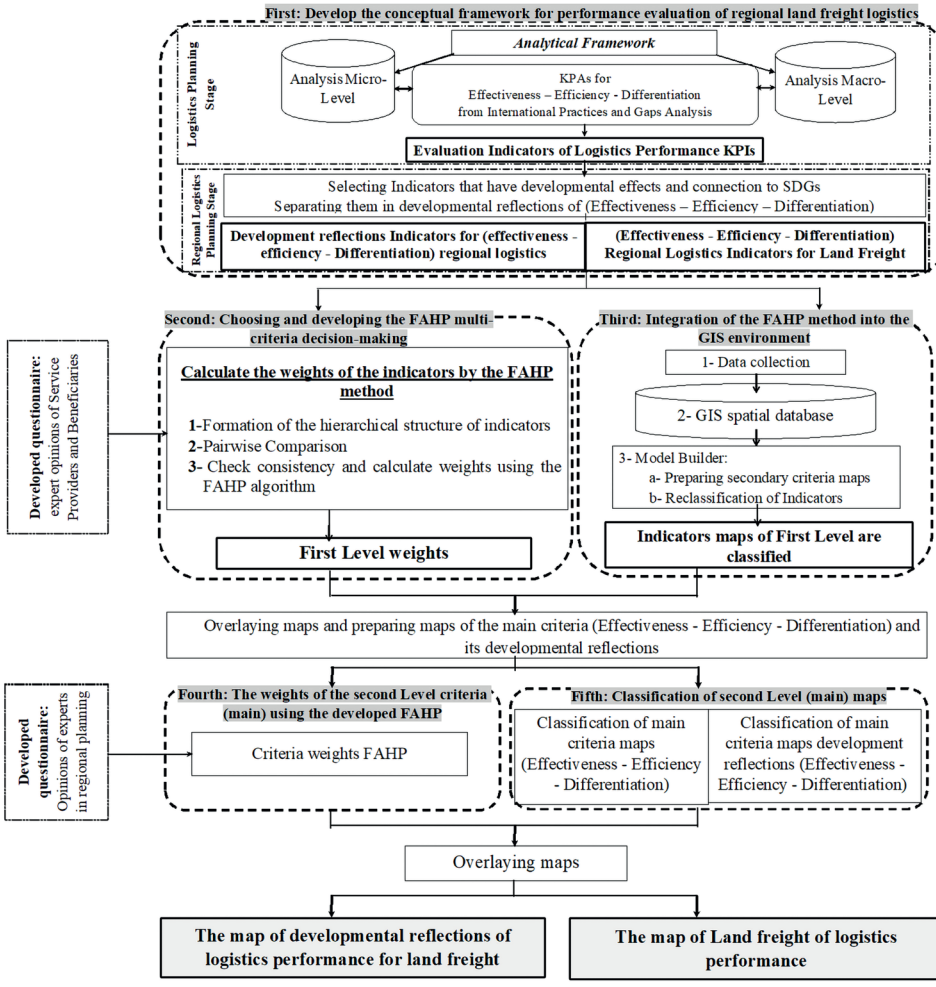

Fig. 3. The research framework

Source: own work.

3.1. First: Developing a conceptual framework for the performance evaluation of regional land freight logistics

The study of concepts at both the micro-level and macro-level aids in identifying Key Performance Area (KPAs) and their corresponding secondary indicators, known as Key Performance Indicator (KPIs). The study by Bakar *et al.* (2014) evaluated LP on a national scale using effectiveness (quality, flexibility, dependability, connectivity) and efficiency (cost, speed, environmental impact). The study

by Sutomo and Soemardjito (2012) assessed port logistics on regional effectiveness through spatial systems and transportation systems and regional efficiency through operational costs and logistics costs. Ecorys *et al*. (2015) evaluated national LP through efficiency, effectiveness, costs, environmental sustainability, employment, safety, and security. The World Bank study by Arvis *et al*. (2016) highlighted service quality and reliability as primary LP goals.

In comparison with micro-level concepts, it was observed that flexibility, dependability, and connection relate to effectiveness, while cost, speed, and environmental impact relate to efficiency. Differentiation, as defined by Fugate *et al.* (2010), represents the highest level of LP by providing innovation and added value. Environmental sustainability and employment development through logistics education also support this approach. Therefore, LP on a macro-level can be evaluated using the framework proposed by Fugate *et al.* (2010), focusing on effectiveness, efficiency, and differentiation, which will serve as the foundation for developing a DSS for regional LP evaluation. This framework was developed in two stages:

1. Logistics planning stage: In this stage, KPIs were selected based on KPAs that align with the seven logistics principles. Consequently, this phase is classified as the logistics planning stage, as shown in Table 2, with Fig. 4 summarising the results of this stage.

Table 2. KPAs and KPIs resulted for evaluation LP on regional scale

Criteria	KPAs	Definition of KPAs	KPIs	Code
Effectiveness	Reliability	It is prediction and related to quality of shipments, hence it includes safety and security (Arvis *et al.*, 2016)	Damages in infrastructure	C12
			Number of accidents	C13
	Service Quality	It refers to low evaluation for indicators of infrastructures, time, track and trace which often relates to congestion (Arvis *et al*., 2016)	Classifications of roads	C2
			Logistics projects in area	C8
	Dependability	facilities for storage between production and transportation and consumption (Kondratjev, 2015)	Number of warehouses	C5
	Flexibility	the ability to deal with changes in environment (Mansidão and Coelho, 2014)	Length of roads	C1
			Number of trucks	C6
			National transportation system	C7
			Number of logistics agencies	C4
			Number of workers	C18

Criteria	KPAs	Definition of KPAs	KPIs		Code
Effectiveness	Resources Distribution	It represents knowing the structure of logistical networks, whereby the capacities of production and warehouses are growing up in the high accessibility points of the highway network (Mckinnon, 2015; Zhang *et al*., 2013)	Number of population		C17
			Number of factories		C16
			Income of manufacturing		C14
			Number of economic units		C15
			Volume of goods		C3
			Volume of goods ton/km		C9
			Import and export / transported by port		C11
			Volume of goods ton/person		C10
Efficiency	Reducing time, effort and cost	Because of the inability to measure costs spatially, it is searched in what reduce time, effort and cost by investment the spaces and infrastructure and improving livelihood environment for population (Srisawat *et al*., 2017)	Proximity to airports		C19
			Proximity to ports		C20
			Proximity to road axis		C21
			Proximity to railway		C22
			Proximity to freight villages		C23
			Proximity to free zones		C24
			Proximity to industrial zones		C25
			Proximity to border gates		C26
			Land price		C29
			Speeds on roads		C27
	Capacity utilisation	It is the utilisation of capacities of factors related to the volume of goods, spaces, infrastructure and vehicles and its reflections on productivity (Ecorys *et al*., 2015)	Use of vehicles		C36
			Average vehicle size		C37
			Land use	Urban	C30
				Forest	C31
				Agriculture	C32
			Gross Provincial Product (GPP)		C38
			Productivity		C39
			Road density		C40
			Warehouses density		C41
			Elevation		C33
			Slope		C34
			Natural disaster		C35
			Average area of warehouses		C28
Differentiation	Employment development	It is one of the more important aspects of enhancing the attractiveness of the logistics profession, which relates to available education, training, enhancement of qualifications and lifelong learning (Ecorys *et al*., 2015)	Number of school and colleges for logistics management programs		C48
			Average wages		C47
			Number of skilled workers		C49

Table 2 (cont.)

Criteria	KPAs	Definition of KPAs	KPIs	Code
Differentiation	Added value	It is creativity in benefit by focusing on satisfaction of the community through achieving earnings and maximizing them (Ecorys *et al*., 2015)	Advantage from borderland	C44
			Transportation performance (tkm) per GPP	C50
			International cooperation projects of logistics within the area	C43
			Value added of the logistics sector	C46
	Innovation	It is known as the modern logistics and contributes to minimising the cost of production through strategic and effective administration, which paints future visions (Ecorys *et al*., 2015; Arvis *et al*., 2016)	Basic structure of Information and communication technology (ICT(	C42
			Supportive policies	C45
	Environmental sustainable	It focuses on limiting external negative factors caused by transportation goods (Mckinnon, 2015)	Emissions	C52
			Distance to population density	C51
			Fuel consumption	C53
			Average vehicle age	C54

Source: own work.

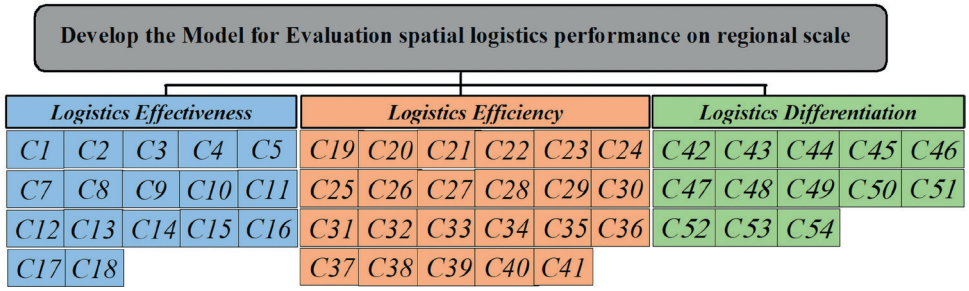

Fig. 4. Results of KPIs for evaluation LP on regional scale

Source: own work.

2. Regional logistics planning stage: Based on the impacts of goods transportation on sustainable development, as illustrated in Fig. 2, the first-level indicators were identified and further divided into developmental reflections for effective-

ness, efficiency, and differentiation at the second level. These were then classified as the developmental reflections for logistics performance (LP) at the third level, as shown in Fig. 5. Since these developmental reflections are connected to the sustainable development goals that regional planning aims to achieve, this stage is categorised as the regional logistics planning stage.

Additionally, the first-level indicators were aligned with the targets and goals of the Sustainable Development Goals (SDGs), thereby linking the second and third levels to these objectives, as demonstrated in Fig. 6.

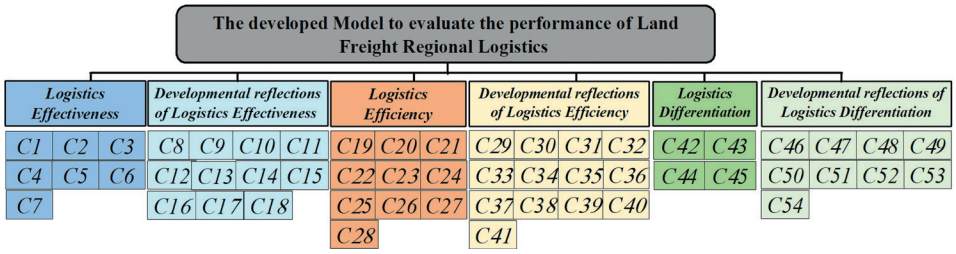

Fig. 5. The developed model to evaluation LP of land freight on regional scale

Source: own work.

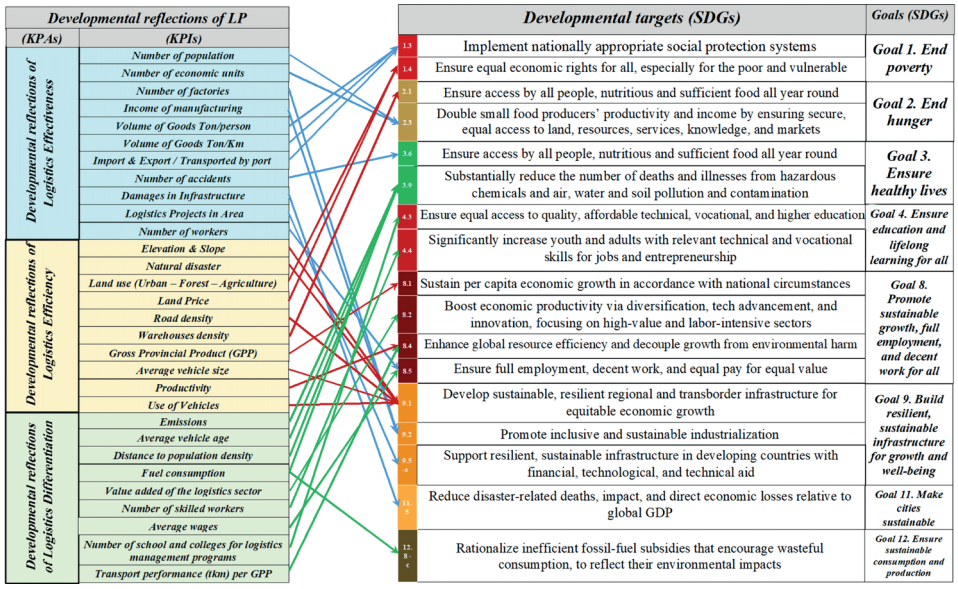

Fig. 6. The connection between the developed model to evaluation LP and SDGs

Source: own work.

3.2. Second: Choosing and developing the FAHP multi-criteria decision-making (MCDM)

Based on the methodology developed by Wątróbski (2016) for selecting a suitable MCDM approach in the logistics sector, the following can be concluded:

1. Alternatives (the study area) can be compared.
2. The criteria will have varying weights.
3. The criteria weights will be expressed quantitatively.
4. Criteria comparisons will be made using a pairwise comparison matrix.
5. Each alternative is connected to all criteria and will be ranked on a quantitative scale.

Thus, the Fuzzy Analytical Hierarchy Process (FAHP) was chosen as the MCDM method for this paper. The Analytical Hierarchy Process (AHP) is a method used to determine the importance of goals/criteria through pairwise comparisons, while fuzzy logic is applied to address decision-making in situations of uncertainty. To implement FAHP, the following steps, as outlined by Awad *et al.* (2014), were followed:

1. Structuring the decision problem in a hierarchical form (analysing goals and their components). A key aspect of this method is ensuring that the number of criteria in each comparison matrix ranges between 2 and 7, with a maximum of 9. In special cases, the number of criteria may extend to 10–11, but this is not recommended. If the number of criteria is too large, it is advisable to aggregate some criteria, redefine their scope, or use alternative formulas (Żak *et al*., 2017). Consequently, criteria for the first level were aggregated, as shown in Fig. 7.

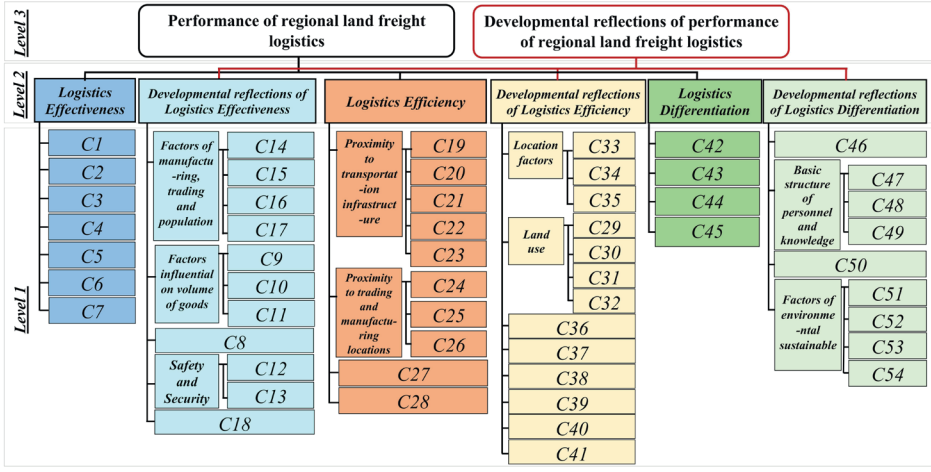

Fig. 7. Hierarchy structure for criteria of study according to FAHP

Source: own work.

2. Conducting pairwise comparisons between criteria by experts based on the Saaty scale. To enhance this step, Carvalho *et al.* (2015) noted that effectiveness reflects the interests of those who benefit from the freight service, while efficiency reflects the interests of those providing the service. Therefore, the first-level survey for effectiveness was conducted with experts from the Chamber of Commerce, Industry, and Agriculture in the study area, and efficiency was evaluated by experts from the goods freight office. Differentiation, being the highest degree of logistics performance (LP), was surveyed with all the mentioned stakeholders.

3. The survey results were checked using the Consistency Index (C.I.) and Consistency Ratio (C.R.). The pairwise comparison matrix was then converted to a fuzzy format using Fuzzy Triple Numbers according to the Saaty scale for each expert. Afterward, the fuzzy decision matrices for each group of experts were aggregated, and the final weights were calculated using the FAHP algorithm, as described by Chang (1996).

3.3. Third: Integration of the FAHP method into the GIS environment

The axis study region, which includes the Syrian governorates of Hama, Homs, and Tartous, was selected as shown in Fig. 8 due to the availability of relevant data on this scale. Spatial and statistical data for the study's indicators were collected from various sectors, including the Central Office of Statistics, Ministry of Transportation, Ministry of Industry, Ministry of Agriculture, Ministry of Trade, and the Ministry of Communication and Technology. Additionally, open data sources such as the International Energy Agency (IEA), Shuttle Radar Topography Mission (SRTM), OpenStreetMap (OSM), Global Map Data Archives, and Global Surface Water Explorer were utilized. The necessary indicators were then calculated as shown in Table 3.

Table 3. Methods of calculate indicators of study

First Level Indicators	Method of calculating	Meaning of symbol
National Transportation System (Sreelekha *et al.*, 2016, p. 133)	Needed Spatial Network Analysis $\alpha = (e - v + p)/(2v - 5)$ (1) $p = e - v + 1$; $\beta = e/v$ (2) $\gamma = e/(3(v - 2))$ (3) $\eta = L(G)/e$ (4)	e: number of edges in the network v: number of vertices in the network $L(G)$: total network length in km p: number of subgraphs
Speeds on roads (Nagne *et al.*, 2013) and (Kofi, 2010, p. 16)	$\eta = L(G)/e$ (5)	e: number of edges in the network $L(G)$: total network length in km

Table 3 (cont.)

First Level Indicators	Method of calculating	Meaning of symbol
Productivity	Volume of goods Tkm / number of trucks	–
Use of vehicles	Used volume of trucks / All volume Available	–
Transportation performance (Tkm) per GPP	Volume of goods Tkm / GPP	–

Source: own work.

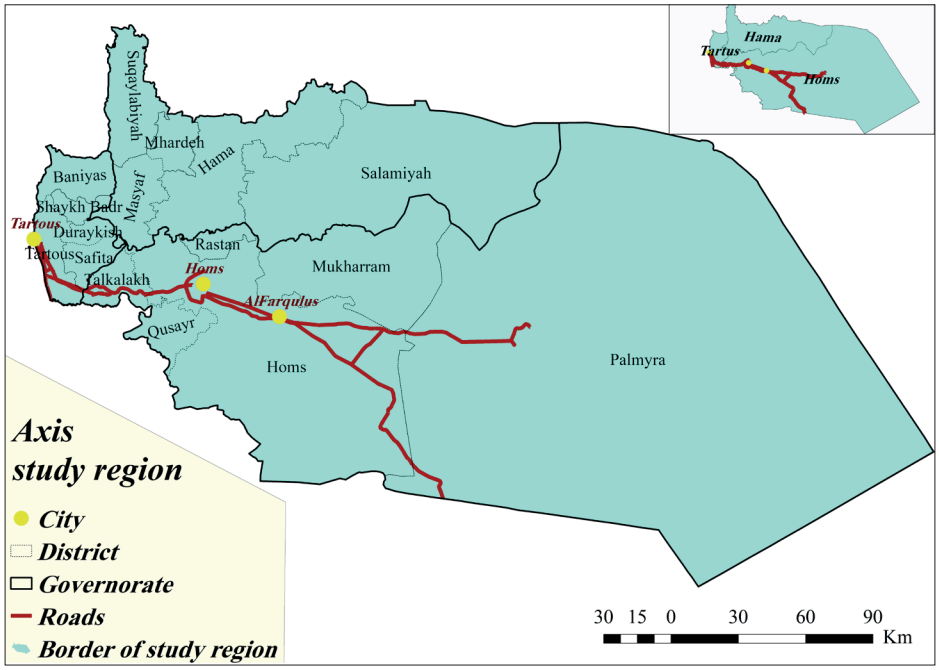

Fig. 8. Axis study region

Source: own work based on Syrian Ministry of Local Administration Data 2018.

1. A spatial database was created (Point – Polygon – Polyline – Raster) and was connected with collected data and indicators calculated according to its scale available.

2. By using Model Builder in Arc Map 10.2.2, it was built the same first level of hierarchy structure in FAHP with suitable spatial analysis tools in Table 4. Therefore, there were six models in Model Builder (Logistics Effectiveness – Developmental Reflections of Logistics Effectiveness – Logistics Efficien-

cy – Developmental Reflections of Logistics Efficiency – Logistics Differentiation – Developmental Reflections of Differentiation Logistics), then there were:

a. Indicators Maps for First Level
b. Reclassified them on a scale from 1 to 10

Table 4. Spatial analysis tools used for criteria of study

First Level criteria	**Available data**	**Spatial analysis used**
Volume of Goods, Volume of Goods Ton/Km, Volume of Goods Ton/person, Number of accidents, Number of trucks, Number of Logistics agencies, Number of workers, Use of vehicles, Average vehicle size, Gross Provincial Product (GPP), Productivity, Number of school and colleges for logistics management programs, Average wages, Number of skilled workers, Transportation performance (tkm) per GPP, Emissions, Fuel consumption, Average vehicle age, Import and Export / Transported by port, Supportive policies	Governorate	Feature to Raster
Number of warehouses, Number of population, Number of factories, Income of manufacturing, Number of economic units, Warehouses density, Average area of warehouses, Basic structure of Information and communication technology (ICT)	Cities	Kernel Density
Classifications of Roads, Length of Roads, Road density, National Transportation System, Speeds on roads	Provinces	Feature to Raster
Damages in Infrastructure	Roads	Kernel Density
Logistics Projects in Area, International cooperation projects of logistics within the area, Supportive policies	Roads, railways and Points	Kernel Density
Proximity to airports, Proximity to ports, Proximity to road axis, Proximity to railway, Proximity to freight villages, Proximity to free zones, Proximity to industrial zones, Proximity to border gates	Each indicator is in a different point layer.	Euclidean Distance
Distance to population density	Cities	Point Density
Land use (Urban – Forest – Agriculture), Land price	Polygon Layer	Feature to Raster
Logistics Projects in Area, International cooperation projects of logistics within the area, Supportive policies	Point Layer according to its Locations	Kernel Density
Elevation and Slope and Natural disaster	Raster	Reclassify
Advantage from borderland	Free Zones	Kernel Density

Source: own work.

The Weighted Sum tool overlays classified maps with their weights, which depends on the (Eq 6) (Srisawat *et al*., 2017):

$$Score = \sum_{i} wE_i; \quad i = 1,2,3\ldots n \tag{6}$$

Where: Score is the overall Indicators score, wi is the additive weight of criterion *i* and the total of weight value is equal to 1, E_i is the Indicators score (1 to 10) of criterion *i*, and n is the number of criteria considered in the decision-making process.

As a result of that, we will have criteria for the second level.

3.4. Fourth: The weights of the second level criteria (main) using the developed FAHP

By using FAHP, the weights were calculated, and to develop this step, because this step represents the stage of regional logistics planning, the survey was done with experts in regional planning.

3.5. Fifth: Classification of second level (main) maps

The results of seventh Model Builder was formed where were reclassified the resulting criteria from overlying second and third level as a spatial analysis in this model on scale 1 to 10.

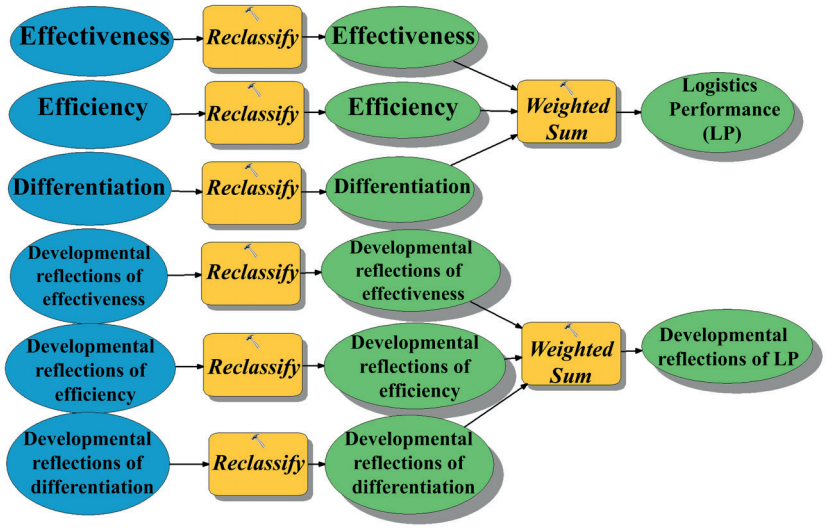

Fig. 9. Model Builder for level 2 of criteria

Source: own work.

As a final step, the weights in the fourth step were overlaid with reclassified maps in the fifth step using Weighted Sum tools, with consideration that the sum of Effectiveness, Efficiency and Differentiation were equalled Logistics Performance index, while the sum of Developmental Reflections of Effectiveness, Developmental Reflections of Efficiency and Developmental Reflections of Differentiation were equalled developmental reflections of Logistics Performance index what consistent with the base hierarchy structure in Fig. 9.

For discussion purposes, the results of the second and third levels were reclassified as shown in Table 5 by taking advantage of study a by Srisawat *et al*. (2017).

Table 5. Reclassified degree of level 2 and level 3 for interpretation purposes

Criteria Degree	**Reclassified Degree**	**Colour**
< 5	*Low*	Red
57	*Medium*	Orange
78	*High*	Light Green
> 8	*Very High*	Dark Green

Source: own work based on Srisawat *et al*. (2017).

4. RESULTS

This study makes a significant contribution by introducing an innovative approach to evaluating regional logistics performance. By integrating FAHP with GIS, it provides a spatial analysis of logistics indicators. The findings show that logistics is crucial for spatial development, with generated maps revealing spatial variations that impact economic, social, and environmental patterns. The results show that regions with high logistics efficiency benefit from equitable resource distribution, lower costs, and improved service quality, fostering sustainable development. In contrast, areas with poor logistics performance face market access limitations, high transportation costs, and weak infrastructure integration, hindering progress.

The study confirms that logistics indicators are essential tools for regional planning. By integrating FAHP with spatial mapping, it links logistics performance to Sustainable Development Goals (SDGs 1, 2, 3, 4, 8, 9, 11, and 12). Enhancing logistics in urban and rural areas boosts economic competitiveness, trade efficiency, industrial balance, and resource optimisation.

Logistics is not just operational but a key element in spatial development. Infrastructure distribution, trade corridor connectivity, and transport facility density shape balanced development. Investing in integrated logistics services enhances economic efficiency, social equity, and environmental sustainability.

This study provides a spatial framework to assess logistics' impact on sustainable development, helping policymakers identify infrastructure needs to strengthen economic competitiveness and resource sustainability.

This section outlines the sequence of extracting and interpreting the results based on the methodological steps.

4.1. Results of applying FAHP for first and second criteria level

For effectiveness and its developmental reflections, the FAHP was applied to the first-level criteria with the input of three experts from each of the Chambers of Agriculture, Industry, and Trade in the study area, which includes the governorates of Tartous, Homs, and Hama. This involved a total of nine experts.

For efficiency and its developmental reflections, the FAHP was applied to the first-level criteria with three experts from the Goods Freight Office in each of the governorates of Tartous, Homs, and Hama, involving a total of nine experts as well.

For differentiation and its developmental reflections, the FAHP was applied to the first-level criteria with three experts from each Chamber of Agriculture, Industry, and Trade, as well as from the Goods Freight Office in each of the governorates of Tartous, Homs, and Hama, making a total of twelve experts.

At the second level of criteria, a survey was conducted to obtain the weights from five experts in regional planning.

As shown in Table 6, the majority of experts prefer effectiveness over efficiency and differentiation, followed by efficiency over differentiation, which is consistent with their developmental reflections. In other words, experts prioritise effectiveness first, followed by efficiency and then differentiation. They also prioritise the developmental reflections of effectiveness, then efficiency, and finally differentiation.

Table 6. Qualitative analysis of experts' opinions according to their response rates

	Saaty Scale	1	2	3	4	5	6	7	8	9
Logistics Performance	Effectiveness with Efficiency	20%		20%	40%	20%				
	Effectiveness with Differentiation					40%		40%	20%	
	Efficiency with Differentiation			20%	40%	20%	20%			
Developmental Reflections Of	Effectiveness with Efficiency				60% 20%	20%				
	Effectiveness with Differentiation			20%	20%		20%	20% 20%		
	Efficiency with Differentiation		20%		40% 20%	20%				
Black shows experts preferring first over second			Red shows experts preferring second over first							

Source: own work.

On the other hand, it is observed that the majority of experts assigned higher scores to the developmental reflections of effectiveness on Saaty's scale compared to the developmental reflections of efficiency. In other words, they prefer the developmental reflections of effectiveness over effectiveness itself. Similarly, when comparing other indicators, it is observed that experts prefer efficiency over its developmental reflections, while they favour the developmental reflections of differentiation over differentiation itself. This gives the initial vision about stakeholders' opinions, which is finally reflected in Fig. 10, showing the results for both the first and second criteria levels after applying the fuzzy method.

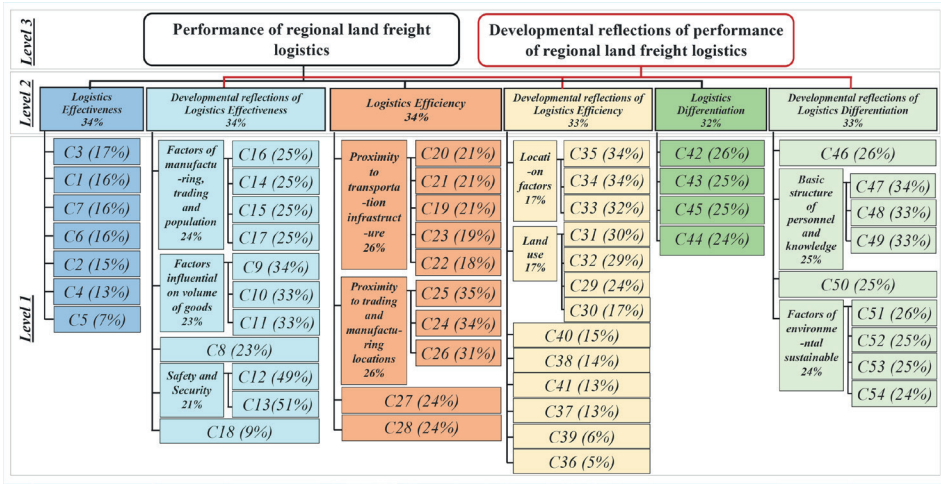

Fig. 10. Resulted weights of level 1 and level 2 for criteria

Source: own work.

4.2. Results of integration FAHP in a GIS environment

Using Model Builder, after performing spatial analysis, Criteria Maps for the First Level were generated. These maps were then reclassified on a scale from 1 to 10. The reclassified maps were overlaid with their respective weights for the six models, resulting in Indicator Maps for the Second Level, as shown in Fig. 11.

The second-level criteria maps, as shown in Fig. 12 were reclassified on a scale from 1 to 10. A value of 0 indicates no spatial value for the indicators. The adopted colour scheme for the values is as follows: grey for 0, red for 1, purple for 2, blue for 3, light blue for 4, black for 5, yellow for 6, light green for 7, orange for 8, dark yellow for 9, and fir green for 10.

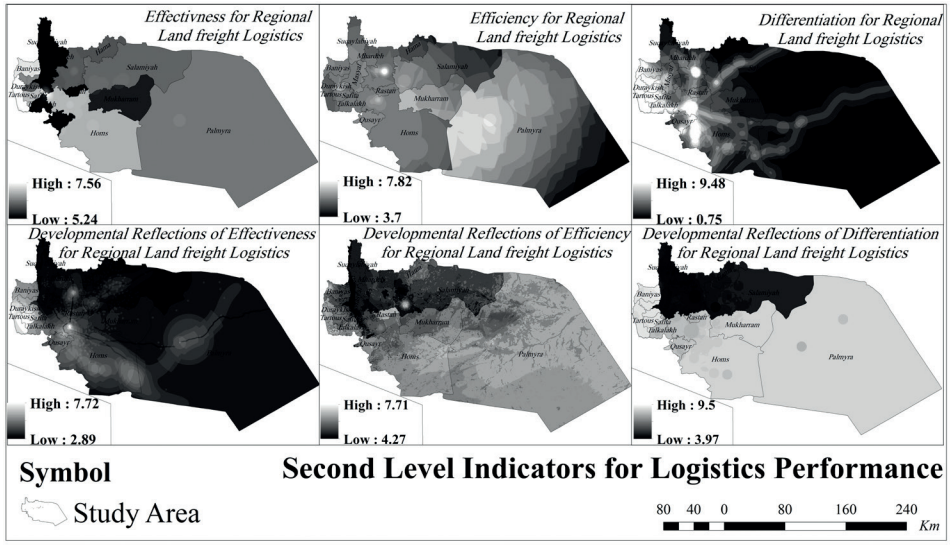

Fig. 11. Second Level Criteria for Logistics Performance and its developmental reflections
Source: own work based on the results of the analysis of first-level indicators based on 2018 data.

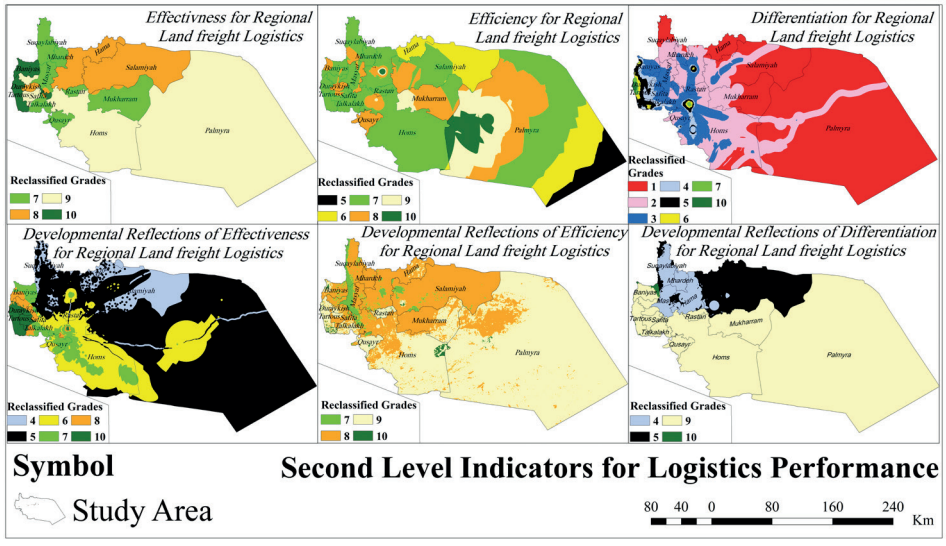

Fig. 12. Second Level reclassified Criteria for Logistics Performance and its developmental reflections
Source: own work based on the reclassification of the maps in Fig. 11 on a scale from 1 to 10.

Finally, the maps were overlaid with their respective weights for the six models, resulting in the third-level Indicators Maps, as shown in Fig. 13 which were reclassified on a scale from 1 to 10 as well.

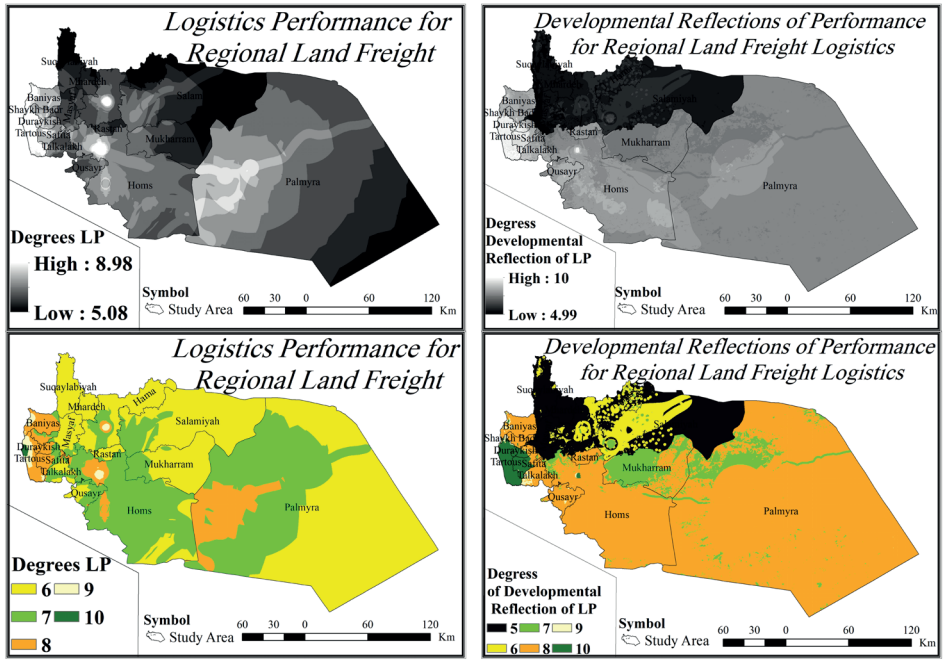

Fig. 13. Third Level Criteria and Third Level reclassified Criteria for Logistics Performance and its developmental reflections

Source: own work based on the analysis results of second-level indicators, then reclassified on a scale from 1 to 10.

4.3. Final results and interpretation

The maps from the second and third levels, shown in Fig. 12 and Fig. 13 were reclassified based on Table 5 for interpretation purposes, leading to the production of Fig. 14 and Fig. 15. Thus, from Fig. 14:

For Effectiveness and its developmental reflections: there is a spatial correlation and agreement between the locations with high levels of effectiveness and their corresponding developmental reflections. Notably, in larger areas with a high degree of effectiveness, there are pockets displaying medium to high levels of development. In contrast, smaller areas with high effectiveness are associated with pockets exhibiting a range of low to medium to high levels of development. This highlights the dynamic impact that the availability of logistics resources has on operational factors and regional development plans. Conversely, the effectiveness contribute in SDGs 1, 2, 3, 8, 9, and 11 by low to medium to high levels.

For efficiency and its developmental reflections: the spatial effects were observed in both proximate and distant locations. For instance, in the eastern part of Palmyra, the limitations of efficiency in that area have reduced the influence

of high-degrees for developmental reflections, resulting in small, medium-to-high pockets on its periphery. Similarly, in the Hama governorate, the retreat of high-efficiency degrees led to lower levels of development in the western and southern areas, with no high-development pockets appearing at all. Conversely, the stability of medium-efficiency degrees in the governorates of Tartous and Homs contributed to the formation of medium-to-high development pockets. This suggests that the good spatial organisation of logistics resources, such as infrastructure and facilities, plays a significant role in fostering positive developmental outcomes. also efficiency contribute in SDGs 1, 2, 8, and 9 reached low to medium to high levels.

For differentiation and its developmental reflections: the effects of spatial disparity in differentiation degrees are evident in both their local and distant developmental reflections. In the Hama governorate, the smallest area with medium differentiation degrees resulted in low developmental reflections. In contrast, the Homs governorate displayed high to very high developmental reflection degrees due to the greater prevalence of medium differentiation degrees compared to Hama. Conversely, the Tartous governorate exhibited the best developmental reflection degrees, owing to its highest differentiation degrees. This indicates the dynamic and significant impact that factors like added value and innovation have on achieving sustainability, aligning with the idea that differentiation represents the highest level of effectiveness and efficiency, also for differentiation SDGs 3, 4, 8, and 12 reached low to high to very high levels.

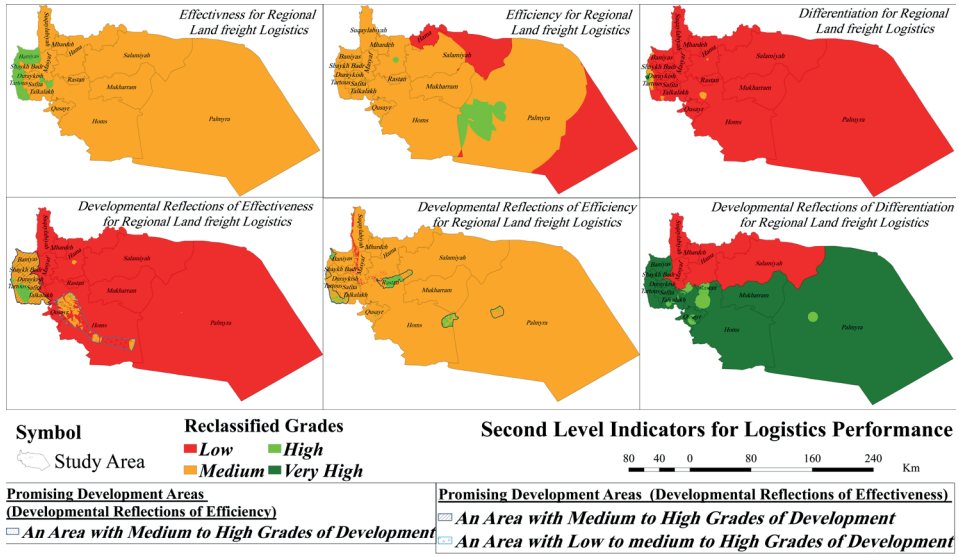

Fig. 14. Second Level reclassified Criteria for discussion purpose for Logistics Performance and its developmental reflections

Source: own work based on the reclassification of the maps in Fig. 11 on a scale from Low to Very High.

For the results of Logistics performance and its developmental reflections: as most studies agree that it is primarily linked to effectiveness and efficiency. While these two concepts share mutual interests, they often involve conflicting or mutually exclusive factors, which is why they were assigned the highest weights. As shown in Fig. 14, the locations of high effectiveness and high efficiency did not coincide, reflecting their inherent opposing features. Meanwhile, spatial differentiation reflects characteristics related to the superiority of activities over competitors.

Since the indicators of developmental reflections are derived from performance indicators, these conflicting features were also observed spatially in the developmental reflections of effectiveness, efficiency, and differentiation. In areas with high degrees of effectiveness, resources tend to be wasted, resulting in operational goals being achieved without reducing costs, efforts, or time. In contrast, locations with high efficiency strive to achieve optimal results but may fall short. As for differentiation, the results indicate a lack of resources for innovation and added value, leading to issues with the spatial variation of sustainability.

As shown in Fig. 15, the study axis passes through the areas with the best logistics performance, concentrated in logistics nodes in the Tartous and Homs governorates. This axis demonstrated high to very high degrees of developmental reflections along its length, with the Tartous governorate showing consistently high to very high degrees transversely. In contrast, the Homs governorate exhibited high to very high degrees, gradually decreasing to medium levels towards Hama, where the developmental reflections were only low to medium due to the reduced logistics performance compared to Homs and Tartous.

Thus, the spatial contribution of the developmental reflections of Logistics Performance in SDGs 1, 2, 3, 4, 8, 9, 11, and 12 reached degrees ranging from low to medium to high to very high.

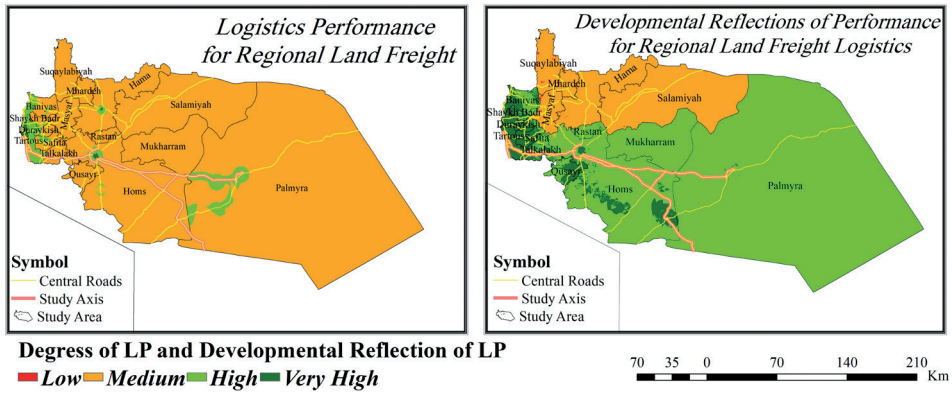

Fig. 15. Third Level reclassified criteria for discussion purpose for Logistics Performance and its developmental reflections

Source: own work based on the reclassification of the maps in Fig. 13 on a scale from Low to Very High.

5. SENSITIVITY ANALYSIS

Following the methodology from Özceylan *et al.* (2015), two sensitivity analyses were conducted: one using equal weights and the other by exchanging weights, as described below:

5.1. Sensitivity analysis with equal weights

When equal weights (i.e., no weights applied) were assigned to the second-level criteria, as shown in Fig. 16 and compared with the results in Fig. 14, the following observations were made:

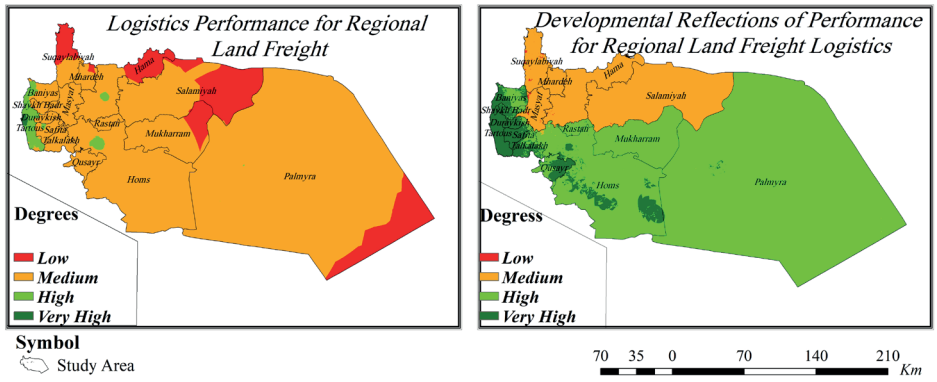

Fig. 16. Sensitivity analysis with equal weights runs for Third Level Criteria for Logistics Performance and its developmental reflections

Source: own work based on the analysis results of second-level indicators without weights, then reclassified on a scale from Low to Very High.

As shown in Fig. 17, the opinions of regional planning experts led to the maximisation of spatial values for approximately 67% of the upper limits of logistics performance indicators and about 33% of the upper limits of the developmental reflections of logistics performance indicators.

As shown in Fig. 16, when applying equal weights, there was an increase in low degrees of logistics performance (LP) and a decrease in high and very high degrees. This indicates that local experts are largely satisfied with the current situation in these locations.

Regarding the developmental reflections of LP, the results closely matched the initial findings, suggesting that the experts' opinions align well with the actual situation in the region.

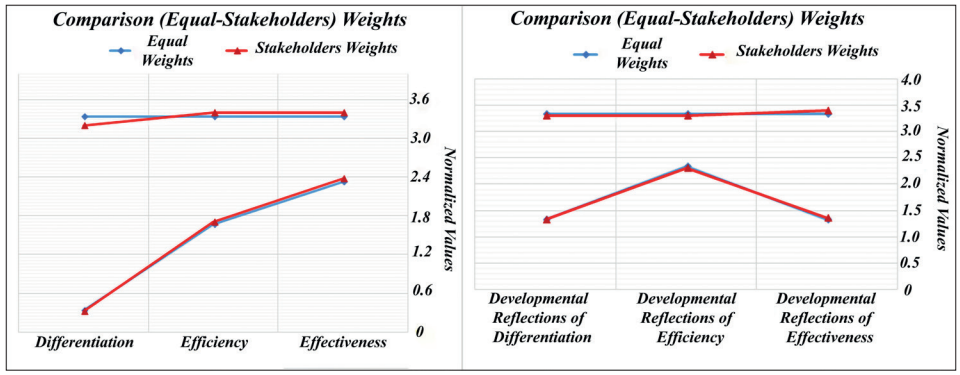

Fig. 17. Comparison of the results of the limits for Third Level Criteria for Logistics Performance and its developmental reflections in the two cases of weights (local experts – equal)

Source: own work.

5.2. Sensitivity analysis by exchanging weights

In this analysis, the weights of the criteria were adjusted to evaluate the impact on logistics performance. Run 1 represents the base run, which reflects the evaluation of logistics performance according to the perspectives of local stakeholders.

By exchanging the weight of the first criterion with the second criterion, we obtained Run 2. Similarly, by exchanging the weight of the first criterion with the third criterion, we obtained Run 3, as illustrated in Table 7.

Table 7. Weights of for Third Level Criteria for Logistics Performance and its developmental reflections according to sensitivity analysis runs

Sensitivity Runs for LP				**Sensitivity Runs for developmental reflections of LP**			
Criteria	**Run 1**	**Run 2**	**Run 3**	**Criteria**	**Run 1**	**Run 2**	**Run 3**
Effectiveness	34%	34%	32%	Developmental reflections of effectiveness	34%	33%	33%
Efficiency	34%	34%	34%	Developmental reflections of efficiency	33%	34%	33%
Differentiations	32%	32%	34%	Developmental reflections of differentiations	33%	33%	34%
Sum	**100%**	**100%**	**100%**	**Sum**	**100%**	100%	100%

Source: own work.

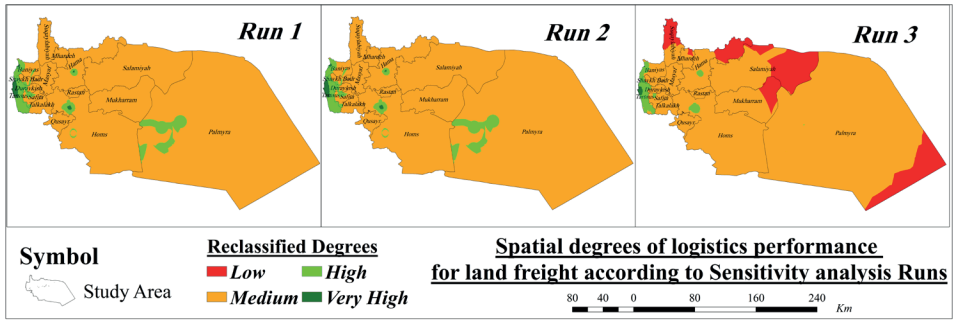

Fig. 18. Sensitivity analysis runs for Third Level Criteria for Logistics Performance

Source: own work based on the analysis results of second-level indicators (Logistics Performance) using exchange weights, then reclassified on a scale from Low to Very High.

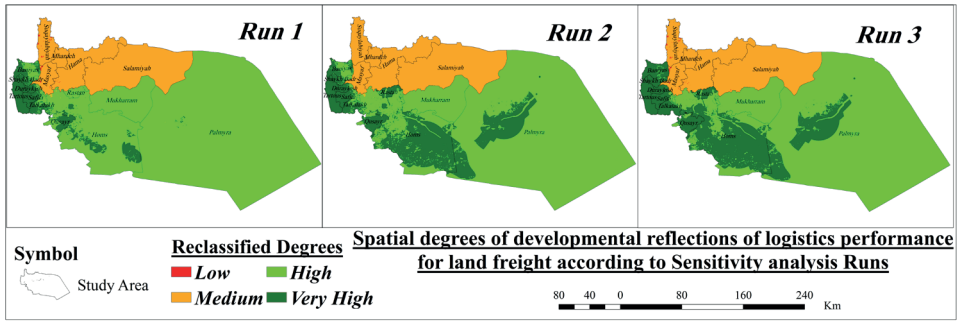

Fig. 19. Sensitivity analysis runs for Third Level Criteria for developmental reflections of Logistics Performance

Source: own work based on the analysis results of second-level indicators (Developmental Reflections of Logistics Performance) using exchange weights, then reclassified on a scale from Low to Very High.

As illustrated in Fig. 18, the results of the sensitivity analysis for Logistics Performance (LP) reveal that the high and very high degrees of LP around the centres of Tartous, Hama, and Homs decreased in Run 3 compared with Run 2 and Run 1. This reduction indicates that the lower degrees of differentiation (which had the highest weight) negatively impacted LP more than effectiveness and efficiency. This outcome aligns with the results shown in Fig. 12.

Similarly, as shown in Fig. 19, the sensitivity analysis for developmental reflections of logistics performance demonstrates that the low degrees of developmental reflections in the Hama governorate disappeared in Run 2 compared with Run 1 and Run 3. This suggests that the better degrees of efficiency in Hama (when weighted with the highest importance) had a more significant positive impact

compared to effectiveness and differentiation. This also corresponds with the results in Fig. 12.

This analysis provides a valuable tool for the decision-maker in the model, facilitating the feedback process and supporting decision-making by enabling the identification of spatial weaknesses and potentials without the need to review sub-maps.

6. DISCUSSION

The final results derived from Fig. 14 align with the qualitative analysis of expert opinions in Table 6. Experts identify resource provision, represented by effectiveness, as the most critical logistical factor lacking corresponding developmental outcomes. They emphasise the necessity of well-structured spatial organisation of infrastructure, denoted by efficiency, which ranks second. When achieved, it fosters appropriate development. In contrast, achieving developmental excellence ranks third due to Syrian war-related constraints, underscoring the validity of expert opinions within the model.

The proposed conceptual framework offers adaptability for integrating additional indicators, provided their data is available. It applies to various developmental logistical studies while maintaining consistency with planning levels (national, regional, structural, or local), contingent on measurable indicators at each level.

The FAHP method enabled the decomposition of complex decision problems into hierarchical sub-criteria, effectively integrating both quantitative and qualitative data through expert-weighted maps. However, a key limitation is the required sample size of 5–12 indicators per group and the limited number of experts, necessitating the use of fuzzy theory to address ambiguity in expert opinions during weighting (Żak *et al*., 2017; Srisawat *et al.*, 2017). Sensitivity analysis provided critical insights for decision-making: equal-weight sensitivity analysis identifies results independent of expert-assigned weights, serving as a benchmark for expert satisfaction, while weight-exchange sensitivity analysis highlights strengths and weaknesses across sub-indicators without requiring model reassessment (Özceylan *et al.*, 2015).

The land freight logistics decision support system plays a crucial role in implementing the regional plan by identifying areas for improvement, needs, and available capacities. The 2018 data timeframe is linked to the completion and approval of the regional study for the designated area in Syria, covering a 10–15-year period and six phases: policy formulation, diagnosis and data analysis, planning (designing the plan), resource mobilisation, programming and implementation, and plan evaluation. Data and expert surveys must be updated during the diagnosis and evaluation phases, where the proposed decision support system should actively contribute (Syrian Regional Planning Commission, 2021).

7. CONCLUSIONS AND RECOMMENDATIONS

The developed methodology, based on Key Performance Areas (KPAs) for selecting secondary indicators, offers a comprehensive approach for evaluating logistics performance. The application of Fuzzy Analytical Hierarchy Process (FAHP) enabled the analysis of both quantitative and qualitative data, while organising the decision-making process hierarchically. Additionally, the inclusion of stakeholders' preferences, derived from understanding the roles of effectiveness, efficiency, and differentiation, enriched the evaluation process.

Using GIS techniques, this study identified the strengths, weaknesses, opportunities, and needs of each spatial location, which can enhance logistics operations and foster economic revitalisation through balanced resource distribution and innovation. The analytical tool developed here provides insights into the dynamic, dramatic, or mixed effects of logistics resource allocation and innovation factors on sustainable logistics operations. Furthermore, it revealed the longitudinal and transverse developmental impacts of the freight axis in the region and the spatial contributions of Logistics Performance (LP) to the Sustainable Development Goals (SDGs).

Sensitivity analysis with equal weights contributes to showing the local privacy of the axis study region, while Sensitivity analysis by exchanging weights contributes to supporting the view of the decision maker and in the feedback process.

Future studies should explore integrating real-time tracking and Internet of Things (IoT) technologies into logistics evaluation frameworks. Such advancements can provide policymakers with dynamic insights into supply chain efficiencies, enabling more proactive infrastructure development strategies. Additionally, further interdisciplinary collaborations between urban planners, economists, and logistics experts could lead to more comprehensive decision-making models that align logistics performance with long-term sustainability goals.

New secondary indicators can be developed based on the proposed conceptual framework and the availability of related data. It is also important to consider integrating the proposed decision support system (DSS) into the stages of regional study preparation – specifically in the analysis of capabilities and needs, as well as in the evaluation phases, by identifying priorities and projects within the regional plan.

As a potential area for future research, the DSS could be further enhanced by using other methods from the multi-criteria analysis literature, such as Entropy, CRITIC, Fuzzy-TOPSIS and Fuzzy-ANP. These methods would enable policymakers to explore various "what if" scenarios. Additionally, establishing a regional logistics observatory to collect data at the regional level and regularly update the defined database would be beneficial for sustaining an informed decision-making process.

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EVALUATING CHANGES IN SPATIAL CONFIGURATION IN MAKASSAR: A SPACE SYNTAX APPROACH

Abstract. As cities expand, their morphology and spatial configuration evolve, necessitating the integration of new spatial plans with existing ones to preserve urban identity. Understanding these changes is crucial for sustainable urban development and effective spatial planning. This study examines spatial transformations in Makassar, Indonesia, following the implementation of a new spatial plan. Using the space syntax method, specifically Angular Segment Analysis (ASA), key spatial properties – including integration, intelligibility, and accessibility – were assessed. ASA was employed to address the lack of geometric information by weighting segment lines according to their angular connections. The findings indicate that as the city grows, overall intelligibility and accessibility tend to decline. However, an increase in local intelligibility and accessibility suggests that well-planned urban design can mitigate these effects, enhancing spatial intelligibility and accessibility. These insights underscore the role of spatial configuration in shaping urban dynamics and highlight the need for a holistic planning approach to maintain integration, intelligibility, and accessibility.

Key words: spatial configuration, space syntax, morphology, integration, intelligibility, accessibility.

1. INTRODUCTION

Cities around the world are experiencing rapid expansion and land-use changes. By 2030, it is predicted that 60% of the global population will reside in urban areas, with Africa and Asia experiencing the most rapid urbanisation (Wang and

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Kintrea, 2021). Developing countries such as India are witnessing alarming urban expansion rates, leading to significant land-use transformations and environmental degradation (Ghosh, 2019). Similarly, Iran has faced uncontrolled urban sprawl, encroaching upon agricultural lands and green spaces (Parsipour *et al*., 2019). The spatial growth of cities influences multiple urban dynamics, including environmental sustainability, socio-economic development, and infrastructure planning (Lu *et al*., 2021). These challenges highlight the urgent need for holistic urban planning approaches that integrate social, environmental, and economic considerations to promote sustainable and well-coordinated development.

Understanding urban dynamics requires interdisciplinary approaches, integrating sociological theories, urban design, and spatial analysis. Recent studies emphasize the importance of pedestrian-oriented development, mixed-use centres, and inclusive urban policies to enhance livability (Kozhakhmetov and Abilov, 2022). Moreover, advancements in computer vision and artificial intelligence have facilitated new methods for analysing urban environments (Prell, 2022). However, despite these developments, research on spatial configuration and urban morphology in Southeast Asian cities remains limited, leaving a critical gap in understanding how urban spaces evolve in rapidly developing regions.

Urban space encompasses the physical environment of a city, including buildings, streets, squares, parks, and public areas where citizens interact and engage in various activities. It is a complex, evolving mechanism that significantly influences urban life by shaping social interactions, cultural exchange, and mobility patterns (Shymko, 2022; Viderman *et al*., 2022). Rather than being static, urban spaces transform over time due to changes in routines, spatial contestations, and planning decisions (Noor and Kamar, 2022). Thoughtful urban design and planning must consider the diverse needs of residents, ensuring accessibility, safety, and inclusivity to enhance urban livability (Petrova and Dvoinev, 2020).

A well-designed urban space contributes to the overall integrity of the city by fostering connectivity between its various elements, such as streets, neighbourhoods, and public squares. The street network, in particular, is a crucial component of urban morphology, serving as the backbone of a city's spatial structure (Oktay, 2023). Studies on urban form and expansion have extensively examined street network configurations, analysing their orientation, connectivity, and entropy to uncover spatial logic and urban order (Boeing, 2019). The application of Geographic Information Systems (GIS) and Space Syntax methods has facilitated the analysis of traditional city centre morphologies, providing valuable insights into urban growth and transformation (El Gouj *et al*., 2022). Additionally, complex network theory has been employed to examine the relationship between street network structures and economic development, utilising indicators such as betweenness and closeness centrality to quantify urban spatial characteristics (Soltani *et al*., 2022a).

The Space Syntax method, developed by Hillier and colleagues, has emerged as a widely used technique for analysing urban morphology and spatial (Yamu

et al., 2021). It enables the examination of spatial properties such as integration, connectivity, and visual exposure to better understand urban structures and their impact on human mobility (Soltani *et al*., 2022b). This method has been applied in various fields, including urban design, architectural research, and urban planning, to inform decision-making processes and improve city layouts. Studies utilising Space Syntax have revealed critical insights into socio-spatial experiences, children's commuting patterns, and neighbourhood accessibility (LOBsang *et al*., 2019). Importantly, research findings suggest that as cities expand, their spatial intelligibility and accessibility tend to decline (Günaydin and Yücekaya, 2020).

Despite the growing significance of spatial analysis in urban studies, the application of Space Syntax – a widely used method for analysing urban morphology – has been predominantly concentrated in European and North American cities. In Southeast Asia, particularly Indonesia, research utilising Space Syntax to evaluate the long-term effects of historical spatial planning on urban development remains limited. This study aims to fill this gap by examining Makassar, one of Indonesia's largest and fastest-growing cities, to analyse how past and present urban planning decisions have shaped its spatial configuration and influenced its future development.

Urban planning decisions – from neighbourhood-scale interventions to city-wide development frameworks – play a crucial role in shaping a city's long-term structure and functionality. Given the rapid urban transformation of Makassar, evaluating its historical and contemporary urban planning strategies is essential to ensuring an integrated and sustainable future urban form. This study investigates how spatial intelligibility and accessibility in Makassar have been influenced by historical and contemporary urban planning approaches. Furthermore, it assesses the role of Angular Segment Analysis (ASA) within the Space Syntax framework to examine spatial integration, intelligibility, and accessibility patterns.

By bridging the gap between historical urban planning and modern spatial development, this research aims to contribute to urban planning discourse by offering insights into how cities can integrate historical urban forms with contemporary planning strategies to ensure sustainable and coherent spatial growth.

2. METHODS

The Space Syntax approach was applied using axial map analysis to evaluate spatial configurations in Makassar. The analysis was conducted with DepthmapX, a software developed by Turner, to measure the intelligibility and accessibility of the city's spatial plans. The spatial datasets were obtained from the Makassar City Spatial Planning Department in GIS layer format and subsequently converted into DXF (Drawing Exchange Format) files for compatibility with DepthmapX.

Two datasets were used, representing the years 2023 and 2034. The 2023 map reflects the current urban layout, while the 2034 map represents the official future development plan. This timeframe was deliberately chosen to capture and compare the present spatial structure with the projected urban form upon completion of the Center Point of Indonesia (CPI) – a strategic national project expected to significantly influence urban growth and movement patterns in Makassar.

Through this analysis, the study identifies the advantages and limitations of the planned urban development and offers recommendations to mitigate potential negative impacts. The findings are intended to provide evidence-based input that can inform policy decisions and contribute to improving the effectiveness and sustainability of future city development plans.

2.1. Research case

This study is located in Makassar city, South Sulawesi Province, Indonesia, which, according to BAPPENAS, is one of the four major growth centres in Indonesia, along with Medan, Jakarta, and Surabaya. With an area of 172 sq. km and a population of more than 1.5 million people. Makassar is the seventh-largest city by population in Indonesia.

In 2013, the reclamation work of Makassar's integrated global business strategic area called The Equilibrium CenterPoint Park (ECP) began, which is a reclamation project of the Center Point of Indonesia area and also other areas in the Makassar coastal area with a total area of around 1,000 ha and has been included in the Makassar Spatial Plan and Regional Plan in 2015. Currently, the construction of the CPI project is still ongoing and is planned to be completed in 2034. The total area of the CPI project is 157.23 ha. According to the agreement, the South Sulawesi provincial government will obtain 50.47 ha of land, the Makassar City Government 3.3 ha, and the remaining 106.76 ha of CitraLand City Losari (Fig. 1).

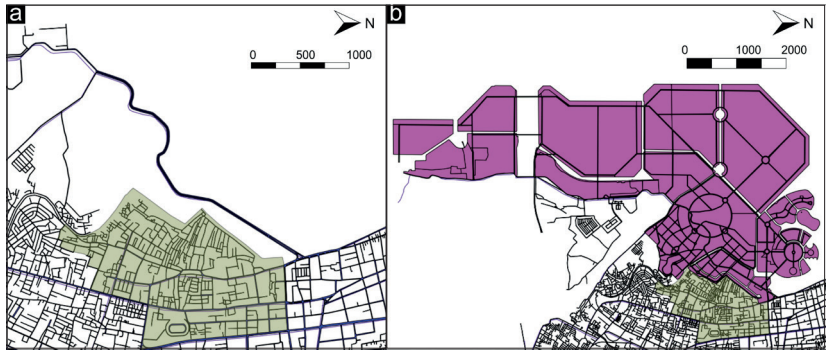

Fig. 1. Makassar spatial plan (a) 2023, (b) 2034
Source: Department of Public Works, Makassar City.

2.2. Space syntax

Space syntax is a method used to analyse and understand the spatial properties and relationships within built environments. It involves examining the configuration and connectivity of spaces, such as streets and buildings, to determine how they influence human experiences and behaviours. It has been applied in various studies to explore the experiential qualities of historical streets (Xu *et al.*, 2021), describe the spatial properties of sustainable cities (Yamu *et al*., 2021), and identify and describe the spatial features of compact cities (Karimi, 2018; van Nes, 2021). Space syntax research has also focused on characterising and predicting socio-spatial experiences, examining the relationships between spatial properties and experiential values (Lee *et al.*, 2023). In general, space syntax is a valuable method for understanding the impact of spatial configurations on human experiences and can inform urban design and planning decisions.

An axial map is one of the most crucial tools in space syntax. In this context, the spaces represented by the fewest and longest sight (and movement) lines on the map are considered to be publicly accessible. This represents or models the necessary relationship between the model and the real world (Joutsiniemi, 2005). The model is simpler than the real-world thing it represents. "An axial map is the minimal set of axial lines such that the set taken together fully surveils the system, and that every axial line that may connect two otherwise unconnected lines is included" is the general guideline that must be followed to create axial maps of built environments objectively (Turner *et al.*, 2005). A model based on the linear link known as 'integration' is created by converting axial maps to graphs and conducting a topological analysis (Wagner, 2008). The concept of an axial line and its application in space syntax is explained, including the static measure of 'connectivity' and its meaning for axial integration analysis (van Nes and Yamu, 2021).

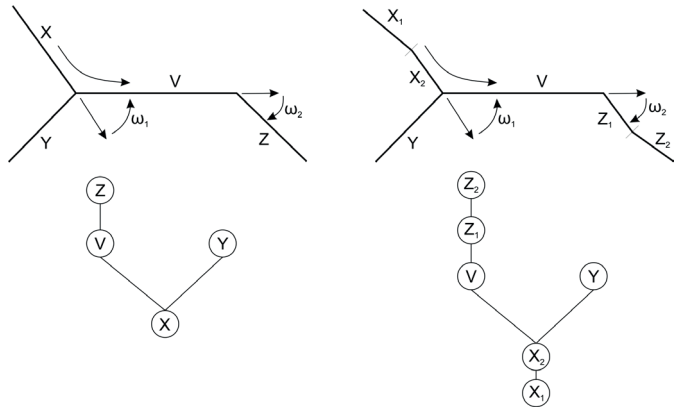

Fig. 2. Paths through a network and their associated j-graphs

Source: own work.

Angular Segment Analysis (ASA) is used to compensate for the lack of geometric information (Dalton, 2001; Turner, 2007). The angular analysis contributes to the various integration analyses by weighting each segment line according to the angle of its connections to other segment lines.

Using the integration maps produced by the ASA analysis, the spatial syntax approach may be used to identify and categorise differences in the way that axes are used within a system according to their depth. The motion of the network inside the system is affected by these distinctions (Peponis and Wineman, 2002).

When calculating Total Depth (TD) in ASA, the angles formed by a turn from one space to another are considered. For example, in ASA, the TD of a segment *x* is as follows:

$$TD_x = \sum_{i \in S, i \neq x} D_\theta(x,i)$$

Where D_θ (*x, i*) is the depth found by taking into account angle (θ) for every turn made by taking the shortest angular route between segments *x* and *i*. The angle (θ) could range from 0 (no turn) to 2 (a 180° turn) (Jeong *et al*., 2015).

A significant metric for space syntax is integration, which is determined by calculating a space's *TD* by the total number of spaces in the system. The integrating/segregating impacts of spaces in buildings or urban contexts are indicated by integration. The integration is as follows:

$$I_x = \frac{NC^2}{TD_x}$$

Where I_x denotes the integration value of space *x*, and *NC* indicates the node count (i.e., the number of nodes within a radius to be analysed) in a street network regarded as a graph consisting of a set of nodes and a set of edges (Jeong *et al.*, 2015).

The integration value has two measurements. The first is the global integration value (Rn), which is defined as the number of connections a node has with all nodes in the system; the second is the local integration value, which is defined as the number of connections a node has with other nodes with a certain proximity in the system (Gann and Gann, 2003). Spaces that have a high degree of integration have a high movement rate, while spaces with a low degree of integration have a lower movement rate. This indicates that spaces with a high degree of integration are more connected and accessible (Hillier, 2001; Hillier *et al*., 1993).

The relationship between the several measures makes it possible to explain the properties and characteristics of a layout in relation to wayfinding (Dalton, 2001). Intelligibility is the correlation coefficient between connectivity and global integration. Intelligibility can help identify how easy (clear) it is for one in a local position to understand the global structure (Al-Sayed *et al*., 2014). In other words,

Intelligibility can be understood as the relationship between a local measure, such connectivity, and the measure of integration in an axial map. This relationship allows an indicator to indicate how permeable and understandable a space is for users.

2.3. Analytical framework

This study aims to analyse the transformation of spatial configurations and evaluate the changes and expansions occurring over time. The focus is on the area surrounding the Center Point of Indonesia (CPI) project, which was incorporated into the Makassar City Regional Spatial Plan in 2015 and is projected to be completed by 2034. By comparing the spatial conditions between 2023 and 2034, the study assesses changes in spatial configuration, intelligibility, and accessibility in the CPI area, offering insights into the potential impacts of this major urban development on Makassar's urban form.

Axial maps for both years were constructed and analysed using multiple radii: R250, R500, R750, R1000, R1500, R2000, R3000, and Rn. These radii enabled the evaluation of spatial qualities at both micro and macro scales. Key indicators analysed include global and local integration, intelligibility (INCO), and choice (INCHO). By comparing the results, the study identifies changes in pedestrian accessibility and road network efficiency over time (Fig. 3).

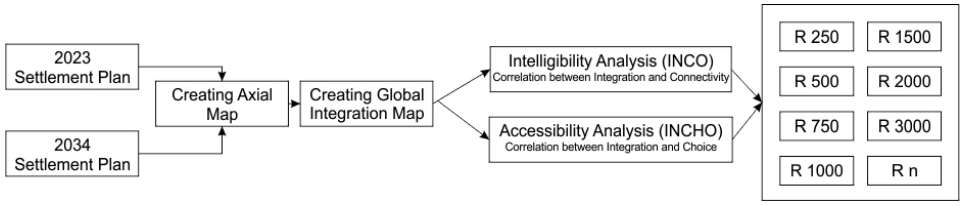

Fig. 3. Method schema

Source: own work.

By comparing the results of the analysis with the spatial sequence method, which enables the comparison of urban areas with diverse characteristics, this study aims to address the following questions in the context of Makassar:

1. How do increasing urbanised areas influence the intelligibility and accessibility of the city's spatial configuration?
2. What are the impacts of past and present urban planning decisions on Makassar's spatial structure and connectivity?
3. At which spatial radius can optimal values of intelligibility and accessibility be identified using the spatial method?

The findings of this study are expected to provide insights into the key criteria and constraints that should be considered in future urban planning efforts for Makassar, ensuring a more integrated and sustainable urban development approach.

3. RESULTS AND DISCUSSION

This study examines changes in urban morphology, growth trends, intelligibility, and accessibility that occur in Makassar city. How and to what degree differences and changes affect the value of integration, followed by changes in the value of intelligibility and accessibility occur.

The average integration value on the 2023 integration map is 494.394 and the segment number was 2638 (Fig. 4). It can be seen that roads with high integration values are located on Cenderawasih Street (756.622), Kakatua Street (682.802), Hati Mulia Street (735.192), and Hati Murni Street (703.872), where many settlements are located around the axis of these streets, and this axis is the initial reference for the development of the surrounding area. While the Mariso fishermen settlement is an area with a fairly low integration value, Cendrawasih Street, Haji Bau Street, and Metro Tanjung Bunga Street are quite important roads that connect other settlements. The highest intelligibility and accessibility values in 2023 were achieved at a radius of R1000 with an INCO of 0.71 and an INCHO of 0.285 (Fig. 5).

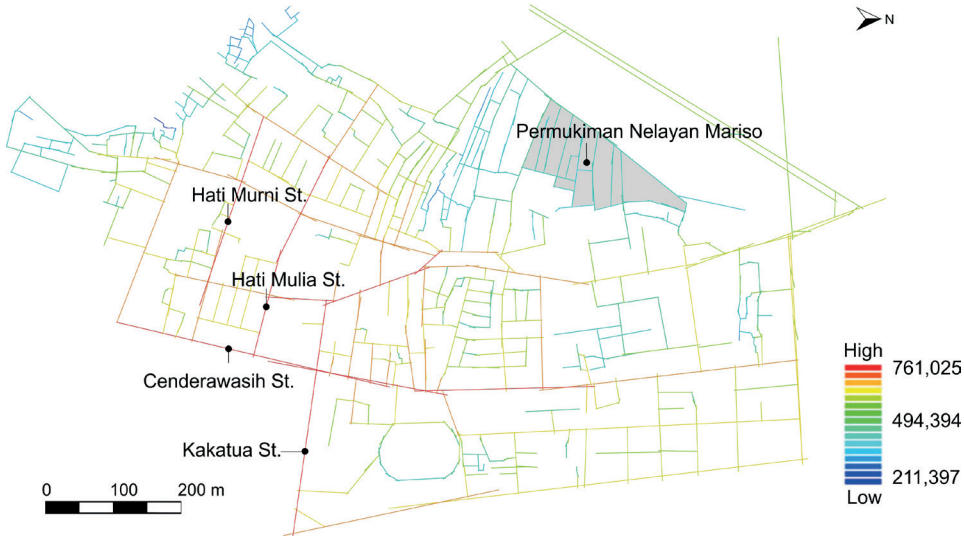

Fig. 4. Spatial integration values for Makassar in 2023

Source: own work.

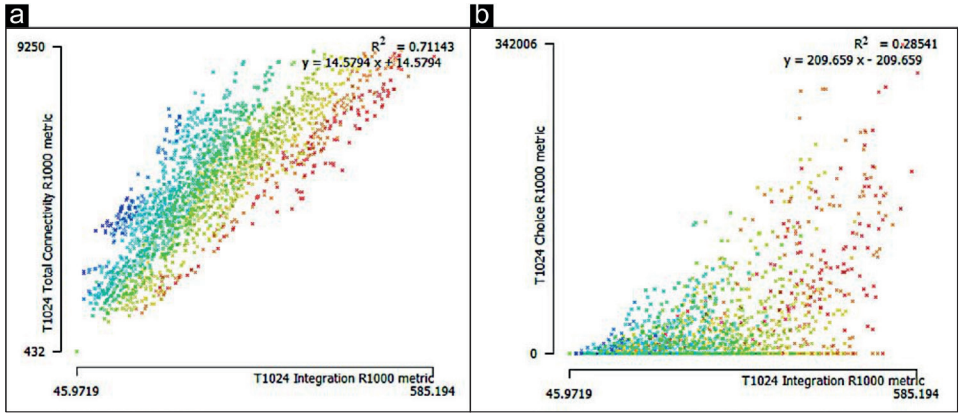

Fig. 5. (a) Correlation between Integration and Connectivity (R1000) of Makassar in 2023, (b) Correlation between Integration and Choice (R1000) of Makassar in 2023

Source: own work.

The average integration value in 2034 on the integration map is 610,811 (Fig. 6). The addition of a large enough space, namely the Equilibrium CenterPoint Park project, including Center Point of Indonesia, brings the number of segments to 3953. Cenderawasih Street (756,622) and Kakatua Street (682,802) are still the streets with high integration values. With this expansion, previously Metro Tanjung Bunga Street (553,111), Penghibur Street (701,121), and Haji Bau Street (652,082) became increasingly integrated roads with the values of Metro Tanjung Bunga Street (869,665), Penghibur Street (927,448), and Haji Bau Street (845,669). There is no significant change in the value of integration in the Mariso Fishermen Settlement. The highest intelligibility value in 2034 is achieved at a radius of R1000 with an INCO value of 0.827, while the highest accessibility value is at a radius of R750 with an INCHO value of 0.30 (Fig. 7).

Referring to Table 1, the intelligibility value at the Rn radius (global radius) in 2023 was 0.09 and experienced a slight decrease in 2034 to 0.06. Although not significant, at only 0.03, this confirms previous research conducted in European cities that there is an inverse relationship between intelligibility and urban growth (Dalton, 2011) also research conducted by (Günaydin and Yücekaya, 2020) in the city of Gaziantep, Turkey. The accessibility value at radius Rn in 2023 was 0.26 and decreased slightly in 2034 to 0.18, or a decrease of 0.08. Consistent with these findings, it seems that that accessibility decreases proportionally with the size of the city.

The decrease in the intelligibility value of 0.03 and the accessibility value of 0.08 is not very significant when looking at the number of segments, which increased by 1.5 times from the previous size.

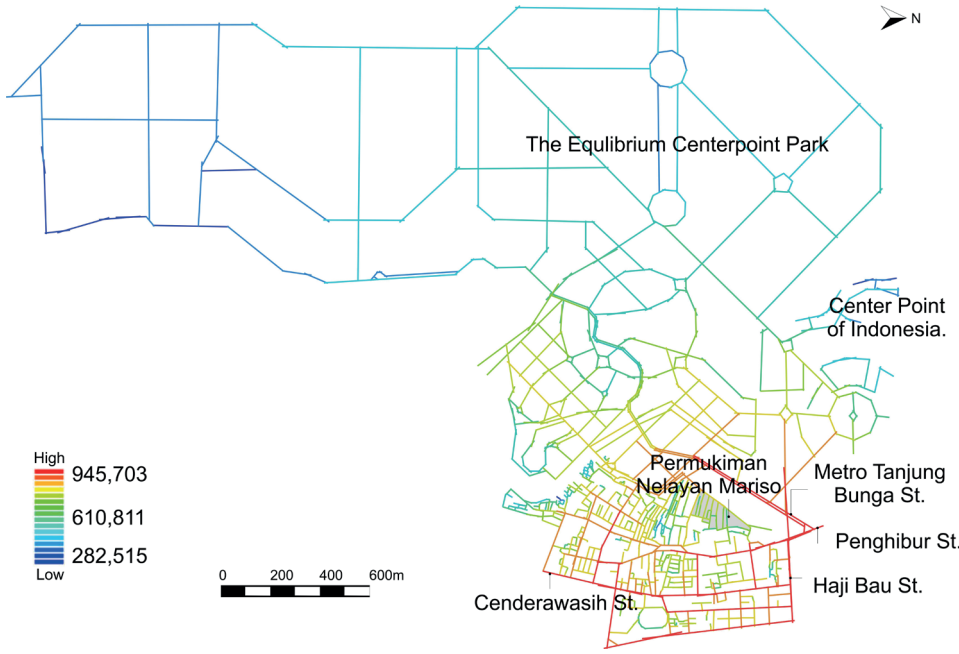

Fig. 6. Spatial integration values for Makassar in 2034

Source: own work.

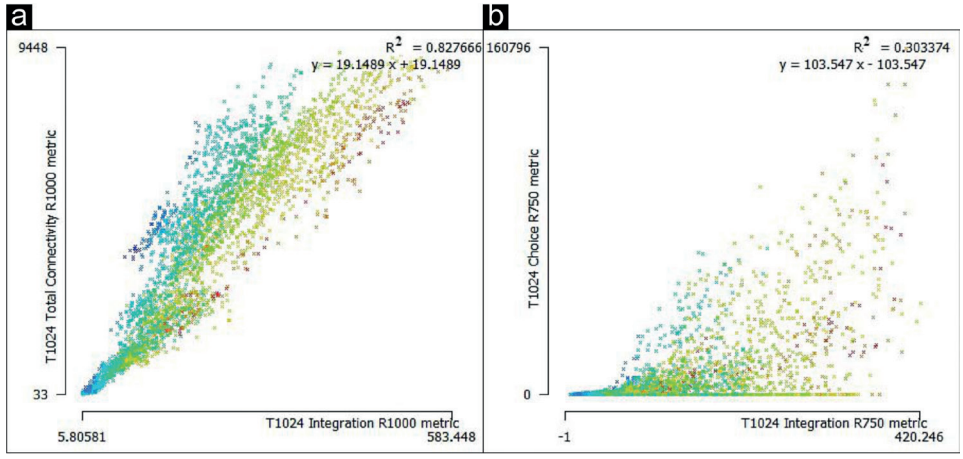

Fig. 7. (a) Correlation between Integration and Connectivity (R1000) of Makassar in 2034, (b) Correlation between Integration and Choice (R750) of Makassar in 2034

Source: own work.

The decrease in the value of intelligibility and accessibility can be explained by the fact that on the 2023 map there was no planning specifically related to existing settlements, while in 2034 there have been efforts for better urban planning, although it will be very difficult to change as a whole considering it is not easy to overhaul the configuration of the city that has been built.

In previous years, the growth of the area in Makassar City only grew organically and undirected. while on the 2034 plan map there have been efforts to arrange a more orderly city so that although there is a global decrease in the value of intelligibility and accessibility at Radius Rn, it is not so large compared to previous studies.

As described in the method and illustrated in Table 1, it is possible to determine which settlement plan achieves the highest value of intelligibility and accessibility, along with the corresponding radius. In this particular case, the settlement plan in 2023 achieved the highest value of intelligibility and accessibility both at a radius of R1000, while the settlement plan in 2034 achieved the highest value of intelligibility at a radius of R1000 and accessibility at a radius of R750.

The interesting thing is that although in the global radius (Rn) settlement planning in 2034, the intelligibility value has decreased compared to the 2023 settlement planning, the local intelligibility value has actually increased. Despite a 1.5 times increase in size, the intelligibility value of R250 actually increased from 0.64 to 0.73, the intelligibility value of R500 increased from 0.65 to 0.76, the intelligibility value of R750 increased from 0.70 to 0.80, the intelligibility value of R 1000 increased from 0.71 to 0.827, the R1500 intelligibility value increased from 0.49 to 0.795, the intelligibility value of R2000 increased from 0.26 to 0.76, and the intelligibility value of R3000 increased from 0.001 to 0.65. This shows that, at the local radius, there is an increase in the intelligibility value at each radius. Therefore, the statement that "intelligibility decreases with urban growth" is true, but it can be said that if the development of a city is well planned and designed, the intelligibility value can be improved or at least maintained even if the city expands.

Quite a different thing happened to the accessibility value; at a radius of R250–1000, there was an increase in the accessibility value. The accessibility value of R250 increased from 0.17 to 0.21, the accessibility value of R500 increased from 0.21 to 0.25, the accessibility value of R750 increased from 0.28 to 0.30, and the accessibility value of R1000 increased from 0.285 to 0.28. However, at a radius of R1500–3000, there was a decrease in the accessibility values. The accessibility value of R1500 decreased from 0.277 to 0.236, the accessibility value of R2000 decreased from 0.281 to 0.200, and the accessibility value of R3000 decreased from 0.26 to 0.15. This could happen because as the size of the area expands, affordability or accessibility at a radius of R1500 and above begins to decrease along with the increasing distance travelled. Even at a radius of R250–1000 in settlement planning 2034, there is an increase in the value of accessibility. This makes sense given that the size of the planned settlement increased by 1.5 times.

Table 1. The intelligibility and accessibility values varying according to years and radius

Plan Year	Radius	Number of Segment	Global Integration	Local Integration	Intelligibility (INCO)	Accessibility (INCH)
2023	250	2638	494.394	42.633	0.64	0.17
	500			93.473	0.65	0.21
	750			163.419	0.70	0.28
	1000			241.846	0.71	0.285
	1500			375.119	0.49	0.277
	2000			446.551	0.26	0.281
	3000			492.346	0.001	0.26
	n			494.394	0.09	0.26
2034	250	3953	610.811	34.829	0.73	0.21
	500			74.388	0.76	0.25
	750			129.581	0.80	0.30
	1000			191.956	0.827	0.286
	1500			304.478	0.795	0.236
	2000			385.203	0.76	0.200
	3000			494.701	0.65	0.15
	n			610.811	0.06	0.18

Source: own work.

This study's findings demonstrate a significant decline in intelligibility and accessibility values at the global scale (radius Rn) as Makassar continues to grow. This observation aligns with Hillier (2001) analysis of 58 cities worldwide, where he found that cities with lower global integration and intelligibility values – particularly those in Arabia – often evolved based on spatial cultures that favoured organic growth over grid-like, planned development. Similarly, many Indonesian cities, including Makassar, have historically grown in an unplanned, incremental manner. This organic spatial culture tends to prioritise localised adaptations over systemic connectivity, which contributes to lower global integration.

In Makassar's case, urban expansion has followed a pattern that reflects a reactive rather than anticipatory planning approach. The 2015–2034 spatial plan reveals that much of the new development is concentrated on the city's western coastal area – land that was previously unoccupied or used for different ecological functions. This transformation is driven by spatial pressures such as increased demand for residential, economic, and social spaces, coupled with a limited supply of developable land in existing urban cores. The conversion of coastal areas, while providing short-term relief, may unintentionally disrupt spatial coherence at a city-wide level if not aligned with broader integration goals.

Notably, although intelligibility and global accessibility values decline with urban growth, the study also found an increase in local intelligibility and accessibility. This supports the argument that well-designed localised interventions can preserve or even enhance spatial legibility within neighbourhoods. Research by Günaydin and Yücekaya (2020), reinforces this finding, suggesting that while macro-level expansion may dilute spatial clarity, micro-scale planning (e.g., pedestrian-oriented design, connected street networks) can counterbalance these effects.

This duality emphasizes the importance of scale in spatial planning. While macro-scale disintegration poses challenges for wayfinding and mobility, local-scale improvements can contribute to urban resilience. For example, the integration of mixed-use corridors, transit-oriented development (TOD), and human-scale street networks – as observed in projects like the revitalisation of Kota Tua Jakarta or the TOD pilot zones in Surabaya – can improve neighbourhood connectivity and spatial intelligibility even within a rapidly growing city.

Therefore, to mitigate the declining spatial quality associated with urban expansion, Makassar's planners should prioritise interventions that enhance specific spatial characteristics, such as permeability (ease of movement), connectivity (degree of interlinkage between streets), and visibility (clarity of spatial layout). Integrating these principles into current and future development – particularly in the CPI project area – can help preserve spatial logic while accommodating growth.

Moreover, the findings of this study highlight the need for urban planning policies that are not only responsive to physical expansion but also informed by spatial analysis tools such as space syntax. By using intelligibility and accessibility metrics as benchmarks for design interventions, policymakers can better evaluate the long-term spatial implications of their plans. This approach can serve as a foundation for more adaptive and context-sensitive planning in Indonesian cities.

4. CONCLUSION

This study aimed to analyse the transformations in the spatial configuration of Makassar City, particularly focusing on the changes in intelligibility and accessibility between 2023 and 2034. The findings reveal that the city's expansion – especially into the western coastal area of Mariso district – results in a significant shift in urban connectivity. Notably, while the global intelligibility and accessibility values decreased due to the city's expansion (1.5 times its current size), local intelligibility and accessibility values increased. This suggests that although large-scale urban growth can reduce spatial coherence at a global level, localised interventions can maintain or even improve accessibility and intelligibility within neighbourhoods.

The decrease in global intelligibility and accessibility poses challenges for urban planners, as it indicates that the spatial layout is becoming more fragmented, potentially hindering efficient movement and accessibility across the city. This could affect not only the ease of navigation but also social connectivity and economic activity. Therefore, future urban planning must address these issues by ensuring that main connectivity corridors, such as Cenderawasih Street, Kakatua Street, Metro Tanjung Bunga Street, Penghibur Street, and Haji Bau Street, are preserved and optimised. Maintaining these axes is crucial for ensuring seamless connections between different parts of the city, supporting both current and future growth while safeguarding the city's overall spatial coherence.

In addition to the technical aspects of spatial design, the integration of Makassar's historical and maritime identity should be prioritised. The preservation and connection of the Mariso fishermen settlements with new urban developments will help retain Makassar's unique cultural and historical character, preventing it from becoming a fragmented city with little sense of place. Urban planners should consider not just the efficiency of infrastructure but also the social and cultural value of historic spaces.

While the study provides valuable insights into the future spatial configuration of Makassar, several limitations must be acknowledged. Firstly, the analysis relies heavily on quantitative measures from the Space Syntax software, which, although useful, does not account for qualitative aspects such as local community needs, social dynamics, or non-physical factors like cultural practices and behaviours. These variables, such as public opinion and the social and cultural context of urban spaces, are crucial for understanding the real-life impact of urban planning decisions. Furthermore, the study's reliance on GIS data and software tools limits the generalisability of the findings to other cities with different spatial cultures or planning approaches.

To address these limitations, future research should incorporate more qualitative data, including surveys and community feedback, to gain a deeper understanding of how urban changes affect residents' lived experiences. Additionally, the study's findings could be extended to other cities with similar spatial configurations to assess the broader applicability of the proposed guidelines.

Finally, this study demonstrates that while urban expansion in Makassar may reduce global spatial integration, thoughtful planning and design interventions can enhance local intelligibility and accessibility. Planners, policymakers, and researchers from diverse fields should collaborate to ensure that the city's growth remains inclusive, sustainable, and reflective of its cultural heritage. With a holistic approach, Makassar can maintain its maritime identity while accommodating future development needs, ensuring that the city remains accessible, integrated, and liveable for its residents.

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IMPORTANCE-PERFORMANCE ANALYSIS OF THE HISTORIC CENTRE OF KRAKOW'S REVITALISATION PLAN THROUGH THE LENS OF THE HISTORIC URBAN LANDSCAPE APPROACH

Abstract. Since 1978, when the Historic Centre of Krakow, Poland, was inscribed on the UNESCO World Heritage List, it has undergone various developments, largely driven by tourism. In 2008, the Krakow City Hall adopted the "Local Revitalization Program: The Old Town" to address such challenges as heritage management and preservation, gentrification, and tourism development in the area. The purpose of this study is to identify this plan's proposed strategies based on the historic urban landscape (HUL) approach and to assess the gap between planning and implementation of the strategies. The HUL approach was introduced by UNESCO in 2011 to enable better management of World Heritage by integrating heritage conservation with a broad spectrum of urban development challenges. First, the content of the document was thematically analysed based on the HUL-proposed tools to clarify suggested strategies. Next, an Importance-Performance Analysis (IPA) was conducted, referring to 19 local experts. This study offers a framework to serve as a reference to evaluate urban plans. Using the plan as a case study, the paper revealed a general understanding of the current and desired status of the strategies' implementation.

Key words: IPA, revitalisation, World Heritage, Historic Urban Landscape, HUL, Krakow.

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1. INTRODUCTION

World Heritage Cities (WHCs) around the world face the dual challenge of conservation and development, as rising tourism as a result of their UNESCO designation frequently leads to urban transformations that threaten their historical integrity (Aslani *et al.*, 2022; Van Oers, 2010). As urban areas face increased pressures from tourism and population density, the need for solutions that balance conservation and development increases (Zhao *et al.*, 2023). To address the complex challenges of heritage conservation amid urban development, UNESCO introduced the HUL approach in 2011 (Veldpaus and Roders, 2017). The HUL approach was developed by emphasising conservation techniques appropriate for 21st-century circumstances (Issarathumnoon, 2020). This approach emphasises an integrative management strategy that includes cultural, social, and economic considerations for sustainable urban heritage management (Veldpaus and Roders, 2017). To achieve the goals of this approach, four tools, including civic engagement tools, knowledge and planning tools, regulatory systems, and financial tools, have been defined (UNESCO, 2011).

The Historic Centre of Krakow is a remarkable example of a European urban architectural ensemble in terms of both landscape and individual monuments (UNESCO, n.d.). Since about fifty years ago, when it was included in the list of World Heritage Sites (WHSs), this urban area has witnessed significant transformations, largely driven by tourism. The tourism boom that followed this designation created a complex interplay between preservation and development. To tackle such challenges, a comprehensive revitalisation plan called the "Local Revitalization Program: The Old Town" (BIG-STÄDTEBAU GmbH, 2008) was issued by Krakow City Hall in 2008. In light of learning from experiences to update prospective planning directions, it is crucial to evaluate such initiatives' impacts and consequences. As Minnery *et al.* (1993) state, urban planning as a key mode of public intervention should undergo assessments in terms of effectiveness and efficiency, just like other public sector activities, to ensure it fulfils its goals and serves the public interest. The evaluation offers several benefits, such as assessing the relevance of policies, measuring outcomes against goals, and supporting better resource allocation.

Accordingly, the questions that this study seeks to answer are:

– What are the strategies proposed in the revitalisation plan in accordance with the HUL approach's tools?

– What is the gap between planning and implementation of the revitalisation plan in terms of strengths, weaknesses, and areas for improvement?

In this regard, the research is structured in two phases. The first step will be a deductive thematic analysis of the "Local Revitalization Program: Old Town." Next, an Importance-Performance Analysis (IPA) referred 19 local experts, including academics and authorities in urban planning, heritage conservation, and tourism fields.

This study contributes to the knowledge in several aspects. This is the first study that assesses a WHC's urban plan from the perspective of the HUL using a hybrid qualitative and quantitative research method. At a broad level, it proposes a framework that can be applied for a revision of urban plans. Also, since the revitalisation plan of Historic Centre of Krakow follows a similar structure and outline to other conventional urban plans, it reflects to what extent the principles and notions of the HUL approach are considered in existing urban heritage conservation and management plans. Finally, the findings identify general directions for improving revitalisation planning at the local level.

2. HISTORIC URBAN LANDSCAPE

The HUL approach builds on the Vienna Memorandum (WHC, 2005) adopted by the International Conference "World Heritage and Contemporary Architecture – Managing the Historic Urban Landscape," held in May 2005 in Vienna (Bandarin, 2010). Later, in 2011, UNESCO introduced the HUL approach to better integrate heritage management with urban development (Veldpaus, 2015). The HUL Recommendation arose from attempts to address the management of urban World Heritage assets that are under an increasing threat from fast urbanisation, expanding tourism demand, and a concentration of urban regeneration and development initiatives in historic core cities (Van Oers, 2010). However, the term Historic Urban Landscape refers to more than just the old town centre. It refers to any area where tourism, business, and cultural activities promote urban renewal. This broader perspective acknowledges that historic city centres are more than just old buildings; they are living, breathing spaces where people interact and occur culture activities (Issarathumnoon, 2020). This approach emphasises a comprehensive understanding of historic city centres, which includes physical structures, social interactions, and cultural significance (UNESCO, 2013).

Cities that follow HUL can achieve their Sustainable Development Goals (SDG) targets and become more sustainable, resilient, and inclusive in urban development. It encourages a worldwide approach to urban areas, while considering economic, social, human, environmental, and spatial aspects (UNESCO, 2015). If the HUL is implemented appropriately, urban heritage can play a catalysing role for socio-economic development. Economic initiatives derived from tourism, commercial use, and higher land and property values by generating incomes support community well-being and the conservation of historic urban areas and their cultural heritage while maintaining economic and social diversity and the residential function (UNESCO, 2013). Figure 1 shows the benefits of the HUL approach implementation.

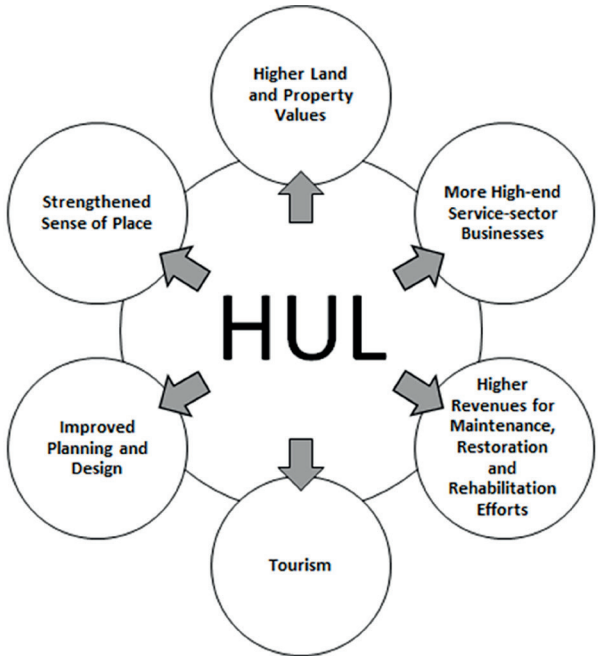

Fig. 1. Benefits of the HUL approach
Source: own work based on UNESCO (2013).

3. TOOLS OF THE HUL APPROACH

As mentioned earlier, the HUL approach comprises four types of tools: civic engagement tools, knowledge and planning tools, regulatory systems, and financial tools. They will be explained in detail in the following.

3.1. Civic engagement tools

According to UNESCO (2011, p. 4), "[It] should involve a diverse cross-section of stakeholders, and empower them to identify key values in their urban areas, develop visions that reflect their diversity, set goals, and agree on actions to safeguard their heritage and promote sustainable development. These tools, which constitute an integral part of urban governance dynamics, should facilitate intercultural dialogue by learning from communities about their histories, traditions, values, needs and aspirations, and by facilitating mediation and negotiation between groups with conflicting interests."

Research indicates that participation is ensured by motivation, opportunities, and ability, and they are important variables for successful civic engagement (Rasoolimanesh *et al.*, 2017). Civic participation may be enhanced through capacity-building activities, an intergenerational approach to culture, mapping of stakeholders and practices, and community-based design. To create a common vision, decision-making processes should involve all levels of society and guarantee transparency and dialogue (Erkan, 2018).

A range of instruments that inform, mobilise, and engage are included in the category of community engagement tools. They take skills and know-how from local communities and other society groups. The tools, which include different kinds of plans, viewscape mapping, baseline character-defining features and process documentation, participant groups' cognitive mapping, insights from anthropology and cultural geography, and locals' documentation of oral traditions and customs, can serve as advisory tools (Bandarin and Van Oers, 2012).

3.2. Knowledge and planning tools

According to UNESCO (2011, p. 4), "[It] should help protect the integrity and authenticity of the attributes of urban heritage. They should also allow for the recognition of cultural significance and diversity, and provide for the monitoring and management of change to improve the quality of life and of urban space. These tools would include documentation and mapping of cultural and natural characteristics. Heritage, social and environmental impact assessments should be used to support and facilitate decision-making processes within a framework of sustainable development."

The knowledge and planning tools indicate to technical methods for analysing, monitoring, and managing urban heritage (Hosagrahar, 2014). Hosagrahar (2014) classified the tools into three main sections, namely: (1) mapping, measuring, and visualisation tools for knowledge and data gathering; (2) reading, interpreting, and analysing tools of the urban landscape; and (3) planning and regulating intervention tools in historic areas and making decisions and choices regarding protection, changes, and new development.

Regarding the first section, mapping, inventorying, and documenting would need to go beyond emphasising the architectural and material characteristics of urban heritage and acknowledge cultural importance and variety, as well as assist in monitoring and managing change. Surveying and documenting are required at several scales, ranging from the urban and regional scale to the interior of individual buildings and architectural details. Depending on the circumstances, survey and documentation may involve the use of electronic devices and systems.

The next section is about how to read and interpret the urban landscape. It consists of various evaluations, such as inventory and database; historical analy-

sis and mapping; visual and formal analysis; cultural analysis; mapping cultural meanings, practices, and identities; socio-economic analysis; morphological analysis; infrastructure analysis; and geospatial referencing.

The final section addresses the identification of ways to handle development demands and potentials in a way that is compatible with the heritage character while protecting and safeguarding the continuity of the most important heritage features. This is done through the assessment of the potential and development pressures on a site, weighing and ranking a range of possible actions and interventions, and predicting and evaluating their consequences. Some of the popular techniques are SWOT analysis, visioning and strategic planning, cultural heritage impact assessment, environmental impact assessment, and zoning (Hosagrahar, 2014).

3.3. Regulatory systems

According to UNESCO (2011, p. 5), "[It] should reflect local conditions, and may include legislative and regulatory measures aimed at the conservation and management of the tangible and intangible attributes of the urban heritage, including their social, environmental and cultural values. Traditional and customary systems should be recognized and reinforced as necessary."

In this context, regulatory systems refer to all laws, regulations, guidelines, and administrative practices that affect urban heritage. This includes regulations related to urban planning, such as municipal plans and zoning laws. Additionally, national laws may offer norms for heritage designation and protection that consist of standards for researching, documenting, and listing historically significant assets and sites (O'Donnell, 2014). Traditional systems and practices should also be considered, respecting public and private land uses, building techniques and materials, and locations where customs and practices are reflected. As a result, new regulatory systems can be developed based on previous traditions and legal tools or tailored to meet the urban imperatives and innovations of the twenty-first century. This process goes forward when professionals, officials, and citizens collaborate together to form new regulations and legal tools through collective action (Höftberger, 2023; O'Donnell, 2014). At the heritage site level, conservation, management, and business plans are commonly used regulatory tools. They identify and assess a site's significance, define development strategies, policies, and conservation practices, recommend specific actions, and develop financial and marketing strategies (Bond and Worthing, 2016).

The HUL approach uses regulatory tools to address threats in cities, particularly through Heritage Impact Assessments (HIA), as a reactive mechanism. Applying impact assessments as a proactive mechanism, such as Strategic/Environmental Impact Assessments, can result in broader benefits (Erkan, 2018).

3.4. Financial tools

According to UNESCO (2011, p. 5), "[It] should be aimed at building capacities and supporting innovative income-generating development, rooted in tradition. In addition to government and global funds from international agencies, financial tools should be effectively employed to foster private investment at the local level. Micro-credit and other flexible financing to support local enterprise, as well as a variety of models of partnerships, are also central to making the historic urban landscape approach financially sustainable."

Heritage financial tools are mechanisms and programs that are used to encourage and facilitate investment in heritage assets (Jafarpour Nasser *et al.*, 2020). The reason of creating financial tools for heritage conservation is based on the principle that historic buildings have values in addition to their economic value, including symbolic, social, environmental, educational, cultural, and aesthetic values, among others, and that a larger community benefits more from those values than the building owner does (Rypkema, 2014).

Cities are in a competition to build competitive dreamlands in line with sustainable development, while they have neglected to accept affordable economic functions. Financial instruments should address this gap by helping communities create good jobs for their citizens. Establishing international and national funds, stimulating private investment, developing adaptable financing (microcredit) models, and supporting local entrepreneurship are all beneficial strategies. In order to achieve this, it is desirable to base income-generating actions on tradition, adopting a range of partnerships beyond public-public, public-private models, and ensuring that the financial models are sustainable (Erkan, 2018).

4. LITERATURE REVIEW

Since the introduction of the HUL approach, many scholars have addressed it. Most of these studies are descriptive and dedicated to reviewing the literature (e.g., Azpeitia Santander *et al.*, 2018; Rey-Pérez and Pereira Roders, 2020; Wenzhuo and Feng, 2017) or interpreting and elaborating on this approach (e.g., Pereira Roders, 2019; Sonkoly, 2017; Veldpaus and Roders, 2017).

In other research, the implementation of this approach has been examined from various perspectives and in different contexts. For instance, De Rosa and Di Palma (2013) investigated the use of the HUL approach in regenerating the port cities, considering Naples, Italy. In a case study of Edmonton, Canada, Jones and Zembal (2019) intended to understand the opportunities and barriers of applying the HUL approach in a fast-growing city. Jiang *et al.* (2022) also employed the

HUL approach within the city of Suzhou, China, to examine the challenges and opportunities in preserving its historical heritage while promoting sustainable urban development.

In the context of World Heritage Urban Areas, Wang and Gu (2020) discussed different challenges of urban landscape management in Pingyao, as one of the WHSs in China, and proposed that the management must be done in a historical, cultural, and socio-economic context. The authors submitted that due to rapid urbanisation and development of tourism in historical cities, the HUL must be integrated into national planning systems. The authors employed a mixed-methods approach, combining qualitative analysis of historical documents and spatial data with quantitative analysis of socio-economic indicators. The study recommended balancing conservation and development, engaging local communities, and adopting innovative planning approaches to ensure the long-term sustainability of historic urban landscapes. Zeayter and Mansour (2018) investigated the use of the HUL approach in the old city of Tyre, a WHS in Lebanon, and in particular the analysis of heritage conservation ideologies. Their study offered insights into the various perspectives and approaches to heritage preservation in the city and how these ideologies influence the implementation of the HUL approach. The qualitative research methodology included document analysis, interviews, and field observations. Findings showed that there was a diversity of the heritage conservation ideology, from the preservationist to the adaptive reuse. The authors also stressed that these diverse perspectives should be considered while creating a holistic and inclusive HUL strategy. In their research, Aureli and Del Baldo (2023) focused on the delicate balance between cultural heritage preservation and the need for sustainable development. The study addresses the city of Urbino, Italy, designated as a WHS, illustrating the part of local authorities in being involved in protecting and increasing the historical centre of the city by engaging stakeholders. Data were gathered using participant observation in the form of informal interviews, group interviews, and direct observation of project activities. The results illustrated the power of participatory governance in promoting the more sustainable use of assets and citizen inclusiveness in heritage revival actions. Macamo *et al.* (2024) investigated the potential of using the HUL approach to support the conservation of heritage on Ilha de Moçambique, a WHS in Mozambique. Their study sought to determine if this method could address the issues with preserving heritage in fast-expanding urban areas. By employing a range of research tools, including field observations, stakeholder interviews, and the analysis of urban planning documents, the authors identified that knowledge of island culture and social and economic processes is crucial for environmental conservation planning. They stressed the importance of a holistic approach that respects the island's entire urban fabric, from its cultural landscapes and buildings to its intangible.

Thematically and with similar case studies, Zhao *et al.* (2023) explored the complex interplay between public policymaking, planning for conservation, and

sustainable heritage tourism on Kulangsu Island, a WHS. The findings highlighted the importance of a coordinated government and local communities with tourism stakeholders' efforts. They underscored the need for adaptive management strategies that can respond to changing tourism demands without compromising the integrity of the island's cultural and historical elements. Dehghan Pour Farashah and Aslani (2021) aimed to develop a tourism-oriented conservation plan for the historic neighbourhood in the Historic City Yazd, a WHS in Iran. The study used field surveys to evaluate the area's environmental, functional, and aesthetic features. The findings recommended careful planning to support both tourism and conservation in historic cities.

Focusing on the Historic Centre of Krakow, two significant studies have been conducted that are somewhat in line with the current research. Bieda and Parzych (2013) addressed the relationship between the preservation of monumental urban landscapes and spatial planning in Krakow. A mixed-methods approach including analysis of historical documents, spatial plans, and the process of urban development was applied. The paper highlighted the need for designing spatial planning strategies that respect the distinct character of monumental towns and support their sustainable development. Kowalczyk-Anioł (2023) has showed how tourism and urban regeneration processes are interwoven and fundamental to one another in Krakow. She used a mixed method combining quantitative data analysis, qualitative data from interviews, and observation. Her findings indicated that tourism-led development could bring alongside positive as well as negative consequences of gentrification, displacement, and social exclusion.

In terms of the methodology, the IPA technique, despite its age, has been widely applied in various scientific fields due to its management applications, especially for evaluation of user satisfaction and quality services. For example, in the context of tourism (e.g., Boley *et al.*, 2017; Disastra *et al.*, 2018), transportation (e.g., Aghajanzadeh *et al.*, 2022; Esmailpour *et al.*, 2020), education (e.g., McLeay *et al.*, 2017; Rozina *et al.*, 2016), and health (e.g., Park *et al.*, 2019; Vidyanto *et al.*, 2023), etc.

A review of the aforementioned studies reveals that the HUL approach has been examined from various perspectives and within the context of WHCs. A wide range of methods, including quantitative and qualitative or a combination of them, have been employed. However, an urban plan, especially in a WHC, has not been evaluated based on the HUL approach so far. On a broad scale, this study presents a framework that could be used to revise urban plans. Furthermore, since the revitalisation plan of the Historic Centre of Krakow shares structural similarities with traditional urban plans, it shows to what extent principles and notions of the HUL approach are considered in existing urban heritage conservation and management plans. The findings also highlight directions for improving the revitalisation planning at the local level.

5. THE HISTORIC CENTRE OF KRAKOW

Krakow is a city in southern Poland and the capital of the historic Lesser Poland Voivodeship (Fig. 2). Krakow is the second most populous city and the fourth largest in terms of area (Budzyński *et al.*, 2014). Krakow's international popularity is evident in its high rankings in the most frequently visited cities in Europe and the world (Noworól and Bartuś, 2007), as well as its top place in the rankings of top European destinations based on TripAdvisor reviews (Tripadvisor, 2024).

Fig. 2. The location of Krakow in Poland
Source: own work.

Krakow, Poland's former capital, has an extensive history dating back to the 7th century. The Historic Centre of Krakow was designated a UNESCO WHS in 1978 for demonstrating continuous urban growth from the Middle Ages to the present, as well as for its exceptional townscape and outstanding individual monuments. The core zone area is 149.65 ha, while its buffer zone covers 907.35 ha.

This area consists of three main parts: the medieval city, the Wawel Hill with its castle, and the historic Jewish town of Kazimierz (see Fig. 3) (UNESCO, n.d.).

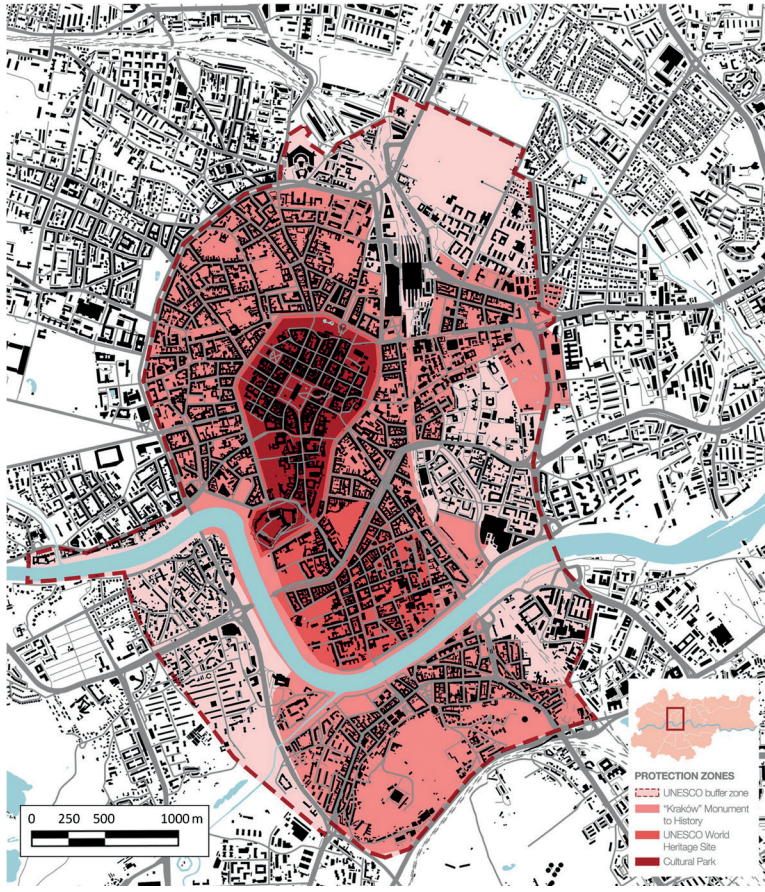

Fig. 3. The boundaries of the core zone and buffer zone of the Historic Centre of Krakow
Source: adapted from Porębska *et al.* (2021).

6. RESEARCH DESIGN

This study used a mixed-methods research design that included a deductive thematic analysis and the IPA. As a qualitative analysis, key themes and patterns from the revitalisation plan were extracted in accordance with the study's objectives. In the quantitative stage, the IPA was applied to calculate importance and performance scores, as well as to determine strategy priorities.

To collect data, an online questionnaire in Polish was prepared and sent to the e-mail addresses of potential respondents in two rounds. Additionally, one of the researchers referred to the Krakow Municipality offices in person and shared the link with the local experts. These individuals were selected through purposive sampling. The selection criteria were appropriate knowledge and experience of the studied plan and the area. Hence, local academics with at least a Ph.D. and authorities from the Krakow Municipality in the fields of tourism, urban planning, and heritage conservation were chosen. Finally, seventeen completed questionnaires were received. The profiles of the respondents are summarised in Table 1.

Table 1. Profile of the respondents

Academia			Public administration		
No.	**Gender**	**Age**	**No.**	**Gender**	**Age**
1	Male	77	13	Male	64
2	Male	68	14	Male	60
3	Male	66	15	Male	49
4	Male	64	16	Female	34
5	Male	59	17	Female	30
6	Male	52	18	Male	28
7	Male	51	19	Female	27
8	Male	51			
9	Male	50			
10	Female	42			
11	Male	40			
12	Female	34			

Source: own work.

The questionnaire included 14 proposed strategies extracted from the document and their descriptions, as well as two columns for evaluating their importance and performance on a five-point Likert scale, ranging from 1 for "very unimportant" or "strongly dissatisfied" to 5 for "very important" or "strongly satisfied."

6.1. Deductive thematic analysis

The first phase of the research consisted of a deductive thematic analysis of the revitalisation plan. Deductive thematic analysis guides the analysis of qualitative data using preconceived themes or categories (Braun and Clarke, 2006). This ap-

proach is structured and follows systematic steps. It often starts with selecting a theoretical framework, familiarising oneself with the data, generating initial codes based on that framework, searching for themes, reviewing themes, defining and naming themes, and finally producing the report (Fereday and Muir-Cochrane, 2006; Guest *et al.*, 2011).

6.2. Importance-Performance Analysis

The IPA technique was developed by Martilla and James (1977) in order to guide decision-making and resource allocation in the field of marketing. One of its applications is the examination of management strategies (Sever, 2015). The IPA framework was selected over other analytical methods (e.g., SWOT) for its ability to prioritise actionable strategies by explicitly comparing stakeholder perceptions of importance (theoretical relevance) and performance (practical implementation). Consequently, the IPA allows for the identification of strategies that require more attention and potential improvements. We apply a traditional IPA matrix with data-centred quadrants here.

Step one: the degree of importance of the attributes extracted from the qualitative stage of the research is determined b_{jp} and c_{jp} (p = 1, 2, 3,…, n and j = 1, 2, 3, …, m) represent the importance value and the performance value, respectively, which are determined for the j^{th} attribute by the p^{th} decision-maker. A Likert scale is applicable to describe these values.

Step two: to integrate the decision-maker' opinions, the geometric mean was utilised. Next, applying equations 1 and 2, the final importance value (b_j) and the final performance value of the j^{th} attribute (c_j) are computed, which is the result of the combining opinion of p decision-makers (Yang *et al.*, 2011).

$$b_j = \left(\prod_{i=1}^{n} b_{jp} \right)^{\frac{1}{n}} \tag{1}$$

$$c_j = \left(\prod_{i=1}^{n} c_{jp} \right)^{\frac{1}{n}} \tag{2}$$

Step three: the threshold values must be specified. It is defined as the overall grand mean of the collected importance and performance scores, which determines the intersection point of the IPA matrix (Fig. 4) axes (Warner *et al.*, 2016).

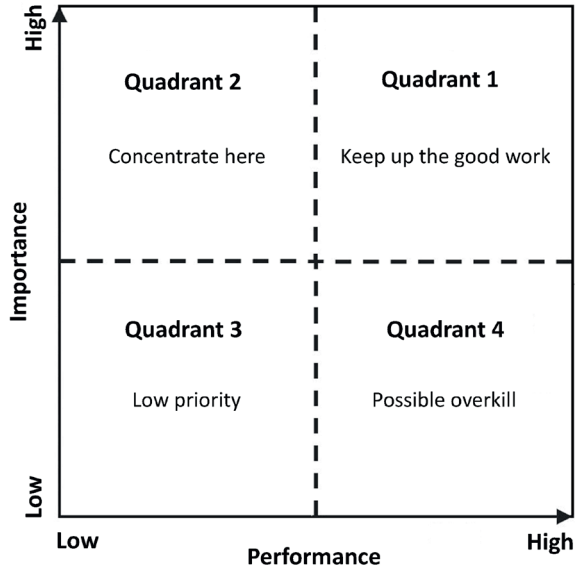

Fig. 4. The IPA matrix
Source: adapted from Yang *et al.* (2011).

The threshold values are calculated by equations 3 and 4. *m* denotes the number of research attributes, whereas μ_b and μ_c reflect the importance threshold value and the performance threshold value, respectively. μ_b and μ_c may not be centered on the axes (Yang *et al.*, 2011).

$$\mu_b = \frac{\sum_{j=1}^{m} b_j}{m} \tag{3}$$

$$\mu_c = \frac{\sum_{j=1}^{m} c_j}{m} \tag{4}$$

Step four: the relative position of each attribute is specified in the IPA matrix. According to Fig. 4, quadrant 1 represents attributes of both high importance and high performance. The set-up standards for this zone are $b_j > \mu_b$ and $c_j > \mu_c$, respectively. Quadrant 2 represents a high importance degree of attributes but a low performance degree. The set-up standards for this zone are $b_j > \mu_b$ and $c_j < \mu_c$, respectively. Quadrant 3 comprises attributes that are considered to be less important and have a low performance degree. The set-up standards for this zone are $b_j < \mu_b$ and $c_j < \mu_c$, respectively. Quadrant 4 contains attributes that are perceived as of relatively low importance but of high performance. The set-up

standards for this zone are $b_j < \mu_b$ and $c_j > \mu_c$, respectively. Therefore, attributes in quadrant 1 should be kept and given more attention as competitive advantages. The attributes included in quadrant 2 are vulnerable and should be prioritised for improvement. The attributes in quadrants 3 and 4 need less attention.

Step five: the weight and ranking of research attributes are established. The weight of the j^{th} attribute is represented by OW_j, which is determined using Equation 5.

$$OW_j = \left| \left(b_j - c_j \right) \times b_j \right| \tag{5}$$

Next, the weights are normalised using Equation 6.

$$SW_j = \frac{OW_j}{\sum_{j=1}^{m} OW_j} \tag{6}$$

where SW_j represents the standardised weight of the j^{th} attribute, $0 \leq SW_j \leq 1$, and $\sum_{j=1}^{m} SW_j = 1$ (Yang *et al.*, 2011).

7. DATA ANALYSIS

7.1. Thematic analysis results

Considering the UNESCO's definition of four HUL tools, namely civic engagement tools, knowledge and planning tools, regulatory systems, and financial tools (see Sections 3.1 to 3.4 for full descriptions), the plan's proposed strategies were identified and categorized as shown in Table 2.

Table 2. The extracted plan's proposed strategies

HUL tools	Code	The proposed strategy
		Description
Civic engagement tools	CET1	Empowering residents through public consultations
		The document emphasises the importance of public consultations, which were aimed at familiarising residents and local communities with the issues of revitalisation. These consultations were a platform to present and discuss the current draft version of the plan, as well as to obtain the opinions, positions and ideas of residents, which is an important step towards including them in the decision-making process.

Table 2 (cont.)

HUL tools	Code	The proposed strategy
		Description
Civic engagement tools	CET2	Flexibility in adapting the plan to the needs of the community
		The document emphasises that the revitalisation plan should be flexible and adapted to new requirements and needs of the community. This approach promotes the active participation of residents in identifying key problems and in defining goals and actions that aim to improve the quality of life in their area.
	CET3	Fostering cooperation between various stakeholders
		The document indicates the need for cooperation between the municipality, operators and other participants of the revitalisation process. Such a management system is intended not only to coordinate activities, but also to enable mediation and negotiations between various interest groups, which is crucial in the context of the diverse needs and values of residents.
	CET4	Community-driven heritage preservation
		In the context of promoting sustainable development, the document also emphasises the importance of preserving and revitalising buildings and objects of historical, cultural and architectural value, which is consistent with the aspirations of local communities to protect their heritage.
Knowledge and planning tools	KPT1	Systematic documentation and mapping
		According to the document, an important element is the systematic documentation and mapping of the cultural and natural features of the revitalisation area. This allows for a better understanding and assessment of the value of heritage, which is crucial for its protection.
	KPT2	Quality of life and urban space improvement
		The document aims to improve the quality of life of residents and the urban space. This theme reflects the ultimate goal of revitalisation efforts, which is to create a better living environment for the community.
	KPT3	Holistic impact assessments
		The document points out the need to conduct heritage, social and environmental impact assessments to support decision-making processes as part of sustainable development. Assessing the current situation in the revitalisation area, the document contains a SWOT analysis that identifies key problems and areas requiring intervention. This approach allows for a better understanding of cultural significance and diversity, which is essential to protect the integrity and authenticity of urban heritage.
	KPT4	Monitoring and management of changes
		According to the document, planning tools should enable monitoring and management of changes in urban space. This means that mechanisms should be introduced that will allow for ongoing assessment of the impact of revitalisation activities on the quality of life of residents and urban space.
	KPT5	Integrated and interdisciplinary approach to revitalisation
		The document indicates the need for an integrated and interdisciplinary approach to revitalisation, which takes into account various aspects of urban life, including cultural, social and ecological aspects.

HUL tools	Code	The proposed strategy
		Description
Regulatory systems	RS1	Compliance with local conditions and higher-level documents
		The document refers to regulatory systems in the context of the revitalisation of the Old Town, emphasising the importance of adapting activities to local conditions and the specific needs of the area. As part of the Krakow Municipal Revitalization Program, it is important that the plan is consistent with existing strategic documents, which include both national and regional regulations regarding spatial, socio-economic development.
	RS2	Introducing appropriate regulations
		The document highlights the need to introduce appropriate legal and legislative regulations regarding the protection of cultural heritage is aimed at preventing the degradation of these objects.
Financial tools	FT1	Obtaining funds from the European Union
		The document indicates the need to obtain funds from various sources, including European Union structural funds, which is necessary to implement revitalisation activities and heritage protection.
	FT2	Collaboration with the private sector and the use of local financial resources
		The document suggests that a variety of partnership models can contribute to the financial sustainability of approaches to the revitalisation of historic urban landscapes. Collaboration with the private sector and the use of local financial resources are key to the long-term success of the revitalisation plan.
	FT3	Using micro-credits and flexible forms of financing
		The document highlights the importance of the local economy and job creation, which can be supported by a variety of financing models, including micro-credit and other flexible forms of support for local businesses. This approach aims not only to revitalise the area, but also to ensure its long-term financial and social stability.

Source: own work.

7.2. The IPA results

Table 3 shows the calculation results of the importance values and the performance values using the geometric mean. The calculations were performed using Microsoft Excel software.

Table 3. The importance and the performance values

Code	The proposed strategy	b_j	c_j
CET1	Empowering residents through public consultations	4.379	3.017
CET2	Flexibility in adapting the program to the needs of the community	3.768	2.845
CET3	Fostering cooperation between various stakeholders	4.124	2.879

Table 3 (cont.)

Code	The proposed strategy	b_j	c_j
CET4	Community-driven heritage preservation	3.800	2.787
KPT1	Systematic documentation and mapping	3.591	3.203
KPT2	Quality of life and urban space improvement	4.349	3.551
KPT3	Holistic impact assessments	3.959	2.777
KPT4	Monitoring and management of changes	4.115	2.959
KPT5	Integrated and interdisciplinary approach to revitalisation	3.740	2.725
RS1	Compliance with local conditions and higher-level documents	3.529	3.090
RS2	Introducing appropriate regulations	3.626	2.969
FT1	Obtaining funds from the European Union	3.941	3.760
FT2	Collaboration with the private sector and the use of local financial resources	4.096	2.889
FT3	Using micro-credits and flexible forms of financing	3.384	2.847

Source: own work.

The importance threshold value and the performance threshold value were determined using the arithmetic mean, and the results are presented in Table 4.

Table 4. The importance threshold and the performance threshold value

	μ_b	μ_c
Value	3.886	3.021

Source: own work.

According to Table 4, the coordinates 3.886 and 3.021 were specified as the border between the four quadrants of the IPA matrix.

Figure 5 visually represents the positioning of each strategy in the IPA matrix. The strategies placed in the first quadrant are considered strengths that should be maintained. In the second quadrant, the strategies need to be improved. The other quarters either have resource wastage or are not essential, so they do not need to be examined. According to Figure 5, the strategies of "systematic documentation and mapping" (KPT1) and "compliance with local conditions and higher-level documents" (RS1) fall into the high importance but low performance quadrant. It indicates a need for improvement in these areas. The strategies of "obtaining funds from the European Union" (FT1), "quality of life and urban space improvement" (KPT2) and, with some leniency, "empowering residents through public consultations" (CET1) are placed in the high importance and high-performance quadrant. It shows they are currently effective and should be maintained. Other

strategies are of lower importance and performance, thus requiring less focus in the immediate future. However, given the number of experts participating in this study, the results for the strategies FT1 and RS2, positioned near the boundaries of quadrant 2, should be interpreted with caution.

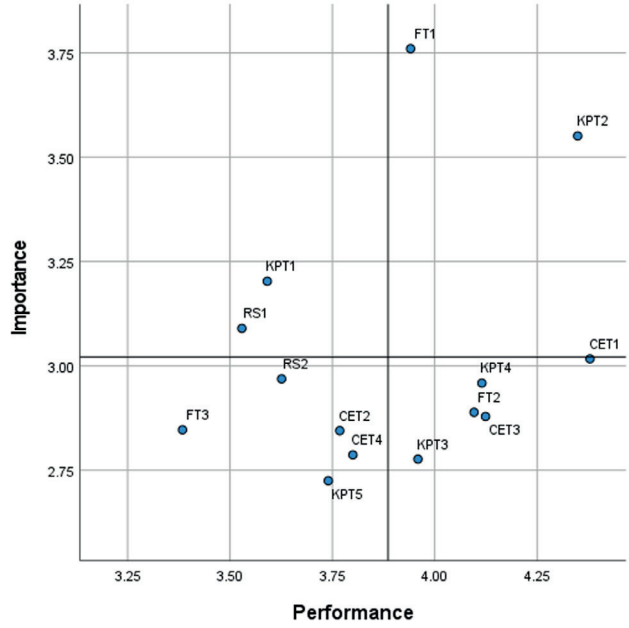

Fig. 5. The IPA matrix for the strategies distribution

Source: own work.

However, given the number of experts participating in this study, it should be cautious in interpreting the results for strategies one and two, which are near the boundaries between quadrants.

In the following, the determination of the weight and rank of each strategy is presented in Table 5. The rank of each indicates the priority for the enhancement of the strategies. It should be noted that the ranking was only done for features that are in the second quadrant (Jalalian *et al.*, 2024).

Table 5. The weight and rank of each strategy

Code	The proposed strategy	OW_i	SW_i	Rank
RS1	Compliance with local conditions and higher-level documents	1.357	0.038	1
KPT1	Systematic documentation and mapping	1.243	0.035	2

Source: own work.

8. DISCUSSION AND CONCLUSION

This study first thematically analysed the content of the revitalisation plan of the Historic Centre of Krakow based on the HUL's recommended tools to extract the suggested strategies. Conversely, the IPA of the plan revealed a general understanding of the current and desired status of the strategies' implementation.

Based on the participant experts' opinion, while a few strategies perform well, others require revision or enhancement to align with the dynamic needs of the studied area. The findings show an uneven distribution for financial tools. While "obtaining funds from the European Union" (FT1) is in progress and has demonstrated its effectiveness, "collaboration with the private sector and the use of local financial resources" (FT2), as well as "using micro-credits and flexible forms of financing" (FT3), surprisingly did not reach the threshold of importance for further improvement. This reliance on external funding sources indicates a lack of attention to community-based financial models that not only enhance local economic stability but are also aligned with HUL's emphasis on community empowerment through sustainable urban practices (Erkan, 2018; Rypkema, 2014). This requires local financing mechanisms to reduce foreign reliance and instead stimulate local investments (Jafarpour Nasser *et al.*, 2020).

From the knowledge and planning tools perspective, "quality of life and urban space improvement" (KPT2) was of high importance and also performed well. This aligns with the broader goals of the HUL approach, which emphasize enhancing urban liveability and sustainability as part of heritage-led development (UNESCO, 2013; Veldpaus and Roders, 2017). Nonetheless, "systematic documentation and mapping" (KPT1) should receive more attention. According to Hosagrahar (2014), robust documentation practices, including inventorying, mapping, and geospatial referencing, are fundamental for understanding heritage values and monitoring change over time.

In the category of civic engagement tools, none of the strategies were considered sufficiently important. However, "empowering residents through public consultations" (CET1) approached the importance threshold and also demonstrated strong performance. In this regard, expanding participatory governance frameworks and ensuring transparent decision-making processes could enhance stakeholder inclusivity and adaptability (Aureli and Del Baldo, 2023; UNESCO, 2011).

Poor performance was noted in the area of regulatory systems, particularly in "compliance with local conditions and higher-level documents" (RS1). This finding highlights the fragmentation within the legislative hierarchy and aligns with Zeayter and Mansour (2018), who emphasised the need for a comprehensive and inclusive strategy in implementing the HUL approach. However, "introducing appropriate regulations" (RS2) was only marginally considered by experts to be important enough for further strengthening.

In summary, this paper contributed to knowledge by proposing a new application for the IPA in urban planning, as well as broke new ground by evaluating a revitalisation plan through the lens of the HUL approach in the context of a WHC. The main limitations of the research were the low participation rate and the number of respondents, which may still restrict the generalisability of the findings. Out of a total of 173 emails sent to potential respondents in two rounds and referring the local experts in person, only 19 completed questionnaires were received. Since the more respondents, the more robust the final results will be, future studies could expand the statistical sample. They also could explore the impacts of these strategies from stakeholder viewpoints and further refine evaluation methods for more precise planning and resource allocation. Addressing knowledge and planning tools as well as regulatory systems will be critical in ensuring long-term success in integrating heritage conservation with urban development due to their high indicators' score.

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APPENDIX

The survey form that was sent to the respondents.

Dear Sir/Madam:
Thank you for taking the time to participate in this survey. This questionnaire is part of a PhD research project at the University of Lodz. This survey aimed at evaluating the importance and performance of Krakow's Local Revitalization Program: The Old Town (2008) based on the Historic Urban Landscape's approach introduced by UNESCO.
Your insights and opinions are invaluable to this research. By assessing both the importance and performance of various aspects of the revitalization program, we aim to identify strengths, areas for improvement, and potential future directions for the program. Your responses will contribute to a comprehensive understanding of the program's consequences and effectiveness from the perspective of those who experience it firsthand.
Please be assured that your responses will be kept confidential and will be used solely for academic purposes. Your participation is voluntary, and you may withdraw at any time without any consequences.
We appreciate your cooperation and valuable input.
Sincerely,
Ehsan Aslani and Armina Kapusta
University of Lodz

Demographic Information:

Age:			
Gender:	Male ☐	Female ☐	Others ☐
Occupation:	Academician ☐	Authority ☐	Both of them ☐

Questionnaire instructions:
The items in the table include the plan's proposed strategies in line with the HUL tools that they were extracted using a thematic analysis by the researchers.
For each criteria listed below, please indicate:

1. The importance of the feature by selecting the most relevant the number in Column A
2. The performance of the feature by selecting the most relevant the number in Column B

- Importance: This section seeks to understand how important you consider various items of the revitalization program.
- Performance: This section aims to evaluate how well you believe these items are being implemented and executed.

The Importance-Performance Analysis questionnaire

Item	Column A					Column B				
	Importance					Performance				
	1) Very Unimportant	2) Unimportant	3) Neutral	4) Important	5) Very Important	1) Very Poor	2) Poor	3) Neutral	4) Good	5) Very Good
(1) Empowering residents through public consultations	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(2) Flexibility in adapting the program to the needs of the community	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(3) Fostering cooperation between various stakeholders	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(4) Community-driven heritage preservation	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(5) Systematic documentation and mapping	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(6) Quality of life and urban space improvement	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(7) Holistic impact assessments	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(8) Monitoring and management of changes	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(9) Integrated and interdisciplinary approach to revitalization	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(10) Compliance with local conditions and higher-level documents	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(11) Need to introduce appropriate regulations	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(12) Obtaining funds from European Union	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(13) Collaboration with the private sector and the use of local financial resources	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
(14) Using micro-credits and flexible forms of financing	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Thank you!

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SPATIAL AND TEMPORAL DYNAMICS OF TOURISM DEVELOPMENT IN THE LAKE NEUSIEDL REGION

Abstract. The study analyses tourism in the Lake Neusiedl region, an important tourist area on the Austrian-Hungarian border. It analyses not only its long-term development but also the current state of accommodation capacities and visitor numbers in selected Austrian municipalities in the region. Emphasis is placed on identifying key trends and seasonal fluctuations. The work is based on data for the years 2000 to 2024, which have been processed using appropriate methods and subsequently visualised. The results indicate a concentration of tourism in a few central municipalities, persistent seasonality, and a slight decline in the region's relative importance within Burgenland. At the same time, the potential for further sustainable tourism development in the area is identified.

Key words: Lake Neusiedl, Burgenland, accommodation facilities, visitation, seasonality of tourism.

1. INTRODUCTION

Tourism is a complex phenomenon, continuously generating new forms. Many of these are based on leveraging the water environment and its immediate surroundings as tourist resources (Furgała-Selezniow and Jankun-Woźnicka, 2021). Despite their long-standing importance in leisure and tourism, lakes only began to

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attract significant international tourism research attention in the early 21st century (Tuohino and Lóránt, 2012). One such example is the area around Lake Neusiedl, a natural and cultural landmark on the border between Austria and Hungary. Characterised by strong winds and extreme shallowness, Lake Neusiedl is a distinctive steppe lake in Europe (Herzig and Dokulil, 2001). Lake Neusiedl has unique natural conditions and is home to many endangered species of animals and plants. Thanks to its unique nature and convenient location, the Lake Neusiedl area enjoys considerable popularity among tourists. The economic importance of the region lies primarily in water sports and nature tourism. However, the future poses a significant challenge for the area: maintaining a stable water level in the lake amid ongoing climate change (Soja *et al*., 2013). Lake Neusiedl in Austria has become an increasingly popular tourist destination in recent years, which has had a significant positive impact on the development of the entire region.

The paper aims to assess the current state of tourism at Lake Neusiedl and comprehensively examine its development and dynamics over the 25 years from 2000 to 2024. The analysis is structured into two main parts: the first focuses on a detailed examination of accommodation capacities, and the second examines the development of the region's visitor arrivals and their seasonality, a crucial aspect of this destination. We will examine tourism at the level of individual municipalities near Lake Neusiedl, utilising several relevant data and statistical indicators to gain a deeper understanding of transformations and trends.

The results of the analysis provide a comprehensive view of the current state and development of tourism around Lake Neusiedl, as well as indicate opportunities and challenges for the future. The study should thus serve as a valuable source of information for tourism professionals, local authorities, and all those involved in the sustainable development of this region.

2. LITERATURE REVIEW

Lakes play a key role in the analysis of tourist destinations. They serve as a fundamental attraction that directly generates visitor numbers to a region and often forms the core of a destination's appeal (Cooper, 2006). Lake tourism brings significant economic and social benefits to many locations, especially in rural areas, creating jobs and enhancing local living conditions (Duda-Gromada *et al.*, 2010). However, effective regulation and management of holiday rentals near lakes is essential for the sustainable development of this sector (Belotti, 2019). As part of lake tourism research, attention is also paid to assessing the strengths and weaknesses of the region, to use the findings to support future marketing campaigns and development (Schröder, 2024). At the same time, environmental changes pose a constant chal-

lenge to the future development of these regions, which also directly affects the sustainability of lake tourism (Dokulil *et al.*, 2010; George, 2009).

Lake tourism is a complex area of interest that has been the subject of extensive and diverse research. Numerous studies have analysed the specifics and challenges associated with tourism at lakes worldwide, ranging from comprehensive case studies of specific locations to theoretical models of sustainable development. Together, these works contribute to a deeper understanding of the economic, social, and environmental aspects that shape the dynamics of lake destinations.

Research on Lake Garda has shown that protecting local resources (both natural and cultural) is a key economic priority that directly influences tourist satisfaction and increases the value of the destination (Goffi *et al*., 2021). Research projects on Lake Altaussee in the Alps indicate how global issues such as climate change and pollution are affecting the lake's ecosystem (Deheyn *et al*., 2025). Effective environmental and landscape planning is essential for areas with diverse land use, such as Lake Constance (Megerle and Eberle, 2005). Puczkó and Rátz (2000) focused their research on Lake Balaton in Hungary, examining the characteristics of tourism development with a particular emphasis on the physical impacts of this development on the environment and how residents and tourists perceived them. It is noteworthy that although both groups perceived both positive and negative effects of tourism, residents considered economic benefits to be the most significant. According to Petrovszki *et al*. (2024), mass tourism was the main driver of urbanisation in the Balaton coastal zone. This process led to the extensive expansion of built-up areas at the expense of the natural regions. Although the intensity of tourism varies, urbanisation continues to spread, requiring regulation to ensure sustainable development.

Research on Lake Neusiedl highlights not only its ecological and tourist importance but also its high sensitivity to environmental changes (Mitter and Kropf, 2025). As Teubner *et al*. (2022) noted, research on this lake had shifted from initial species inventories to a current focus on the impact of global warming and human activities. More recent studies examine the lake's hydrology and its vulnerability to climate change in detail, confirming its vulnerability to water level changes (Tolotti *et al*., 2021). Meteorological variables influence water level fluctuations (Hackl and Ledolter, 2023). Water balance projections for 2035–2065 indicate a significant risk of hydrological deficits, leading to a drop in water levels below current levels (Soja *et al*., 2013). Meteorological conditions and existing climate change will be key factors for the future of Lake Neusiedl, despite all development plans (Sailer and Maracek, 2019).

The management of Lake Neusiedl faces significant conflicts of interest, where the economic demands of tourism clash with the need for ecological management and nature conservation. Csaplovics (2019) indicated the polarisation between economic exploitation and environmental protection in the region. Finding a sustainable balance between these conflicting goals is crucial for the future of the

area. It is precisely in the context of this need for sustainability that research also focuses on cooperation with stakeholders, with Kropf *et al*. (2021) emphasising that solving complex social problems requires a coordinated approach. Zimmermann-Timm and Teubner (2021) have stressed the fundamental importance of effective communication and open discussion with the public, which includes diverse interest groups (farmers, water managers, national park representatives, hunters, municipal representatives, and citizens).

Lake Neusiedl is a key area that is the subject of comprehensive research in many strategic documents. These documents examine it from various angles: from nature conservation and biodiversity (Wolfram *et al*., 2014; Wrbka *et al*., 2012), national park management (Nationalpark Neusiedler See – Seewinkel, 2021), tourism and regional development (Tourismusverband Nordburgenland, 2024), water resource management (Wolfram *et al*., 2020), and climate change adaptation (Weiss *et al*., 2013).

Tourism around Lake Neusiedl, often linked to cultural and natural heritage (UNESCO World Heritage Centre, 2020), is also an essential area of research. Studies evaluate nature conservation systems and tourism development in border areas (Šilhánková and Pondělíček, 2013; Sallay *et al*., 2016), sustainable development of lake tourism in the region (Pomucz and Csete, 2015), and the potential of ecotourism, including cycling tourism (Lukic and Filipovic, 2019; Gauster *et al*., 2020). At the same time, the impact of climate change on summer outdoor tourism is being investigated (Pröbstl-Haider *et al*., 2021).

3. METHODOLOGY

In the initial phase of our study, it was necessary to identify the Austrian municipalities around Lake Neusiedl that would be included in the analysis. In selecting the municipalities, we focused on the districts of Neusiedl am See and Eisenstadt-Umgebung. However, it is essential to note that the town of Rust has a statutory status, which means it is not part of any of the districts mentioned above and has its administration.

We then included in our selection those Austrian municipalities whose cadastral territories are directly adjacent to Lake Neusiedl. Based on this criterion, we identified a total of 13 municipalities that were included in our analytical investigation. Subsequently, we expanded our scope to include an additional eight municipalities that, although not directly bordering Lake Neusiedl, are located in its immediate geographical vicinity. In including them in our analysis, we carefully considered additional relevant aspects. The primary criterion was the environmental criterion, specifically whether the municipality's territory overlaps with the

Neusiedler See-Seewinkel National Park. In addition, we also considered the economic and social importance, focusing on municipalities with a dominant tourism presence, a long wine-growing tradition, or a demonstrable historical significance for the region. Figure 1 represents the selected municipalities.

For the analysis of tourism in the Lake Neusiedl region, we relied exclusively on data provided by Statistics Austria (STATcube Austria). Our study utilised 25 years of annual data (2000–2024), which enabled us to identify long-term trends and developments. However, when examining seasonality, we proceeded to a more detailed analysis at the monthly level within this same 25-year period. This approach enabled us to capture more subtle fluctuations and gain a deeper understanding of the seasonal characteristics of tourism in the region.

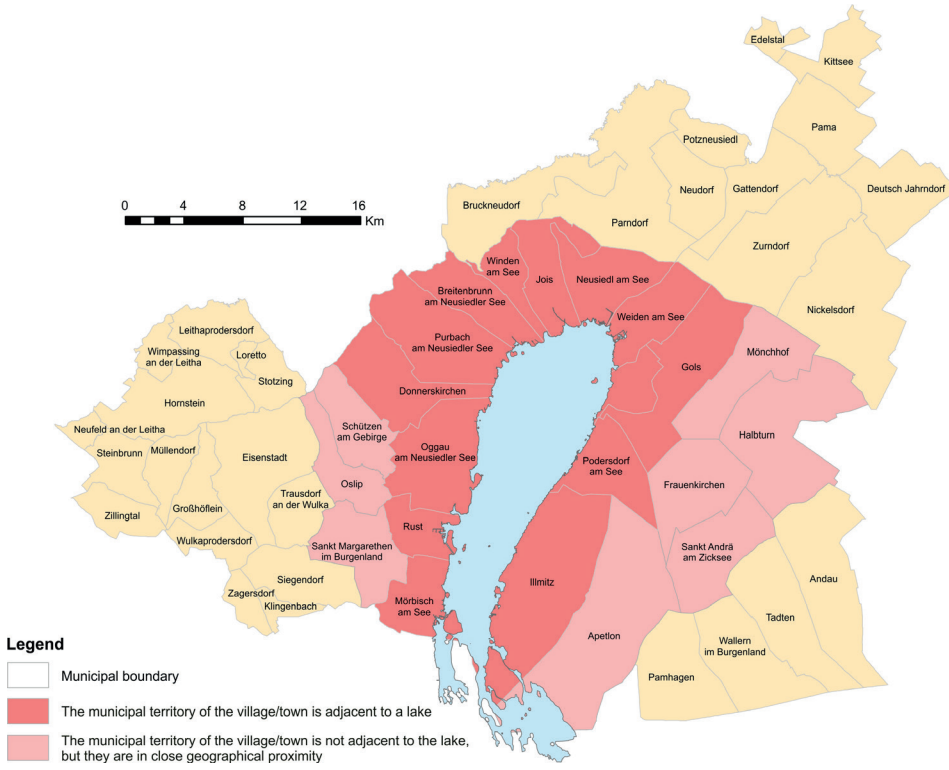

Fig. 1. Municipalities included in the analysis of the Lake Neusiedl region
Source: own work based on data from http://data.statistik.gv.at

The first part of our analysis focused on a detailed examination of the accommodation sector in the region. The key indicators we focused on included the total *number of accommodation facilities*, their *structure by type* (hotels, apartments/

guesthouses, private accommodations, other accommodations), as well as the total accommodation capacity in terms of the *number of beds*. Even though campsites are an essential part of the region's accommodation facilities and capacity, we did not include their quantitative data in our statistics to avoid potential distortion in the analysis results. However, we have devoted a separate section to these accommodations in the results section of our paper. The second part of the follow-up analysis focused on the characteristics of the region's visitor arrivals and their seasonal fluctuations, examining the total number of *arrivals* and *overnight stays* in detail.

Throughout our analysis, we utilised a range of specific indicators. In this section, we, therefore, explain the methodology for calculating the various indicators used to ensure the transparency and clarity of our findings.

Based on Krukowska and Świeca (2018), we defined the Tourist accommodation density index for our analysis. While the authors mentioned above utilised the number of beds in their methodology, we opted to use the number of accommodation facilities to reflect the specific data available for the studied region.

$$\text{Tourist accommodation density index} = \frac{\textit{Number of accommodation facilities in the municipality}}{\textit{Built-up area of the municipality}\left(\textit{in km}^2\right)}$$

The Statistical Office of Austria (STATcube Austria) provided the database of the built-up area of individual municipalities. This approach is crucial for achieving more accurate results, as it considers the actual level of concentration of accommodation capacities within the urbanized areas of individual municipalities.

As part of the analysis of the region's visitor numbers, we also focused on a key indicator, the occupancy rate of accommodation facilities. This parameter provided us with valuable information on the current occupancy of hotels, guesthouses, and other types of accommodations, which enabled us to understand the dynamics of demand and the efficiency of the existing accommodation capacity in the region. According to Eurostat (2025), the following relationship applies to the calculation of the bed occupancy rate:

$$\text{Occupancy rate of bed places}\left(\%\right) = \frac{\text{Number of overnight stays}}{\text{Number of beds x Number of days}} \times 100$$

For a more accurate assessment of seasonal fluctuations in visitor arrivals, the analysis of occupancy rates often considers whether the period refers to the primary summer season (May to October, i.e., 184 days) or the winter season (November to April, i.e., 181 days), or the year-round period (365 days).

Seasonality is a key characteristic of tourism, manifested in the temporal imbalance of visitor numbers, expenditures, and infrastructure utilisation (Butler, 2001). Tourism seasonality poses a global problem for most major destinations, particularly from a sustainability perspective. Despite its significance, there is no homogenous international methodology for measuring it on a worldwide scale (Duro and Turrión-Prats, 2019). When examining the seasonality of visitors to the region, we focused on the number of overnight stays, which is a key indicator in this context. Overnight stays are directly related to the economic benefit of accommodation and other services in the region. Longer stays mean higher visitor spending on lodging, meals, activities, and shopping. The number of overnight stays is, therefore, a better indication of the actual utilisation of accommodation facilities. A high number of arrivals may also include overnight visits, which do not utilise accommodation services to the same extent as multi-day stays. An analysis of overnight stays at different times of the year can reveal not only when most visitors arrive but also how long they tend to stay in other seasons. Karamustafa and Ulama (2010) shed light on different metrics for measuring seasonality in tourism, highlighting that although overnight stay data was crucial for deeper analysis, its use was dependent on data availability. In their research, the authors often used the indicator of the number of overnight stays (Vergori, 2017; Ferrante *et al*., 2018; Krabokoukis and Polyzos, 2024).

For our seasonality analysis, we applied the coefficient of variation method, which we calculated using monthly data on the number of overnight stays over a 12-month period. This approach aligns with methodologies employed by other researchers, such as Duro and Turrión-Prats (2019), who also utilised the coefficient of variation in their studies. This statistical tool enabled us to quantify the degree of variability in the number of overnight stays during the year, thereby identifying the intensity of seasonal fluctuations in visitation to the region. To calculate the coefficient of variation (Bedeian and Mossholder, 2000):

$$CV = \frac{S}{\overline{x}} \times 100 \text{ where:}$$

S represents the standard deviation of the data set (in our case, the number of overnight stays per month);

$\overline{x}$ represents the arithmetic mean of the dataset (average number of overnight stays per month);

The coefficient of variation is also often expressed as a percentage by multiplying the result by 100.

This coefficient indicates the relative degree of variability of the data about their mean. The higher the value of the coefficient of variation, the greater the variability (dispersion) of the data around the mean, which, in our context, indicates more pronounced seasonality.

4. RESULTS

In the results section of our research, we focused on two main areas. The first was an analysis of accommodation facilities in the Lake Neusiedl region, where we examined their development and structure in detail. The second, equally important area was the analysis of visitor numbers and seasonality in the Lake Neusiedl region. Within this section, we identified key trends in visitation, examined the impact of seasonal fluctuations, and provided a comprehensive overview of the region's tourism dynamics.

4.1. Analysis of accommodation facilities in the Lake Neusiedl region

Accommodation facilities and their capacities represent a key element of tourism infrastructure, the development of which provides essential information on the dynamics of tourism in a given area. A closer look at the Lake Neusiedl region itself (Fig. 2) reveals interesting structural changes.

While the number of accommodation facilities has declined significantly since 2009, the number of beds has declined more moderately and has shown more stability since the beginning of the period under review. The increase in the number of accommodation facilities in the area in recent years has likely led to the addition of smaller, private accommodation providers, even outside the central tourist municipalities.

At the beginning of the reference period (2000), the Lake Neusiedl region accounted for a significant part of Burgenland's accommodation base (approx. 69%). However, over the period 2000 to 2024, this proportion gradually decreased. While the total number of accommodation facilities in Burgenland has shown an increasing trend in recent years, the Lake Neusiedl region has stagnated, leading to a decrease in its share to 57% (2024). This development suggests a more dynamic development of accommodation services in other parts of Burgenland. From a long-term perspective, it is challenging to determine with certainty the exact factors that have contributed to the observed development in the share of accommodation facilities. Burgenland has started to invest more in tourism outside Lake Neusiedl. Interest in rural tourism, cycling, and wine tourism has also increased in other parts of the region. Supply and demand within the Lake Neusiedl region have also influenced the development of accommodation services.

The area accounted for approximately 59% of the total number of beds in Burgenland in 2000, indicating its strong dominance in tourist accommodation at the turn of the millennium. However, in the following years, this share also gradually declined, reaching only 42% in 2024. This change indicates a decline in the relative importance of the Lake Neusiedl region in terms of total bed capacity. The fact that accommodation capacity in the other areas of Burgenland has been increasing slightly has also contributed to the decline in the share.

In the long term, therefore, it is clear that although the Lake Neusiedl region retains a vital position in terms of accommodation facilities and accommodation capacity, its relative position in Burgenland as a whole is gradually declining.

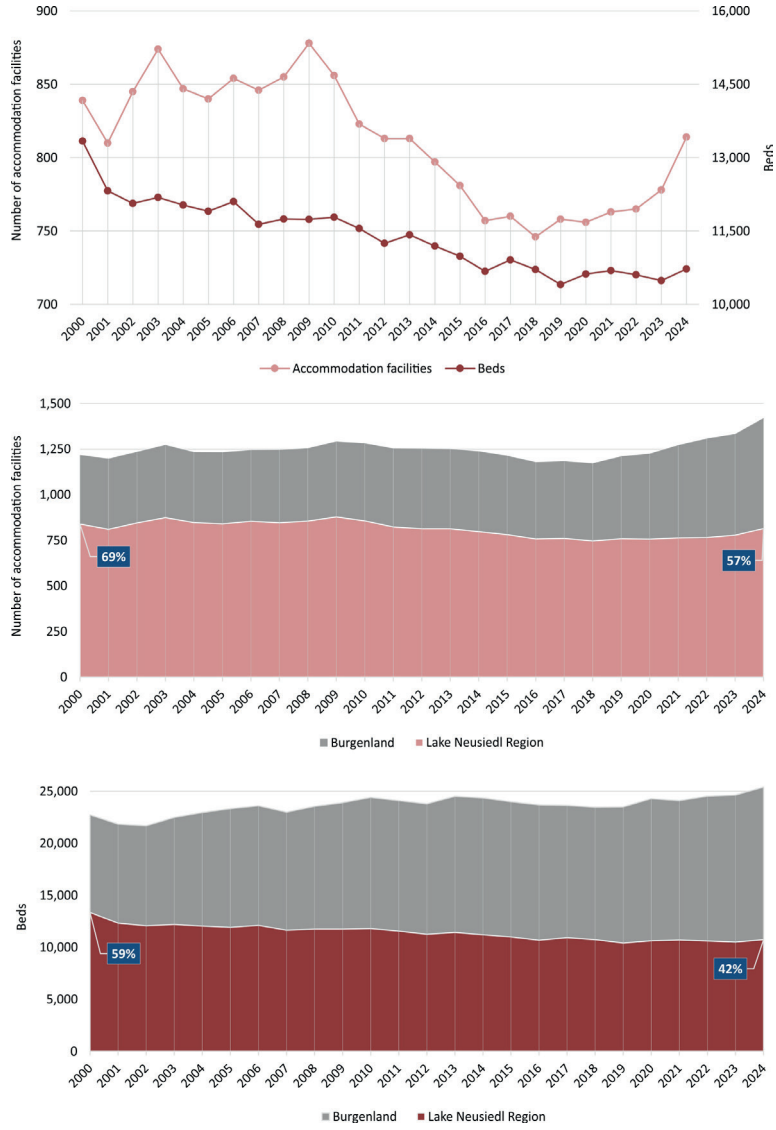

Fig. 2. Overview of the development of the number of accommodation facilities and bed capacity in the Lake Neusiedl region and its position within Burgenland (2000–2024)
Note: The analyses are based on standard accommodations, excluding extra beds and camping

Source: own work, STATcube Austria.

The structure of accommodation facilities has been most strongly influenced by private facilities throughout the study period, with a share consistently above 70% and showing a slight upward trend recently (Fig. 3). These are smaller, often family-run accommodations typical of a region with a tradition of private tourism. Their high proportion is indicative of the powerful entrenchment of this form of tourism and the preference for smaller, more personal accommodation. Although hotels consistently represent around 20% of all accommodation types, their long-term stability has recently shown a slight decline. This suggests that while hotels remain a vital component of the accommodation landscape, their overall significance in the region is gradually declining.

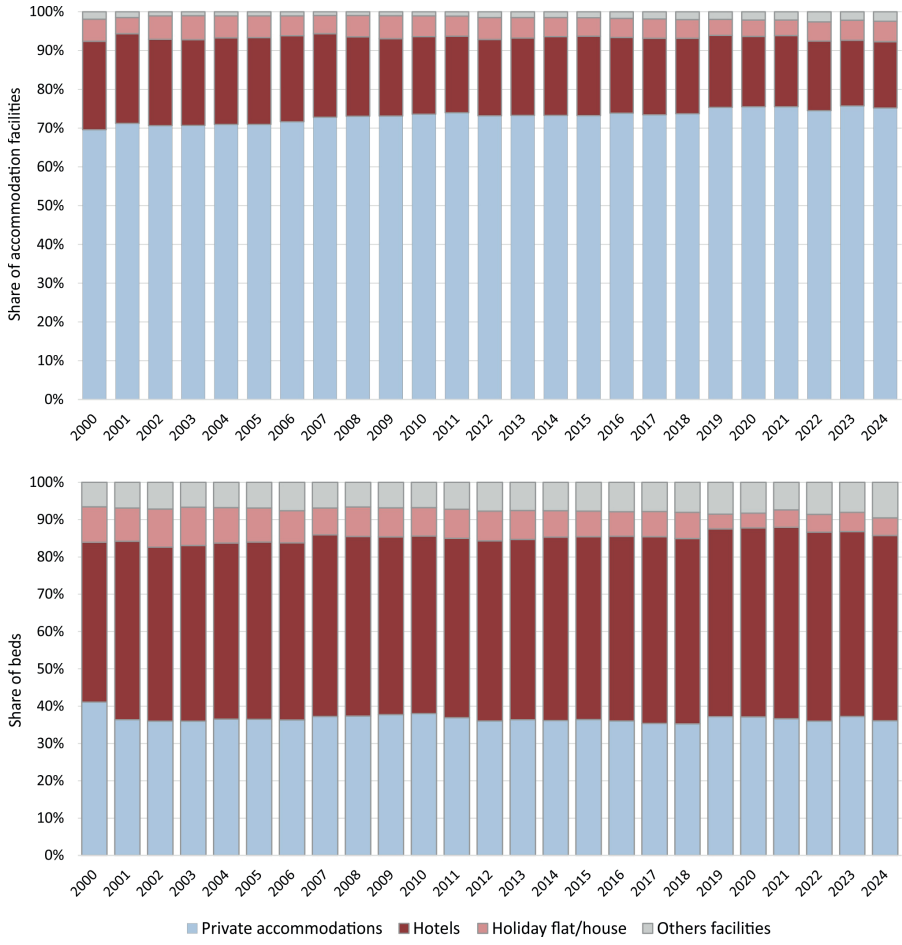

Fig. 3. Structure of accommodation facilities and bed capacity in the Lake Neusiedl region (2000–2024)
Note: The analyses are based on standard accommodations, excluding extra beds and camping
Source: own work, STATcube Austria.

The largest share of beds has long been held by hotels, which consistently account for approximately 50–55% of the total accommodation capacity. This share reflects the fact that, although hotels are not the most numerous type of facility, they provide the largest capacity. Private accommodation, on the other hand, accounts for only around 35–40% of beds. They are often smaller private accommodations with a limited number of beds, usually intended for individual travellers or families.

Figure 4 presents the change in the number of selected accommodation facilities, specifically hotels and private accommodation. The graph reveals the varying dynamics within the municipalities of the region: in some, such as Winden am See, Schützen am Gebirge, and Oslip, an increase in private accommodations is evident, which may indicate the beginning of tourism development and dynamism. Conversely, municipalities such as Neusiedl am See and Purbach am See have seen a shift in orientation from hotels to private accommodations. A negative trend, i.e., a decrease in the number of hotels and private accommodations, is noticeable in Illmitz and Podersdorf am See. In the case of Podersdorf am See, this decline is probably due to the increase in camping sites, which absorb part of the accommodation demand.

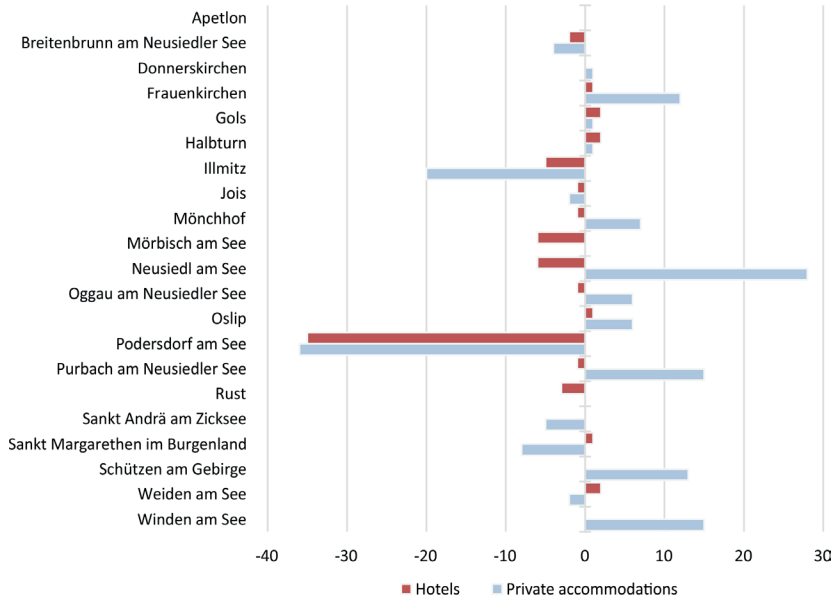

Fig. 4. Change in the number of hotels and private accommodation facilities by municipality in the Lake Neusiedl region (2000–2024)

Source: own work, STATcube Austria.

Campsites represent a significant component of accommodation facilities and total accommodation capacity in the Lake Neusiedl region (Fig. 5). The development indicates a gradual return to popularity of camping tourism in this region, which has

been gaining in attractiveness in recent years as a form of leisure time spent in direct contact with nature. With a total bed capacity of more than 6,500 places, the region is characterised by its relatively extensive accommodation possibilities.

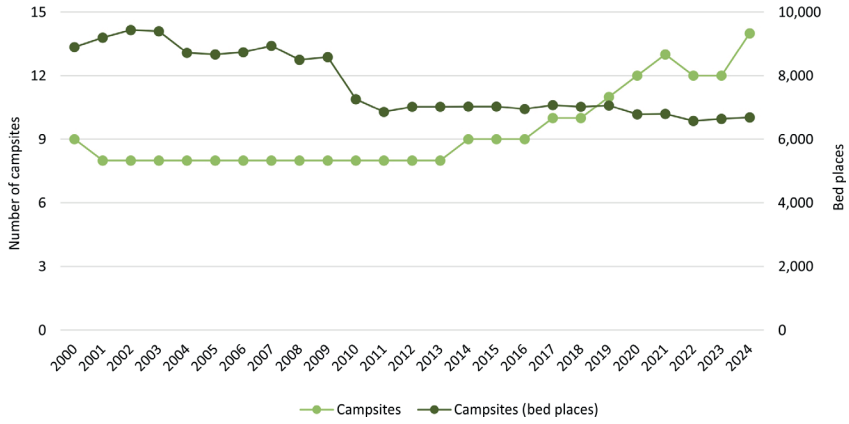

Fig. 5. Campsite and bed capacity trends in the Lake Neusiedl region (2000–2024)
Source: own work, STATcube Austria.

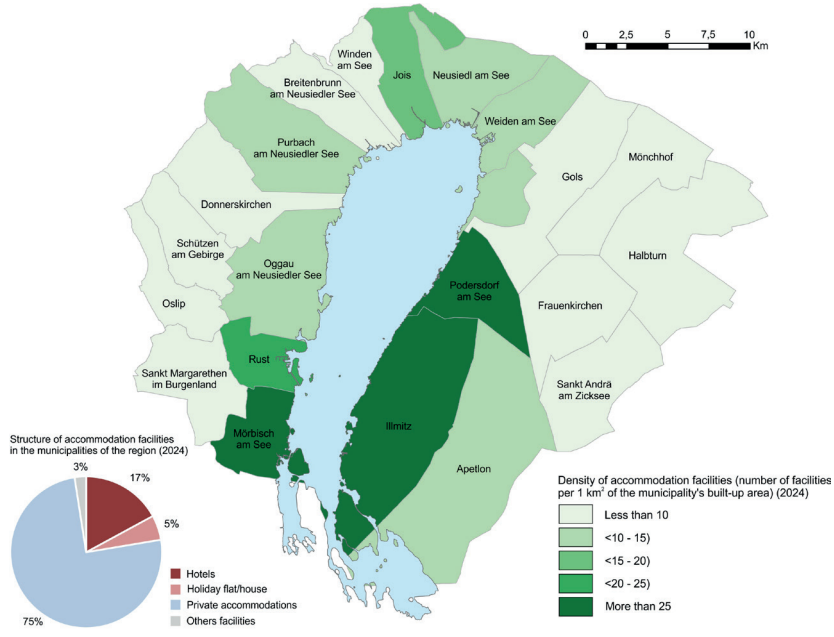

Fig. 6. Spatial distribution of accommodation facilities in the Lake Neusiedl region (2024)
Note: The analyses are based on standard accommodations, excluding camping
Source: own work based on data from http://data.statistik.gv.at, STATcube Austria.

The spatial distribution of accommodation facilities (Fig. 6) shows that the largest concentration of facilities is located in the municipalities of Mörbisch am See, Podersdorf am See, Illmitz, and Rust. These are long-standing, popular tourist destinations offering a wide range of accommodations, high-quality services, and an attractive environment close to the lake. Areas with a medium concentration of accommodation (e.g., Jois, Apetlon, Neusiedl am See, or Weiden am See) have a significant but less concentrated accommodation offer. Peripheral municipalities (e.g., Oslip, Schützen am Gebirge, Halbturn, and others) have a low density of accommodation facilities, complementing the region's offer with potential for rural tourism. The map clearly shows that a few key locations dominate the tourist offer of the Lake Neusiedl region. At the same time, the rest of the area has a lower concentration of accommodation facilities.

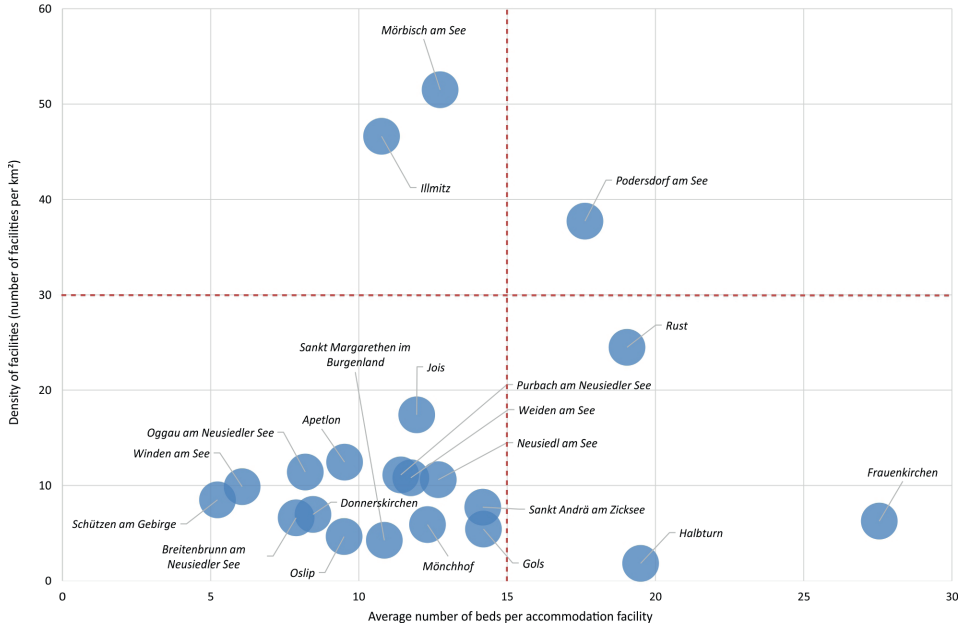

Fig. 7. Characteristics of accommodation infrastructure in the municipalities of the Lake Neusiedl region (2024)

Note: The analyses are based on standard accommodations, excluding camping

Source: own work, STATcube Austria.

To further understand and identify the spatial infrastructure of accommodation facilities that play a key role in the regional tourism of the Lake Neusiedl communities, we conducted a comparative analysis. This analysis is based on two primary parameters: the density of accommodation facilities (the number of facilities

per square kilometre) and the average number of beds per facility. To organise and identify the typical profiles of the municipalities more clearly, we divided them into four main quadrants using two auxiliary lines (Fig. 7).

High density and high capacity of accommodation facilities

Podersdorf am See is located in this quadrant and represents the most important tourist centre of the region. It is characterised not only by a high number of facilities per sq. km but also by a higher average capacity of facilities. This location is likely to offer a wide range of services and accommodations in larger facilities such as hotels, apartment houses, or larger guesthouses.

High density of accommodation facilities, low capacity of accommodation facilities

There are municipalities such as Mörbisch am See and Illmitz, which have a higher number of smaller facilities in a small area. These are likely to be municipalities with well-developed private accommodation.

Low density of accommodation facilities, high capacity of accommodation facilities

Frauenkirchen exemplifies the characteristics of this quadrant, characterised by a low number of facilities and a high average capacity. The situation suggests the presence of fewer, larger facilities, such as hotels or wellness complexes. These venues may focus on a specific tourism niche, such as spa or conference tourism.

Low density of accommodation facilities, low capacity of accommodation facilities

Most of the municipalities in the study region, such as Schützen am Gebirge, Oggau am Neusiedler See, Donnerskirchen, or Breitenbrunn am Neusiedler See, belong to this group. These localities have a scattered and rather marginal tourist importance, with a small number of facilities that provide only a limited bed capacity. These are probably complementary destinations that play a supporting role in the stronger tourist centres.

4.2. Analysis of visitor numbers and seasonality in the Lake Neusiedl region

In the next part of the empirical analysis, we will focus in more detail on the study of visitor numbers and seasonality in the Lake Neusiedl region. This section aims to identify key trends in visitation to the area and its adjacent communities, examine the impact of seasonal fluctuations, and provide a comprehensive view of the dynamics of tourism in this crucial location.

Figure 8 illustrates the evolution of two key tourism indicators in the Lake Neusiedl region over the time horizon 2000 to 2024 – namely, the number of

arrivals and the number of overnight stays. Apart from the noticeable decline in both indicators during the COVID-19 pandemic period, it is notable that the overall long-term growth trend has been more pronounced for the number of arrivals than for the number of overnight stays. These dynamics suggest that Lake Neusiedl is a destination primarily visited by day-trippers or visitors who prefer shorter stays.

An interesting detail is the comparison of the share of the Lake Neusiedl region in the total number of visitors to Burgenland. While in 2000, the share of arrivals was 47%, by 2024, it fell to 38%, indicating a gradual decline in its relative importance within county-wide tourism. Nevertheless, the absolute figures confirm an increase in visitor arrivals also in the Lake Neusiedl region, but with a more moderate dynamics compared to other parts of Burgenland.

A similar trend can be observed in the indicator for the number of overnight stays. While in 2000, the share of the Lake Neusiedl region in the total number of overnight stays in Burgenland was 50%, by 2024, it is expected to decrease to 38%. This difference suggests that although the number of overnight stays around Lake Neusiedl has exhibited a relatively stable trend, other parts of Burgenland have experienced a more significant increase in this indicator.

Our analysis examined the individual contributions of municipalities to overall visitor numbers, aiming to identify local disparities and dominant tourism centres (Fig. 9). Podersdorf am See stands out as the most significant tourist centre, accounting for over 30% of all tourist arrivals. Frauenkirchen and Rust also hold important positions, and together with Podersdorf, they concentrate over half of the region's total tourist demand. Ilmitz, Mörbisch am See, and Neusiedl am See are also notable, each attracting over 5% of visitors in the analysed year. The remaining municipalities show significantly lower figures, with eight of them not even reaching a 1% share of visitors.

A similar trend also dominates the overnight stays indicator, where Podersdorf am See even occupies a more prominent position. This municipality is the dominant tourist destination within the region, generating almost 33% of all overnight stays in 2024, thus significantly outperforming the other municipalities. Rust and Frauenkirchen followed, and these three municipalities together accounted for more than half of the total number of overnight stays in the region. At the other end of the range were municipalities such as Schützen am Gebirge, Sankt Margarethen im Burgenland, and Winden am See, which played a marginal role in the regional accommodation sector.

In the next part of the analysis, we will examine the occupancy rates in the Lake Neusiedl region and relate this data to the previous study on visitor numbers. The aim is to gain a more comprehensive understanding of the efficiency of utilising the existing accommodation infrastructure in the context of observed tourist demand in the region.

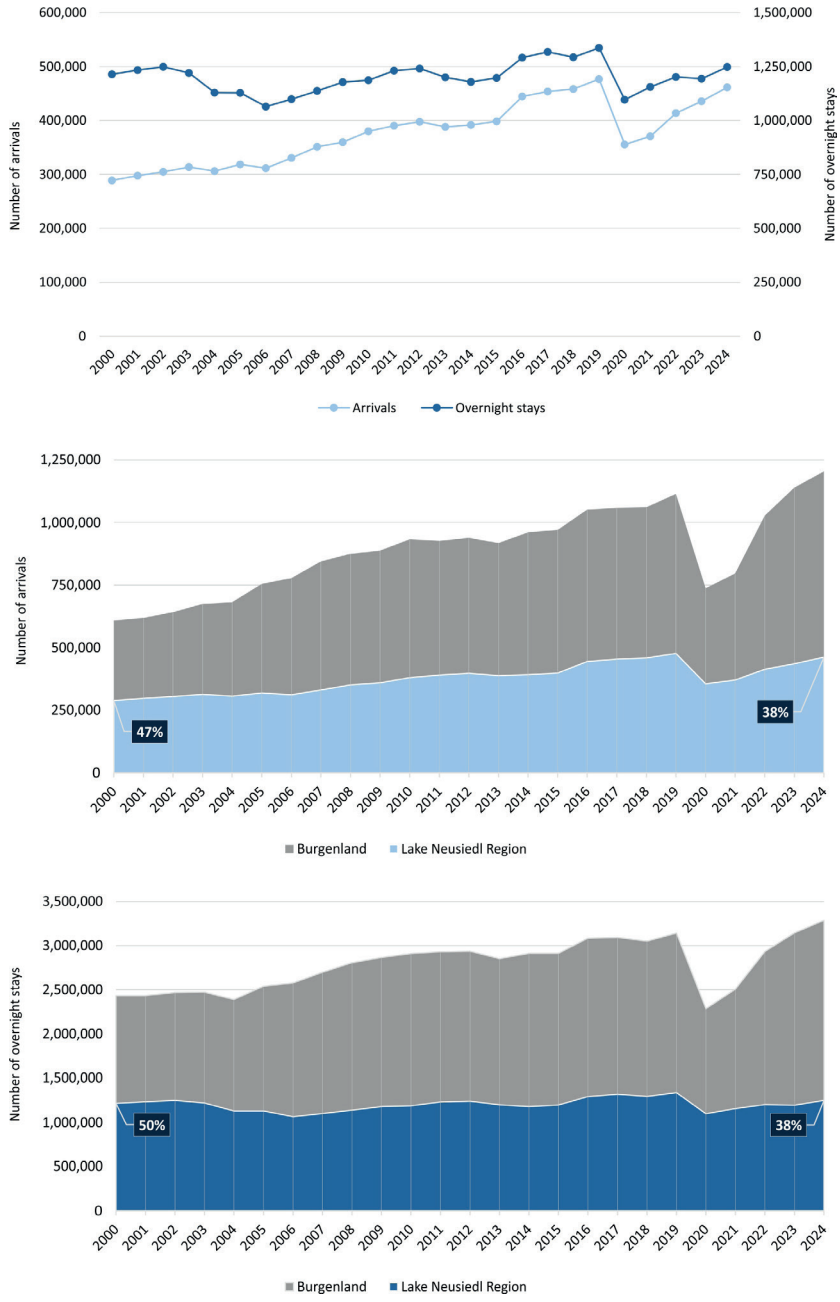

Fig. 8. Overview of the development of the number of arrivals and overnight stays in the Lake Neusiedl region and its position within Burgenland (2000–2024)

Note: The analyses are based on standard accommodations, excluding extra beds and camping

Source: own work, STATcube Austria.

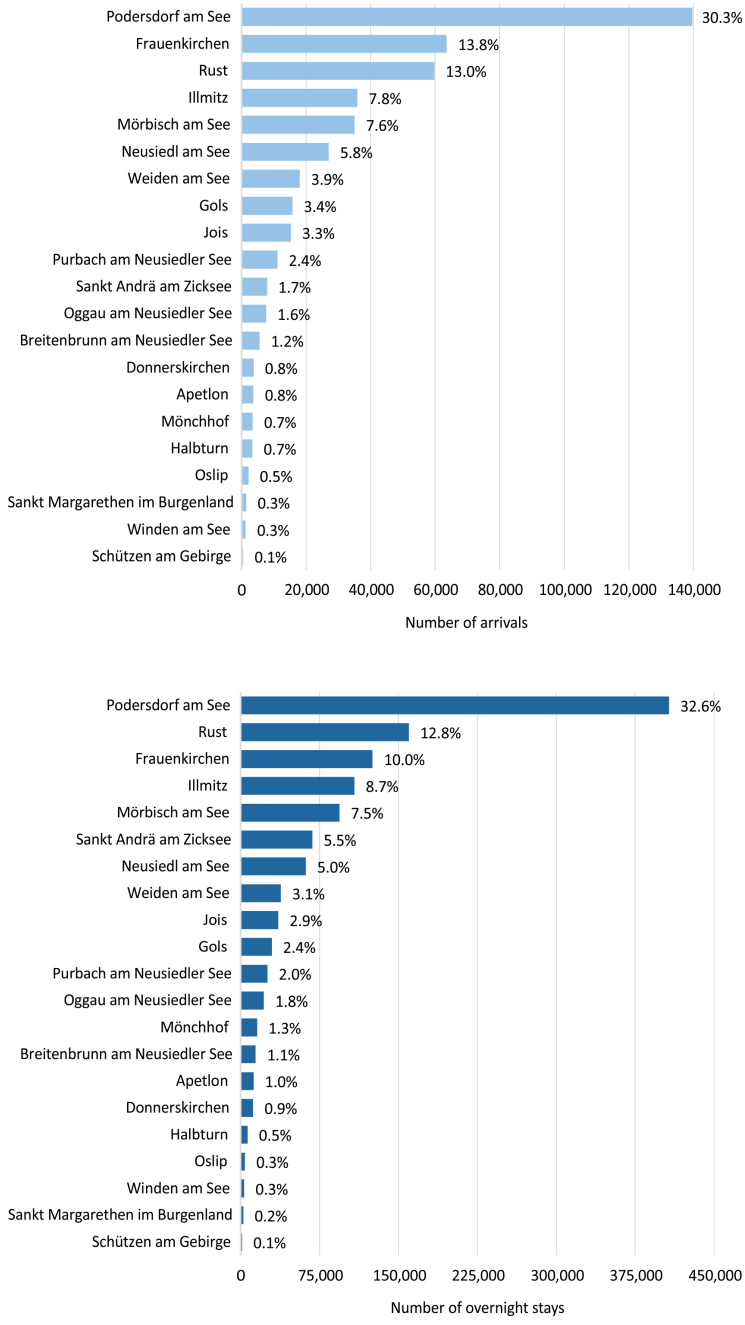

Fig. 9. Structure of arrivals and overnight stays by municipality in the Lake Neusiedl region (2024)
Note: The analyses are based on standard accommodations, excluding extra beds and camping
Source: own work, STATcube Austria.

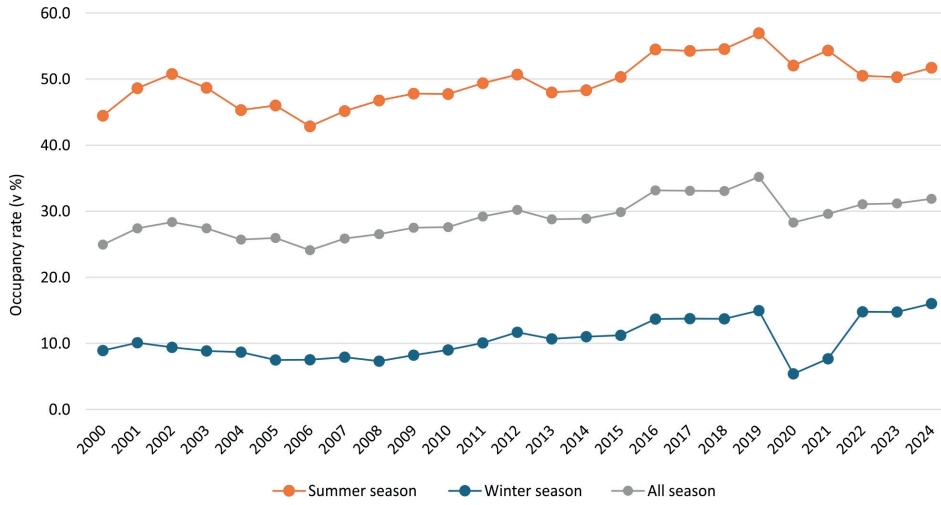

Fig. 10. Development of the occupancy rate of accommodation facilities in the Lake Neusiedl region (2000–2024)
Note: The analyses are based on standard accommodations, excluding extra beds and camping
Source: own work, STATcube Austria.

Figure 10 details the long-term trend in occupancy rates (accommodation capacity utilization), expressed as a percentage, over three key timeframes: the summer season (April to September), the winter season (October to March), and the year-round average (covering all months of the year). This breakdown enables a comprehensive assessment of seasonal fluctuations and overall accommodation utilisation during the period under review.

The summer season has long shown the highest occupancy rate of accommodation facilities. The highest rates were recorded in 2018 and 2019, just before the pandemic, which suggests the strong position of summer tourism in the region – especially in connection with natural attractions such as Lake Neusiedl, cycling routes, and cultural events. The year 2020 saw a slight drop in occupancy rates, a direct consequence of the extensive restrictions on tourism imposed by the COVID-19 pandemic. In the following years, a gradual recovery is evident; however, the region's occupancy levels have not yet returned to pre-pandemic levels and currently remain above 50%.

The overall occupancy rate, expressed as an annual average, has shown a gradual increase since 2000 (from about 25% in 2000 to about 35% in 2019 before the pandemic). This trend is indicative of the region's growing popularity as a year-round tourist destination. The winter season typically exhibits the lowest occupancy rate of accommodation facilities in the long term, indicating the significant seasonality of tourism in the region. After 2010, a slight but steady increase can be observed, which may be related to the development of wellness facilities, spas, or cultural and gastronomic offerings outside the primary summer season.

The occupancy rate (Fig. 11) represents the percentage of accommodation capacity utilised in the individual municipalities of the region, separately for the summer and winter seasons, as well as for the year-round average.

Podersdorf am See has the highest occupancy rate during the summer season and has long maintained its position as one of the region's key tourist destinations thanks to its attractive offer of summer recreation, beaches, and water sports.

During the winter season, Frauenkirchen and Sankt Andrä am Zicksee have the highest occupancy rates, highlighting the importance of well-developed wellness and spa tourism in these locations, such as the St. Martins Therme & Lodge. The increased occupancy in the adjacent municipalities may indicate that visitors use these locations primarily for accommodation near the aforementioned thermal spas.

Frauenkirchen and Sankt Andrä am Zicksee have the highest year-round occupancy rates, and their year-round occupancy rates even exceed those of Podersdorf am See, which is primarily popular during the summer season. This fact once again confirms the year-round attractiveness of these two municipalities, likely due to their offerings of wellness and spa services.

In the final part of our analysis, we examined the seasonality of the Lake Neusiedl region in more detail (Fig. 12). To quantify and understand seasonal fluctuations in visitation, we used a measure of variability, specifically the coefficient of variation, applied to the overnight visitation data. This method enabled us to objectively assess the magnitude of seasonal variation across the region. High values indicate an intense concentration of visitation in a limited period (usually the summer season), while lower values indicate a more balanced pattern of visitation throughout the year. In the analysis, we included not only the average for the entire Lake Neusiedl region but also data from selected municipalities that are currently experiencing the highest visitation. This comparison enables a more detailed examination of the differences in seasonal patterns between the most popular localities and the overall regional average. For individual municipalities, the seasonality coefficient should show a decreasing trend. This indicates a gradual levelling out of the differences in visitation between the strong summer and weaker winter seasons, which contributes to more stable year-round capacity utilisation and revenues.

The entire Lake Neusiedl region shows a gradual slight decrease in the seasonality coefficient of variation. This is also a positive trend in terms of long-term sustainability and levelling out differences in visitor arrivals between months. It signals an effort to diversify the offer and to attract visitors also outside the traditional summer peak.

Sankt Andrä am Zicksee is currently showing a positive trend, as evidenced by a decreasing seasonality coefficient. A similar positive trend was also observed in the past in Neusiedl am See and Rust, but after some time, the decline in their coefficient stabilised. In the case of Frauenkirchen, this trend of levelling off was particularly pronounced after 2010, which can be attributed to the development of year-round attractive wellness and spa tourism cantered on St. Martin's Therme & Lodge. The construction of this modern complex was completed, and the first phases were opened,

creating new attractions for winter and year-round visitors to the Frauenkirchen region and its surroundings. By contrast, Mörbisch am See exhibits the most pronounced seasonality among the surveyed sites, with coefficient of variation values often exceeding 125%. This high seasonality is primarily due to its popularity for summer cultural events, particularly the well-known opera festival on the lake, which heavily concentrates on overnight stays in a limited number of summer months.

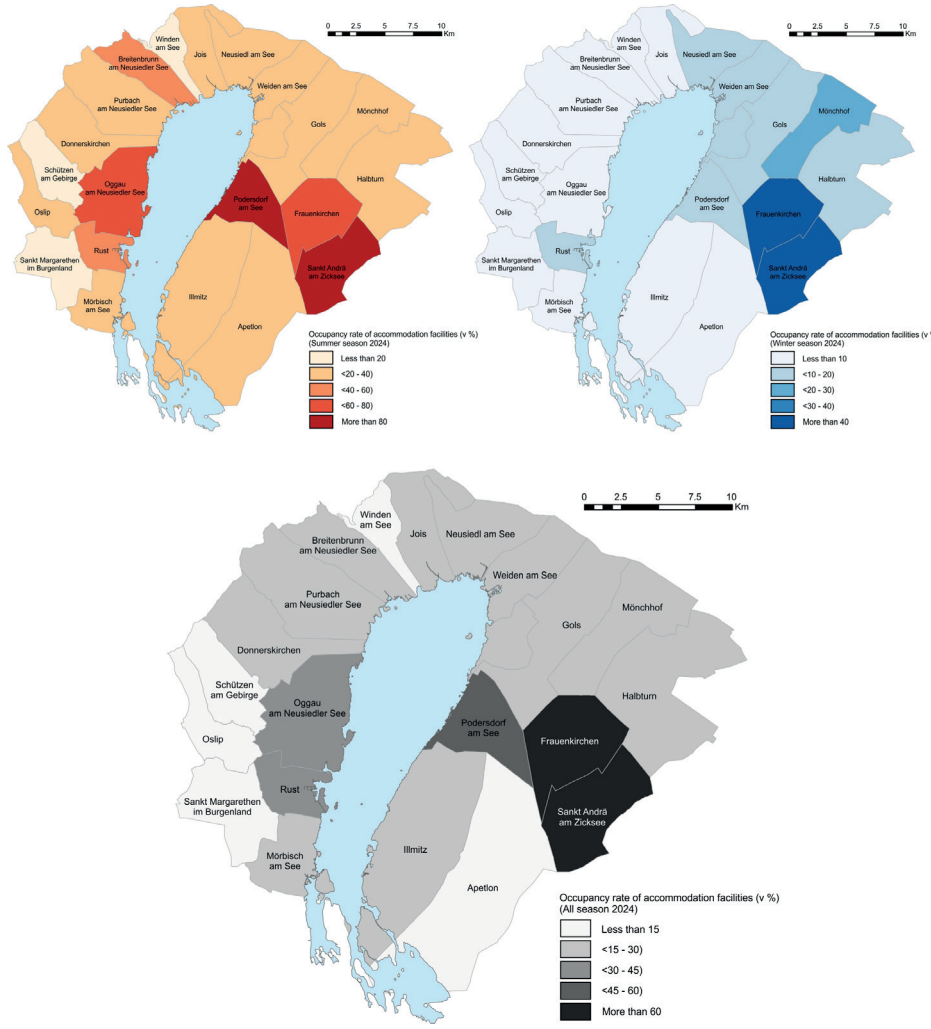

Fig. 11. Spatial distribution of occupancy rates of accommodation facilities in the Lake Neusiedl region (2024)

Note: The analyses are based on standard accommodations, excluding extra beds and camping

Source: own work based on data from http://data.statistik.gv.at, STATcube Austria.

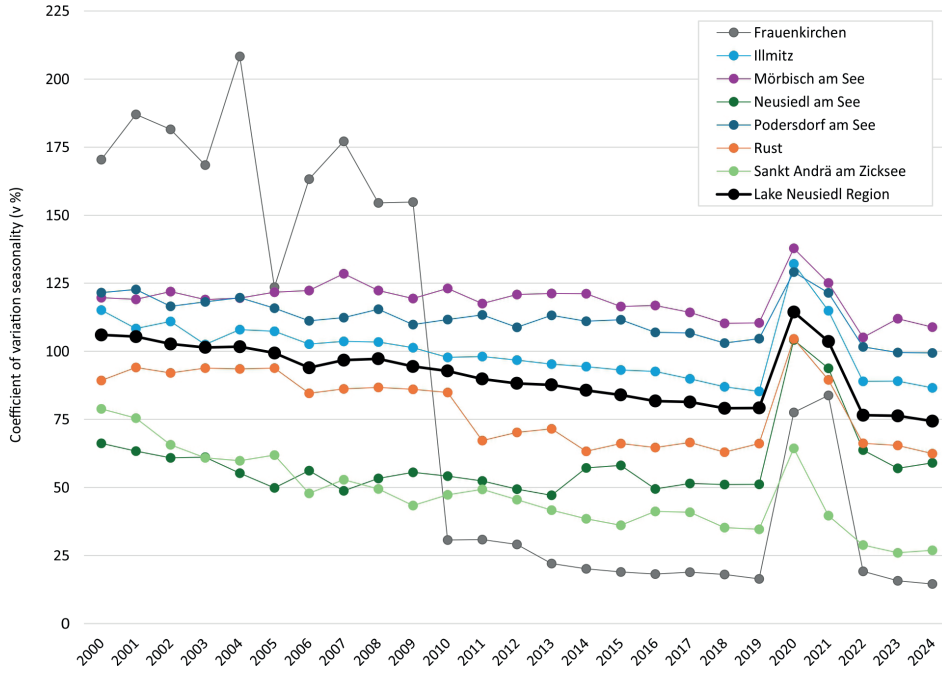

Fig. 12. Evolution of the seasonality coefficient of variation in selected municipalities and the Lake Neusiedl region (2000–2024)

Note: The analyses are based on standard accommodations, excluding extra beds and camping

Source: own work, STATcube Austria.

5. CONCLUSIONS

Tourism is one of the most important economic sectors that supports the development of local communities and the preservation of natural and cultural heritage. The Lake Neusiedl region, a UNESCO World Heritage Site, is an excellent example of this link. Its appeal lies in its unique combination of characteristics: it is the westernmost steppe lake in Eurasia, with a rich biodiversity that represents a cultural landscape created by a diverse ethnic composition. In addition, there is a rich archaeological, architectural, and ethnographic heritage. It is this unique combination that attracts visitors from all over the world and creates essential opportunities for tourism development (UNESCO World Heritage Centre, 2020).

The primary objective of this paper was to examine the development and current state of tourism in the Lake Neusiedl region, focusing on three key areas: accommodation facilities, visitor arrivals, and seasonality.

The development of the number of accommodation facilities in the region has shown that, although Lake Neusiedl remains one of the main tourist areas in Burgenland, its share of the total accommodation capacity has decreased slightly. The structure of accommodation facilities in the region reveals an interesting trend: although private accommodations account for a significant portion of all providers, hotels dominate in terms of total capacity. At the same time, these smaller private facilities suggest a strong location for family tourism and a personalised approach, which can be an advantage in the future if properly promoted. The analysis revealed different trends in accommodation facilities: while in some municipalities (e.g., Winden am See) the number of private accommodations is growing, in others (Neusiedl am See) there is a shift from hotels to private accommodations, and in Podersdorf am See and Illmitz there is an overall decline. Camping tourism is becoming popular again in the Lake Neusiedl region, as evidenced by a total capacity of more than 6,500 beds, making it a significant component of accommodation options. As interest in camping tourism increases, so does the demand for quality infrastructure and services that can meet the diverse and demanding requirements of tourists (O'Neill *et al*., 2010). The spatial distribution of accommodation facilities is unequal – it is mainly concentrated in municipalities such as Podersdorf am See, Illmitz, Mörbisch am See, and Rust, which are thus profiled as the main tourist centres of the region. Other municipalities, especially those outside the area, have a complementary role, with the potential to develop specialised forms of tourism, such as agro-tourism, rural tourism, or spa tourism. According to Sallay *et al.* (2016), municipalities and smaller towns in the region cooperate instead of competing with each other. This cooperation is essential for the development of the whole area, as the region is not a typical agglomeration, but rather a network of peer municipalities. Together, they can provide all the necessary functions for residents and tourists while effectively protecting their heritage.

A comparison of the density of accommodation facilities and their average capacity shows that Podersdorf am See is notable as the most comprehensively equipped municipality – it offers not only a high number of facilities but also a higher capacity. Other municipalities, such as Frauenkirchen, are characterised by fewer facilities but high capacity, indicating the presence of more extensive hotel and wellness complexes. These differences between the municipalities create a varied structure of the tourist offer that can appeal to different target groups of visitors. It appears that the intensity of accommodation in specific areas of the studied region or country is closely correlated with the tourist attractiveness of that place (Bełej, 2022). The study by Navrátil *et al.* (2012) highlights that an alternative methodology is necessary for a detailed analysis of the distribution of accommodation facilities. Instead of relying on conventional statistical data, they propose to create their own geocoded database of different types of accommodation facilities. With such a database and a suitable methodology, it would be possible to reveal the specificities of the distribution of accommodation facilities and their spatial structure within the different municipalities in a given region.

The second part of the analysis focused on visitation and seasonality. Northern Burgenland, in particular, has a tradition of tourism, where the largest number of tourists is concentrated each year. The central and southern parts of the region have developed more intensively in recent years, but their growth rate is still slower than in the north (Lukic and Filipovic, 2019). Trends in the number of arrivals and overnight stays indicate that, although absolute visitor numbers in the region are increasing slightly, their relative weight within the entire state of Burgenland is decreasing. The distribution of visitors among the municipalities revealed the dominance of Podersdorf am See, which accounts for more than a third of all arrivals and overnight stays. Rust, Frauenkirchen, and Ilmitz also maintain a strong position. Conversely, many smaller municipalities have only a marginal share, indicating a concentration of tourism in a few strong locations. It will be important for further development to consider how this demand can be extended to less exposed areas.

Based on the findings, seasonality in the Lake Neusiedl region can be characterised as single-peaked, which is also typical for Mediterranean destinations. According to Butler and Mao (1997), this pattern is characteristic of places where tourism is primarily influenced by sun and warm weather, resulting in a distinct peak season concentrated in the summer months.

In terms of occupancy rates, a significant seasonal difference was identified. The summer months represent the peak season, while the winter period is significantly weaker in terms of capacity utilisation. Exceptions are Frauenkirchen, and Sankt Andrä am Zicksee, which have higher year-round occupancy rates due to spa and wellness services. The evolution of the seasonality coefficient of variation suggests that in some municipalities, the differences between the main (summer) and secondary (winter) seasons are gradually levelling off. This trend is particularly noticeable in the spa areas, where the year-round offer reduces the dependence on the summer season. On the contrary, municipalities that mainly focus on cultural summer events (Mörbisch am See) and active outdoor recreation (Ilmitz, Podersdorf am See) exhibit the most pronounced seasonality. The problem of seasonality in tourism has been intensively researched in the academic environment, focusing mainly on methodological aspects. As the literature shows, authors are constantly trying to develop new and more sophisticated methods to measure and analyse it (Grossi and Mussini, 2021; Duro, 2016; Fernández-Morales, 2003).

Overall, the Lake Neusiedl region still holds a powerful position within Austrian tourism but faces several challenges – especially in the areas of more even development of the offer concentrated in other municipalities of the region, reducing seasonal fluctuations, and preserving the cultural heritage within the framework of ecotourism. The key to sustainable development will be to support smaller municipalities, increase the attractiveness of off-peak seasons, and preserve the natural and cultural heritage that makes the region so special. The results of this study can serve as a basis for strategic tourism planning and inspire the development of a balanced and long-term sustainable tourism model in the Lake Neusiedl region.

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REVIEW ARTICLES

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THE OUTERMOST REGIONS OF THE EUROPEAN UNION: FROM THE BEGINNING TO THE PRESENT

Abstract. The main objective of this article is to analyse the concept of the outermost regions, which, on the one hand, correspond to areas of the EU located at great distances from Europe and, on the other, promote a positive discrimination between regions by granting specific economic benefits. A literature review and analysis of socio-economic data are the main methods used to achieve the proposed objectives. The research focused on the legal evolution of the ORs in the EU Treaties, the development support programmes under European cohesion policy, and the main indicators that make it possible to characterise the current economic and social situation of these remote areas. From this type of analysis, it was possible to see that the majority of the ORs are still far from the average values of the EU-27, both economically and in terms of the standard of living of their inhabitants, despite the substantial progress that has been made over the last 30 years, as a result of an increasingly consolidated outermost status in European politics.

Key words: OR territories, islands/archipelagos, EU treaties, Cohesion Policy.

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1. INTRODUCTION

Some Member States of the European Union (EU) have territories that are a very long way from the European continent, which makes participation in the European common market complex and hinders the movement of people, goods, and services. These far-flung areas have coexisted in the European Economic Community (EEC)/EU since its inception when the Treaty of Rome was signed in March 1957 – these were territories with political ties to France and the Netherlands, mostly consisting of archipelagos/islands. In 1973, with the first enlargement of the EEC, Danish and British island territories[1] located on other continents were added.

However, it was the enlargements that occurred in the 1980s that gave the impetus to the group that would later become known as the outermost regions (ORs), with the integration of the Atlantic archipelagos of the two Iberian countries. From that decade on, it became possible to distinguish between the extra-European territories of the EEC/EU and the outermost regions of the 'Overseas Countries and Territories,' or OCTs. In this context, Alexandru Balas (2024) established their main difference in terms of European status: "The ORs of the EU are an integral part of EU territory and policymaking, while the OCTs are not,"[2] (p. 218). Therefore, we note that although the OCTs belong to respective EU Member States, they are technically excluded from the European Union, while Community legislation and law apply in the ORs, since "being part of the European Union, the outermost regions must apply EU laws and obligations," (Oulahal, 2022, p. 129).

In the current text, the object of study will only include the outermost regions, with an initial approach having been made as part of our doctoral thesis in geography, approved in 2022, and it is now our intention to proceed with a deeper examination of this subject.

Although geographically the outermost regions have always been within the EEC/EU, formally they are of very recent origin. Initially, this was a claim from EU regions that are separated from the European continent, with the aim of achieving a distinctive status that would enable them to reduce the disadvantages resulting from their inherent natural conditions: "This particular nature of the ORs fully justifies the recognition of a specific status under Community law and, by the same token, the possibility of differentiated treatment by the Union for these nine regions," (Bourdin *et al.*, 2024, p. 585).

The main objective of this article is to provide a framework for the concept of the outermost regions, as EU territories located a long way from the European continent and enjoying a special status that allows them to be granted a series of specific advantages with the aim of promoting their regional development. We present a new proposal for the concept of the ORs, one that includes an intrinsic

[1] Until 2020, when the United Kingdom left the European Union.

[2] "...but rather have an association agreement with the EU" (Balas, 2024, p. 219).

conceptual framework, and this forms the crucial innovative contribution of this article. In fact, it adds a new dimension to the traditional opposition of centre vs. periphery, one that is characterised by spatial discontinuity since the existence of natural barriers means that the regions are a considerable distance from the political and economic centres to which they are linked.

The method used to achieve the objectives of the present study was especially based on a review of specialised literature, which proved to be quite scarce and significantly concentrated on the countries with the ORs, and on the statistical processing of official data. However, it should be noted that there are statistical limitations in this regard, as there is little official data available for the nine ORs, which is why we have chosen to use the latest information published by the European Commission.

This text is organised as follows: first, the concept of the outermost region will be approached from the natural framework of the territories and the classic Centre/Periphery theory to the emergence and consolidation of the concept in legal terms; next, we will proceed with the territorial and socio-economic characterisation of the outermost regions; finally, the current situation regarding support granted under the outermost region status will be presented and analysed.

2. CONCEPT OF OUTERMOST REGIONS

In order to position the concept of the outermost in the first place, we consider it important to place it within the framework of John Friedman's Centre/Periphery theory (1966, 1972), an economic model with implications for spatial organisation. It is based on a set of dependency relationships, hierarchical at various levels, but which can generally be summarised in a Centre/Periphery dualism, with a dominant *Centre* (more developed territories) and a dominated *Periphery* (less developed areas).

According to Immanuel Wallerstein (1974), the origin of the position of each of these components in the world system, or more specifically in the world economy, is mainly explained by the presence of internal mechanisms that contributed to forming strong states in the Centre. However, these circumstances sometimes diverge in some regions or countries, hence the establishment of weak states in the Periphery. From this point of view, this sociologist placed emphasis primarily on political issues. However, Abamukong and Jobst (2016) have warned that the Centre/Periphery model does not consist only of groups of nations but also occurs within each nation. Thus, large metropolitan areas of each country are the true national centres of wealth concentration, and through this the means of power, able to influence peri-urban territories and rural areas, with which different degrees of interdependence are established.

For John Friedman (1972), this dichotomy depended on the type of external relations that the various economic areas developed between themselves. He believed

that the development base tended to be underpinned by the processes of innovation, while recognising that most of the territories lacked this capacity. In effect, "the centre is the *locus* of the command power, which controls the surplus of the production chains, as well as producing and disseminating new technologies, while the periphery is subordinated by the appropriation of the economic surplus and dependent on external technology," (Liberato, 2008, p. 130). Naturally, these economic circumstances favour the emergence of other disparities, such as the concentration of activities and the cultural environment, which is more favourable in the Centre and thus contributes to greater demand for goods produced there (Alberto, 2009).

As a rule, the Centre has a higher rate of growth, with the power to decide to adapt/change its own development model and influence, sometimes even decide on the economic models of the peripheral regions. From this point of view, and without refuting the intrinsic potential of peripheral regions, the main economic centres are essential for growth in regressive areas, from a perspective that seeks to reduce regional asymmetries.

It is on the basis of this latter idea that the concept of the 'outermost' arises, in that on the periphery some areas are more marginal than others, depending on the degree to which they are connected to the main socio-economic centres.

The Treaty of Lisbon or the Treaty on the Functioning of the EU, was signed in 2007 and reformulated in 2009. In Articles 349 and 355 it acknowledges that the structural social and economic situation of the outermost regions is persistently affected by their remoteness, insularity, small area, difficult topography and climate, and economic dependence on a small number of products. On the basis of these factors that hamper the development of the ORs, we have drafted a diagram that positions the outermost regions on the basis of the Centre/Periphery model (Fig. 1).

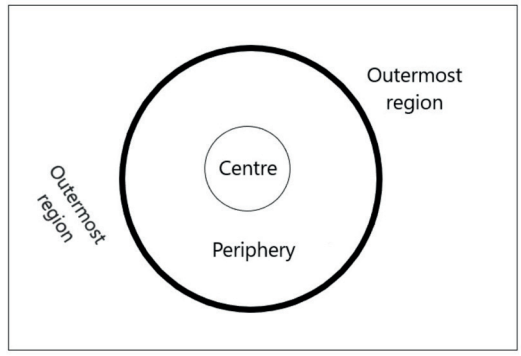

Fig. 1. Schematic representation of the relationship between the Centre, the Periphery, and the Outermost
Source: own work.

We can therefore say that the Centre is the 'commanding voice' of the areas and, for this very reason, it can influence the forms of development of the regions

under its influence. Thus, the central area (with political, economic, and social power) can determine the degree of periphery of the other territories.

Right after the area with decision-making power comes the periphery. This is identified by being beyond the limits of the *Centre*. Areas become more peripheral with distance from the centre, although this condition can vary with the degree of connectivity in terms of communications with it.

According to Hermet *et. al.* (2025), the concept of the outermost regions refers to an order of magnitude that is not very comparable in terms of distance. However, the outermost regions are both further away from peripheral areas and have spatial discontinuity. This is marked by a very significant morphological obstacle, such as the ocean (represented by the thickest boundary), which physically separates them from the periphery, thus making them very distant from the central area. In contrast, the outermost regions are spatially individualised, unlike, for example, the regions of mainland Europe, which, despite their administrative division, are connected at a terrestrial level (and, therefore, have spatial continuity). In fact, they are in an unfavourable geographical position, which has negative implications in terms of distance, time, and cost in relation to the periphery, and more especially to the *Centre*. The geographical factor of 'ocean' seems to us to be the aspect most relevant to having the spatial condition of being the outermost, and not so much the fact that they are islands, not least because the outermost regions in fact include a continental territory – French Guiana.

Consequently, outermost areas add a third pole to Friedman's model (1966, 1972), but one which cannot be confused with the third component of the world system presented by Wallerstein (1974), the Semi-Periphery, since it is positioned between the Centre and the Periphery, while outermost regions are located beyond the limits of the periphery of the European Union.

Taking the ideas presented on the 'outermost' as a starting point, it was possible to develop a conceptual proposal for an outermost region (of the European Union): a politically European region whose location is far from the European continent, separating it from respective decision-making centres and poles of national and community development.

3. OUTERMOST REGIONS IN THE TREATIES

Although the founding Treaty of the European Economic Community (Rome, 1957) made reference to the specific characteristics of the non-European regions of the French state, little progress was made in this direction until Portugal and Spain joined in 1986. It was the first enlargement of the EU to include three regions (Azores, Madeira, and Canary Islands) with similar characteristics and objectives. Thus, with the increase in the number of territories and Member States in the EEC/EU, there was a new force (and perhaps more will) to obtain specific support for this type of a region.

Ángel Fornieles Gil (2008) has indicated that this is not clear, P. Guillaumin (2004) and C. González Laínez (2005) stressed that the term 'outermost' was used for the first time in October 1987, at the General Assembly of the Conference of Peripheral and Maritime Regions (CPMR), on Reunion Island. It was used by Mota Amaral, the president of the Conference and of the Regional Government of the Azores then, when he tried to categorise the situation of the regions furthest from the European continent under the concept of 'peripheral regions,' spontaneously using the expression 'more than' and then 'ultra' (RUP PLUS, 2008; Valente, 2016).

It is no coincidence that the term 'outermost regions' appeared in 1987, according to Isabel Valente (2013, p. 116): "establishing the status of outermost regions for these areas is due to the unequivocal and enthusiastic action of the Regional Governments of Madeira and the Azores, in strict coordination with the Government of the Republic." In this context, Amaral (2022), who as President of the Government of the Azores was directly involved in the process of recognising and consolidating the status of the outermost regions, had no doubts about attributing the leadership to Portugal. He noted in a Joint Declaration annexed to the Treaty of Accession in 1985 that he was considering the problems specific to the Portuguese Atlantic islands and the need to develop mechanisms capable of overcoming their structural disadvantages.

Isabel Valente (2013; 2016) emphasised the fact that in 1986, following a proposal by the President of the European Commission, Jacques Delors, an Inter-service group was formed to represent the Commission in its assignment to find specific measures for all non-European territories. According to this historian, it was this type of "Community approach that later brought together the four French Departments (Guadeloupe, Martinique, French Guiana and Réunion), the Canary Islands and the Autonomous Regions of the Azores and Madeira," with a view to "upholding a common status that would allow the Community institutions to adopt specific measures for their territories," (Valente, 2013, p. 119).

The first measures resulting from this approach began to be taken in 1989, when the programmes of specific options for dealing with remoteness and insularity, the POSEI, were approved. This was an exclusive support programme for regions a long way from mainland Europe. It set them apart within the European Economic Community by giving them one more Community programme than the other regions of the Member States. However, it was during the discussion of the first programme, POSEIDOM, in 1988 that Isabel Valente (2013; 2016) claimed that the outermost regions were born. This was when a working session was held on the island of Madeira, on the initiative of the President of the Regional Government of this archipelago, bringing together representatives of the regional governments of the seven outermost territories of the European Union, with the aim of addressing issues of common interest.

Although a certain awareness of the Outermost Regions had already been conceived, there was no legal or political recognition of them in the European Treaties. So the group of seven regions, backed by their countries, began to press

for a common status in the Treaties. The first sign was given in 1992 with the signing of the Maastricht Treaty (or the Treaty of the European Union), in which the outermost regions were politically recognised in attached declaration no. 26. However, these distant territories were omitted from the body of the Treaty on European Union: this left clauses[3] in the primary law unchanged, and, therefore, it remained impossible to amend or change them through the legislative way to help Ors (Perrot, 2021). However, as a meeting was scheduled for 1996 with the main purpose of revising the Treaties, Danielle Perrot (2021) noted that the Presidents of the ORs took advantage of this meeting to reinforce their common position with the aim of removing from the texts what they considered to be obstacles to their development. This joint effort was successful because "in 1997 the Amsterdam Treaty introduced a legal basis for the outermost regions' status," (Oulahal, 2022, p. 129). Its body enshrined, for the first time in the history of the European Treaties, a common legal status for the outermost regions, through Article 299(2), a status that was consolidated in the most recent text of the European Treaties, the Treaty of Lisbon (2007), in which information on the outermost regions was included in Articles 349 and 355. This text states that in view of the structural social and economic situation of the outermost regions and the factors whose persistence and combination seriously jeopardise their development, the Council, on a proposal from the Commission and after consulting the European Parliament, would adopt specific measures aimed in particular at laying down the conditions of application of the Treaties to those regions, including common policies. When the specific measures in question were adopted by the Council in accordance with a special legislative procedure, the Council would also act on a proposal from the Commission and after consulting the European Parliament.

In fact, and although Alexandru Balas (2024) has stated that references to the ORs are still minimal in EU Treaties, there is no doubt that they are now categorically indicated in their texts. That is to say, the European Treaties recognise the structural handicaps of the ORs, as well as the need for specific measures tailored to the geographical reality of the region, to enable them to reach the average economic and social level of the European Union. Amaral (2022) considered that the struggle initiated by the Portuguese regions, even before Portugal joined the EEC, was successful, since when referring to the current text of Article 349 of the Lisbon Treaty, he stated:

> One cannot fail to emphasise how the text of this provision draws its rationale from the 'Declaration on the outermost regions of the Community', annexed to the Maastricht Treaty, whose origins lie in the 'Joint Declaration on the economic and social development of the autonomous regions of the Azores and Madeira', annexed to the Treaty of Accession of Portugal and Spain to the European Communities (Amaral, 2022, p. 27).

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[3] There are rules in the text of the Treaties that are so precise that not even the Council or the Member States can infringe or circumvent them. The designated clauses thus constitute what are known as clauses preventing differentiation (Perrot, 2021).

4. LOCATION OF THE OUTERMOST REGIONS

The information in Article 349 of the Lisbon Treaty draws attention to an increase in the number of outermost regions, from the traditional seven to nine, but this does not coincide exactly with the current ORs. At first, in fact, there was an increase in the number of regions but not in territory. This is because Saint Martin and Saint Barthélemy were under the administration of Guadeloupe until 2007, when they voluntarily changed their status to a French overseas collectivity. Thus, once administratively separated from the archipelago of Guadeloupe, they acquired the status of outermost regions on 1 December 2009. Saint Barthélemy, however, by political will, shortly afterwards opted to move to the group of Overseas Countries and Territories (OCTs), which happened on 1 January 2012, and thus it left the group of outermost regions. In contrast, the island of Mayotte, took the opposite route. Traditionally classified as an OCT, in 2011 it obtained the status of a French overseas department which enabled it to join the group of the ORs on 1 January 2014 (Freitas, 2010).

In 2025, the European Union's outermost regions comprised nine territories, all of them non-European, widely scattered across two oceans, the Atlantic and the Indian Ocean, and two continents, Africa and America (Fig. 2).

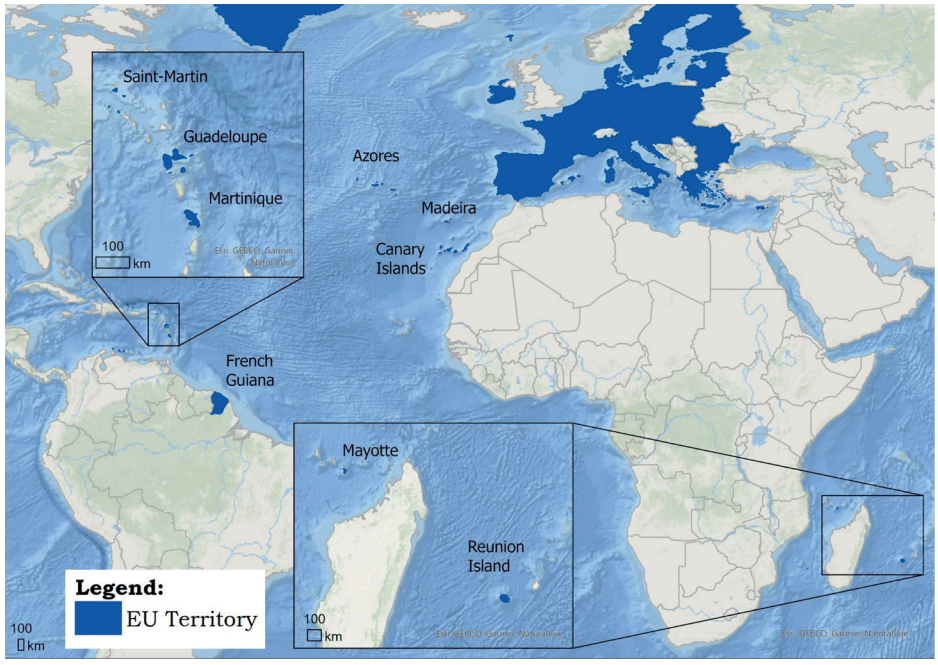

Fig. 2. Identification and location of the outermost regions of the European Union
Source: own work, the map is based on Esri, GEBCO, Garmin, and NaturalVue.

Geographically, it is possible to identify four archipelagos: the Azores, Madeira, the Canaries, and Guadeloupe; one continental territory, French Guiana; three islands, i.e., Martinique, Réunion, and Mayotte; and, finally, a part of an island, i.e., Saint-Martin. The ORs thus have a predominantly insular profile, with one exception, i.e., French Guiana, which is a South American enclave in the Amazon rainforest. From a political point of view, these regions belong to three European Union Member States: Portugal (the autonomous regions of Azores and Madeira), Spain (the autonomous community of the Canary Islands), and France (one overseas collectivity, Saint-Martin, and five overseas departments, Guadeloupe, Martinique, Réunion, Mayotte, and French Guiana).

Table 1 provides information on the surface areas of the ORs, the actual physical distances to the capital of their country and the nearest continental territory.

Table 1. Dimensions and external distances of the ORs

Regions/ Islands	**Surface (km²)**	**Distance to the capital of the country (km)**	**Minimum continental distance (km)**	**Nearest continental country**
Azores	2,333	1,448	1 448 (Europe)	Portugal
Canary Islands	7,447	1,794	97 (Africa)	Morocco
Guadeloupe	1,710	6,762	606 (America)	Venezuela
French Guiana	84,000	7,228	In America	Brazil and Suriname
Madeira	795	969	638 (Africa)	Morocco
Martinique	1,080	6,857	492 (America)	Venezuela
Reunion Island	2,510	9,402	1 695 (Africa)	Mozambique
Saint Martin	53	6,723	806 (America)	Venezuela
Mayotte	376	8,053	493 (Africa)	Mozambique

Source: own work based on Google Maps and National Geographic World Atlas.

The outermost regions vary considerably in size, from the 53 sq. km of Saint Martin to the 84,000 sq. km of the continental mass of French Guyana, an area similar to that of Portugal (92,000 sq. km). However, small island territories predominate, including inhabited spaces as small as the islands of Santos (12,8 sq. km) in Guadeloupe or the island of Corvo (17 sq. km) in the Azores, with the French territory of Réunion being the largest outermost island.

It is easy to conclude that the nine outermost regions are so far from the capitals of their countries that they are closer to a continent other than Europe. The only exception is the Azores archipelago, whose nearest continent is, in fact, Europe. However, in absolute terms, and in general, it is the most remote region,

as the island of Réunion is 800 kilometres from Madagascar. Despite that, it is not the Azores, but Madeira, which is the least distant from the European continent, although it is closer to the African coast.

Considering the distance criterion, apart from the Azores, the other ORs are located on two other continents: Africa and America. French Guiana, as already mentioned, is a continental territory "embedded" in the Amazon rainforest and has land borders with Brazil and Suriname. The other regions are closer to three continental countries: Morocco (Madeira and the Canary Islands), Venezuela (the French Caribbean regions), and Mozambique (the French overseas departments in the Indian Ocean). These are continental areas with development problems, especially in the case of Africa, where the economic growth of the outermost regions leads to disparities with the surrounding region, which sometimes has consequences in terms of irregular migratory flows. It is on the basis of these circumstances that Portugués Carrillo and Zafra Díaz (2014) drew attention to the importance of characterising the ORs not only in terms of the fact that they were located a long way from Europe, but also in terms of their proximity to third countries.

From the above, there is no doubt that these are all regions that are located at very significant distances (spatially, temporally, and cost-wise) from the centre of Europe. This has a negative impact on their economic growth and human development, compared with the contiguous regions of Europe and the islands that are close to it, which creates permanent disadvantages with respect to achieving European cohesion.

Following this line of thinking, in 2002 an innovative proposal to virtually localise the outermost island regions existing at the time, which resulted from a study conducted by the interregional cooperation network EURISLES[4] (European Islands and Systems of Links and Exchanges) interregional cooperation network, was made on the initiative of the Islands Commission of the Conference of Maritime and Peripheral Regions of Europe (CPMR). This is a map that aims to represent the virtual distance of the outermost island regions from the centre of Europe, whose geographical precision is based on the symbolic city of Maastricht. To do this, the travelling time of a semi-trailer by road, the crossing time by ferry, and the respective frequency and waiting time coefficients were used. These times were then converted into kilometres, based on the average speed of 60 kilometres per hour of a lorry travelling on mainland roads. Once the conversion was done, the six outermost regions represented were significantly further away from their natural position. The island of Réunion, in the Indian Ocean, which is the furthest away in absolute terms, is less affected as most of its journey takes place on the African continent and not just on an ocean, as is the case with the other regions. Madeira and the Canary Islands are located in a position equivalent to the interior

[4] It can be consulted in EURISLES (2022, pp. 69–70), https://europeansmallislands.com/wp-content/uploads/2016/04/off-the-coast-of-europe.pdf

of Brazil (Amazon rainforest), the others are located in the Pacific Ocean, therefore, to the west of the American continent, with the French regions of Guadeloupe and Martinique being virtually the furthest from Maastricht.

At the time, this was undoubtedly very innovative and perhaps one of the most appropriate ways to represent the real dimension of the outermost regions, considering the fact that an ocean and/or a continent are responsible for the considerable increase in the real time-distance of European regions, which are very far away from the continent to which they politically belong.

5. SOCIO-ECONOMIC FRAMEWORK OF THE OUTERMOST REGIONS

The nine outermost regions together are home to more than 5 million inhabitants, with the Canary Islands standing out with more than 2 million residents (Table 2). Saint Martin has the fewest residents, numbering just over 32,000. Most of these regions have high densities, with the exception of the Azores (104 inhabitants per square kilometre) and French Guiana (3 inhabitants per square kilometre), the others range from 241 inhabitants per square kilometre in Guadeloupe to 742 inhabitants per square kilometre in Mayotte.

Table 2. Table summarising social and economic indicators for the outermost regions[5]

Region	Population (2020)	Fertility index (2019)	GDP PPC per average inhabitant of EU (2020)	General unemployment rate % (2020)	Poverty risk rate % (2021)	Number of doctors per 100,000 inhabitants (2019)	Early drop-out of studies: % between 18 and 24 years old (2023)	Population with 24 years old with complete higher education % (2020)	% of households with broadband Internet access (2021)
European Union (27)	**447.3 million**	**1.53**	**100**	**7.1**	**16.5**	**391.0**	**9.9**	**32.8**	**88**
France	*67.3 million*	*1.83*	*104*	*8.1*	*15.6*	*336.4*	*8.0*	*39.7*	*88*
Guadeloupe	412,682	2.30	69	17.5	31.3	277.9	22.3	23.3	75

[5] Note that no information is available for Saint Martin other than the resident population. Therefore, the remaining analysis does not include this French territory. The same applies to Mayotte for some indicators.

Table 2 (cont.)

Region	Population (2020)	Fertility índex (2019)	GDP PPC per average inhabitant of EU (2020)	General unemployment rate % (2020)	Poverty risk rate % (2021)	Number of doctors per 100,000 inhabitants (2019)	Early drop-out of studies: % between 18 and 24 years old (2023)	Population with 24 years old with complete higher education % (2020)	% of households with broadband Internet access (2021)
French Guiana	288,086	3.73	46	16.1	42.0	219.2	33.6	18.7	79
Martinique	359,821	2.00	76	12.4	26.0	305.9	18.5	27.1	86
Mayotte	278,926	4.60	30	27.8	–	81.0	–	–	–
Reunion Island	856,858	2.39	68	17.4	34.5	337.6	24.7	22.9	87
Saint Martin	32,489	–	–	–	–	–	–	–	–
Portugal	*10.3 million*	*1.43*	*76*	*6.9*	*16.4*	*532.2*	*9.1*	*28.2*	*84*
Azores	242,786	1.24	67	6.1	25.1	354.5	27.0	15.8	88
Madeira	254,254	1.16	69	8.1	25.9	442.3	–	22.9	87
Spain	*47.3 million*	*1.23*	*84*	*15.5*	*20.4*	*440.4*	*16.0*	*39.7*	*96*
Canary Islands	2.2 million	0.94	62	22.6	29.4	394.5	18.2	34.4	97

Source: European Commission (2022, pp. 3–4).

The French ORs have high synthetic fertility rates, indicative of their demographic vitality, which can be double the national average, as in the cases of French Guiana and Mayotte. The Portuguese regions, and Spain, in particular, have very low figures, unable to ensure the renewal of generations, and even lower than the results for their own countries. This type of demographic contrast had already been observed by Frank Temporal (2015), who especially highlighted the extremely young population of these French regions. It should also be noted that despite the weak demographic performance of the Iberian regions, they are still among the youngest at national level as a result of the general ageing of the Iberian populations.

In 2020, all the outermost territories had a GDP per capita that was far from that of the European Union and below the average results achieved by their respective countries. Despite these differences, Tiago Freitas (2010) initially noted that since 1995 most ORs have had grown faster than the EU27 average, emphasising the rapid growth of Madeira and identifying French Guiana as the only deviating region. However, the European Union Communication (2022) showed that between 2000 and 2020 only Réunion, Mayotte, and Martinique managed to come close

to the EU average, with Guadeloupe achieving zero growth and the other regions falling further behind. Bourdin *et al*. (2024) stressed the divergence observed over the last decade, even questioning the effectiveness of recovery policies for the ORs. These authors have noted that the COVID-19 crisis will have affected the outermost regions more, but we cannot ignore the serious international financial crisis of 2008, which shook the economies of southern European countries, strongly affecting the results of the Portuguese archipelagos and the Canary Islands.

In 2020, Mayotte and French Guiana stood out because they were more than 50% below the EU average, revealing how far behind they were in terms of development, while Martinique had the highest figure, identical to that achieved by Portugal (76%). Fontaine and Hermet (2025) ascribed Mayotte's significant lag to the persistence of a subsistence economy, still largely based on traditional principles, particularly on agriculture, fishing, crafts and livestock farming. With regard to French Guiana, Silva *et al*. (2016) indicated that the economic lag stemmed from its distance from France and its links with economically fragile countries, implying a high dependence on national funds and the weak development of its economic sector, which was mainly based on the exploitation of natural resources. Meanwhile, the European Commission Communication (2022) emphasised that the standard of living of Martinique's residents was one of the highest in the Caribbean, with a thriving agricultural sector in banana and rum production and significant tourism activity.

Overall unemployment rates are higher in the ORs, with the exception of the Azores, which has the lowest percentage overall. People's risk of poverty is also considerably higher in the ORs: in 2021 they had a much higher risk of poverty rates than the national and EU figures. As a result, no OR had a figure lower than 25.1% (Azores), while no national average exceeds 20.4% (Spain). The Portuguese ORs had the lowest at-risk-of-poverty rates, while the highest percentages generally corresponded to the French territories, with French Guiana having the highest rate, at around 42%.

In terms of access to healthcare, the ORs were in a worse position in terms of the number of doctors per 100,000 inhabitants in 2019 compared with the average figure for their countries, apart from Réunion, which managed to slightly outperform France. Mayotte's low figure was a cause for concern, as it greatly limited its population's access to specialised healthcare.

In terms of education, on the one hand, school dropout rates between the ages of 18 and 24 were much higher in the ORs compared to the average for the countries and the European Union, although the imbalance was not considerable in the case of Spain because the national figure was also high. On the other, in terms of the percentage of the population with completed higher education, the Canary Islands were notable for having a figure higher than the European Union average, while the Azores were in the opposite situation, with only 15.8%. All the ORs had a percentage of inhabitants with completed higher education that was lower than the national figure.

In terms of the percentage of households with broadband internet access in 2021, the outermost regions of Portugal and Spain had higher coverage than the national

figure, with the Canary Islands having close to 100 per cent. With no data for Saint Martin and Mayotte, no OR had coverage of less than 75 per cent, while Réunion and Martinique had percentages close to that of France. Considering this indicator, there was a real convergence with the EU standard, since most of the ORs were not that far from the EU average, and even exceeded it in the case of the Canaries.

Despite this kind of approximation to the European average values, it is undeniable that, considering most of the indicators presented, "the ORs are in fact still significantly behind in their development compared to the EU average" (Bourdin *et al.*, 2024, p. 583). In contrast, these authors claim that the outermost regions are "islands of prosperity" in their regional environments. In fact, apart from the Portuguese regions, and especially the Azores, the other ORs are located in regions of weak economic and social development, given their location in the Caribbean/South America and close to the African continent. It is, therefore, not surprising that Frank Temporal (2015) characterised the Canary Islands as a foreign immigration area. However, he did the same for French Guiana and Mayotte, even though these are generally the ORs that lag furthest behind in development, which may indicate a poorer type of neighbourhood and/or easier access for immigrants than are found in other outermost regions.

Conversely, according to Nascimento and Valente (2024) there is currently a new epistemological concept for the ORs in that they are beginning to be valued as assets and opportunities for the EU, as an alternative to a perspective that is overly focused on the concept of problem regions. In this sense, Balas (2024) has warned that references to ORs in EU treaties focus only on socio-economic development issues, making no direct reference to the geopolitical potential of these regions. What is really at stake is the possibility for the EU to further exploit the advantages related to the geostrategic position of the ORs in various areas of the globe (Valente, 2015; Freitas, 2022; Fonseca, 2023; Balas, 2024; Nascimento and Valente, 2024). The potential is indeed enormous, giving the EU a global dimension and greatly increasing its maritime representation. The ORs constitute European platforms in other parts of the globe, with the capacity to develop various types of cooperation with the African and American continents and even influence the transmission of European values in more problematic neighbouring areas.

6. MEASURES IN THE CONTEXT OF THE STATUS OF THE OUTERMOST REGIONS

The persistence in recognising the status of outermost regions and their subsequent inclusion in the texts of the European Union Treaties was based on the idea of providing these regions with special mechanisms that were sufficiently capable

of counteracting the enormous structural handicaps that these regions faced on a permanent basis. Constraints that might, for example, be the regions of fragmented archipelagos, since they consist of a considerable number of inhabited islands, across which the population is spread. This characteristic could naturally indicate development difficulties. On the one hand, a small surface area means little agricultural land available and a shortage of raw materials. In addition, the degree of morphological homogeneity of the areas could have implications in terms of less climatic diversity. This would affect the agricultural sector, causing economic dependence on a small number of products and the need to import most of the goods consumed. On the other, the low number of inhabitants is a sign of a weak consumer market which, when the region is very fragmented, reduces the chances of economies of scale being developed. However, these circumstances could be minimised, and even enhanced, if there were, in fact, greater economic integration in the immediate area, benefiting from being part of a dual geo-economic space – the European Union and the surrounding geographical region.

Aragón and Hernández Arteaga (2022) have noted that the legal regime for the outermost regions includes not only direct support measures through the European Union budget, but also the possibility for their countries to justify changes to part of the legal regimes established at EU level, such as tax or competition law. With regard to support measures, Isabel Valente (2009) grouped them into two categories: special economic and fiscal measures, with a direct taxation regime, distinct from the rest of the EU on the one hand and specific supply regimes, with price subsidy mechanisms for certain consumer goods on the other. Most of these measures are part of the programmes of options specific to remoteness and insularity (POSEI), created specifically for the outermost regions. However, support for the ORs is not limited to this type of programme, and they are granted special benefits in other programmes with a global scope.

During the 2014–2020 period, the ORs benefited from a total EU investment of €13.3 billion (Lopes, 2022), which represents an increase of approximately one billion euros compared to the previous period (2007–2013).

Table 3. Community funds allocated to the ORs for the period 2021−2027, by region

Regions/ Countries (€ million)	**ERDF**	**ERFF+**	**ESF**	**ESF+**	**EAFRD**	**EMFAF**	**REACT-EU**	**POSEI**	**By Country and Grand Total**
Guadeloupe	465	94	199	27.5	155		195		
French Guiana	346	65	165	22.4	97		165		
Martinique	393	89	164	27.7	112		198		

Table 3 (cont.)

Regions/ Countries (€ million)	ERDF	ERFF+	ESF	ESF+	EAFRD	EMFAF	REACT-EU	POSEI	By Country and Grand Total
Mayotte	389	58	122	16.5	53		139		
Reunion Island	1033	203	443	61	337		489		
Saint Martin	51	8	17	2.4			43		
France	*2677*	*517*	*1110*	*158*	*754*	*142*	*1229*	*1949*	*853.5*
Azores	632	58	431	19	285		128		
Madeira	400	60	280	20	173		86		
Portugal	*1032*	*118*	*711*	*39*	*458*	*102*	*214*	*743*	*3417*
Canary Islands	1430	507	682	166	148	88	630	1879	5530
Total Programs	**5139**	**1142**	**2503**	**362.5**	**1360**	**332**	**2073**	**4571**	**17482.5**

Source: European Commission (2022).

Based on the information available in the European Union document *Overview of the outermost regions – assets, challenges and opportunities* (2022)[6], whose sources of funding for the ORs are shown in Table 3, we can conclude that for the 2021−2027 period there has been an increase in the specific additional allocation of around €1.514 billion. This comprises €1.142 billion for the Structural Funds (ERDF) and €372 million for the European Social Fund Plus (ESF+). For the allocation of the additional ERDF funds, the outermost regions are considered less developed, regardless of their GDP, and are exempt from the requirements for the allocation of thematic concentration. Furthermore, the ORs can use these funds to make investments in certain areas that are not authorised in the other regions of the European Union: "with the exception of the outermost regions, cohesion policy no longer supports the construction of airport infrastructure" (Aragón and Hernández Arteaga, 2022, p. 44). The new specific ESF+ allocation is also released from the allocation of this fund by thematic areas and is intended to promote youth employment and education and training in the ORs. POSEI is still allocated €635 million euros a year, distributed as follows: €278.4 million for the French regions, €106.2 million for the Portuguese territories, and €268.4 million for the Canary Islands. This type of funding is aimed at supplying essential farming products and supporting local

[6] Accompanying the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. It can be consulted at this link: https://ec.europa.eu/regional_policy/sources/policy/themes/outermost-regions/rup-2022/comm-rup-2022-glance_en.pdf

agricultural production. Nor are there any changes to the volume of funding made available under the European Maritime, Fisheries and Aquaculture Fund (EMFAF), with €315 million earmarked for compensation for additional costs and for structural investments. The ORs are able to allocate 60% to compensation, in which case they will receive the full amount from the EU. The European Agricultural Fund for Rural Development (EAFRD), worth €1360 million euros, provides 85% co-financing for the least developed outermost regions and 80% for the others, adds the highest sectoral co-financing rates and offers exemptions from various obligations, which helps to simplify access to the funds for the ORs. The Recovery Assistance Programme for Cohesion and the Territories of Europe (REACT-EU) foresees a specific additional amount of €146.4 million, on top of the national allocations, which will generate a total investment of €2,000 million. €280 million is also available for cooperation between the ORs and other neighbouring territories, including a co-financing rate for cooperation projects in the outermost regions (Interreg). The Connecting Europe Facility (CEF) has specific provisions to support projects in the ORs' transport, energy and digital sectors, with co-financing rates of 70%. Investments in connections to ports and airports and urban nodes can be co-financed.

The programmes presented and the support measures for the ORs mentioned are currently the most significant, although there are many more in various EU programmes. These can be consulted, for example, in the European Commission staff working document (2022.5.3).

Between 2021 and 2027, an overall investment of €17.483 billion is planned for the nine outermost regions as a whole. Combining more favourable co-financing rates with additional specific appropriations, and also benefiting from an exclusive programme worth a total of €4.571 billion, the inhabitants of the outermost regions represent the largest investment in the European Union: "the existence of the outermost regions requires the EU to step up its efforts towards economic, social and territorial cohesion" (Aragón and Hernández Arteaga, 2022, p. 41). Arthur Olivier (2025) reinforces this idea by stating that the ORs are the regions of the European Union that benefit most from Cohesion Policy and gives the French ORs as an example, since they represent only 3.2 per cent of France's population but account for 17.4 per cent of the structural funds received at national level.

7. CONCLUSION

Some of the founding countries of the EEC/EU have had extra-European territories since the Treaty of Rome. However, there is no doubt that it was with the entry of the Iberian countries, almost thirty years later, that the idea of them benefiting from their own status within the European Union gained momentum. The term

'outermost region' emerged and was politically accepted, while at the same time a specific support programme was created for these territories, i.e., POSEI. It was in a declaration annexed to the Maastricht Treaty that the outermost regions first appeared at this level, and they were later consolidated in the Amsterdam and Lisbon Treaties, evolving to form "a category of their own, distinct from that of the other Community territories," (Asín Cabrera, 2005, p. 9).

The main scientific contribution of this article is to present a proposal for the concept of the outermost region and its original conceptual schema (Fig. 1). The concept of outermost regions is defined in terms of their great distance from the "European centre" and their territorially discontinuous nature, interrupted by an ocean and/or other continents. The recognition of the enormous structural difficulties of the outermost regions in the European Treaties has led to the creation of more advantageous mechanisms for these regions, making this the most positive discrimination in the whole of the European Union. In fact, over the last thirty years there has been a significant channelling of Community funds, with obvious impacts on the outermost regions at various levels, but especially in the economic and social spheres. Despite the huge Community investment made and the progress that has been achieved, the development indicators of the outermost regions are still generally below those of their countries, and far from the average for the European Union. This is why the largest ever increase in support for this type of territory for the 2021–2027 period is justified. It invokes the European Union's principle of solidarity with regions with very specific geographical constraints.

The fact that we have presented a simple research methodology and that the statistical data used is somewhat limited is mainly down to two fundamental reasons: first, our intention was to only provide an introduction to the characterisation of the various ORs, and second, the necessary statistical information is not always available for the different outermost regions. Emphasising this difficulty, Sébastian Bourdin *et al*. (2024) have even indicated that the ORs are often overlooked in the EU's spatial approach in academic studies due to the unavailability of statistical data. In this context, the almost complete absence of official data on Saint Martin, as well as the lack of certain statistical information on Mayotte, naturally affected the interpretation of the results, since the planned socio-economic characterisation was substantially incomplete, making it difficult to compare them with the other regions. The small amount of data available for Mayotte indicates that it is the least developed OR, but it has not been possible to determine the actual degree of development of Saint Martin.

Nevertheless, progress has been made in terms of providing information on these territories, which will surely help to consolidate other lines of research. In this context, we believe that the conditions could be met for studies to be carried out in the ORs on more specific themes, such as those suggested below: migration: origins, causes and types; European *vs* non-European tourism: internal and external transport networks; trade relations in goods and services with the European Union.

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CPLP OF THE SEA: TOWARDS A LUSOPHONE MARITIME SPATIAL DATA INFRASTRUCTURE (LMSDI)

Abstract. This article explores the potential of a Lusophone Maritime Spatial Data Infrastructure (LMSDI) to enhance geospatial cooperation among Portuguese-speaking countries. Grounded in bibliographic and documentary analysis, the study examines how shared oceanic heritage and spatial data interoperability can support marine governance across the CPLP. It proposes the development of a Lusophone Geoportal for monitoring Exclusive Economic Zones, promoting environmental enforcement, and advancing the blue economy through digital integration and multilateral collaboration.

Key words: Exclusive Economic Zones, blue economy, spatial data infrastructure, Lusophony, maritime governance.

1. INTRODUCTION

The Portuguese language constitutes a foundational element of the Community of Portuguese-Language Countries (CPLP), serving as a common basis for political, economic, and scientific cooperation among nations spanning four continents. Since the establishment of the first oceanic routes in the fifteenth century by navigators such as Vasco da Gama (1469–1524), the language has spread across seas and territories, giving rise to a global linguistic space through which also circulate normative

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frameworks, administrative practices, and territorial governance models (Romaine, 2009; Mowbray, 2012; Tabory, 1975; Núñez, 2013). Nonetheless, despite the CPLP's vast and strategic maritime presence, it still lacks integrated mechanisms for surveillance, monitoring, and the shared management of its oceanic spaces.

Control over maritime routes and naval infrastructure has historically been central to the projection of power. In the 21st century, this logic has extended to outer space, where satellites ensure communication, positioning, and Earth observation. The convergence between maritime and spatial domains has a direct impact on security, trade, and environmental monitoring, further deepening technological asymmetries among States (Bueger and Liebetrau, 2023; Pekkanen *et al.*, 2022; Porter and Porter, 2024).

Contemporary ocean governance increasingly demands the capacity to integrate remote sensing, meteorological data, and orbital imagery to forecast extreme events, safeguard fishery resources, and combat illicit activities such as maritime trafficking and illegal fishing (Ilcev, 2024; Spanier and Kuenzer, 2024; Dolce *et al.*, 2020). For CPLP countries with extensive Exclusive Economic Zones (EEZs) yet uneven institutional capacities, such requirements pose both geopolitical and technical challenges.

In this context, Marine Spatial Planning (MSP) offers an approach capable of articulating spatial technologies with national and international legal frameworks, promoting data interoperability, evidence-based environmental management, and digital sovereignty. This article proposes the creation of a Lusophone Maritime Spatial Data Infrastructure (LMSDI) as an integrated solution to support the CPLP in establishing a cooperative model of data-driven ocean governance (Shabbir *et al.*, 2019).

The methodology adopted in this article is based on comparative documentary and bibliographic analysis, combining legal, institutional, and technological dimensions to support the proposal of the LMSDI. The study examines national experiences in the implementation of Marine Spatial Planning, identifies key interoperability gaps, and advances a regional solution focused on the development of a shared geoportal among CPLP member states. Expected outcomes include: the integration of databases concerning Exclusive Economic Zones; the strengthening of technical and normative cooperation among member states; and the consolidation of a strategic joint presence in the Atlantic and Indian Oceans, with enhanced digital sovereignty, environmental security, and governance of the blue economy.

Initiatives such as the European Union's Marine Spatial Planning framework and the United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM)[1] have adopted integrated formats, combining techni-

[1] United Nations. General Assembly Resolution A/RES/66/206, of 22 December 2011, which formally recognises the United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM) as the technical body for global geospatial information governance, https://ggim.un.org/documents/a_res_66_206_E.pdf

cal architecture with multilevel governance models – as exemplified by Directive 2014/89/EU on Maritime Spatial Planning[2] and Directive 2007/2/EC, which established the Infrastructure for Spatial Information in the European Community (INSPIRE).[3] Drawing on these precedents, this article proposes a solution adapted to the Lusophone context, recognising that the feasibility of a shared infrastructure such as the LMSDI depends simultaneously on the definition of operational standards and the institutional alignment of member states. As such, the text is not purely descriptive or normative in nature, but rather propositional, seeking to articulate data policy and technical planning as inseparable components of a unified strategic agenda.

2. CONTEXT AND FOUNDATIONS

2.1. The Community of Portuguese-Language Countries (CPLP) and the maritime dimension

The Community of Portuguese-Language Countries (CPLP) is an intergovernmental organisation founded in 1996, comprising Angola, Brazil, Cape Verde, Guinea-Bissau, Equatorial Guinea, Mozambique, Portugal, São Tomé and Príncipe, and Timor-Leste, in addition to a number of observer states. Its activities span a range of domains – including education, security, environment, and economy – with the overarching aim of deepening political and institutional coordination among its member states (Medeiros and Pinto, 2023).

In the maritime domain, the CPLP holds a significant presence across the Atlantic and Indian Oceans, exercising jurisdiction over vast Exclusive Economic Zones (EEZs). The management of these spaces entails shared challenges concerning resource exploitation, maritime security, and the monitoring of illegal activities (Duarte *et al.*, 2024). Strengthening cooperation among Lusophone countries in this field could enhance their collective international engagement, bolstering mechanisms for surveillance and the sustainable use of marine resources (Hanenberg, 2021).

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[2] European Union. Directive 2014/89/EU of the European Parliament and of the Council, of 23 July 2014, establishing a framework for Maritime Spatial Planning. *Official Journal of the European Union*, L 257, 28.8.2014, pp. 135–145, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32014L0089

[3] European Union. Directive 2007/2/EC of the European Parliament and of the Council, of 14 March 2007, establishing an Infrastructure for Spatial Information in the European Community (INSPIRE). *Official Journal of the European Union*, L 108, 25.4.2007, pp. 1–14, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32007L0002

The principal economic activities conducted within CPLP maritime spaces include fishing, hydrocarbon extraction, deep-sea mining, and the development of marine biotechnology (Pavia, 2015). While the degree of dependence on these sectors varies across countries, the management of fishery resources and the mitigation of environmental impacts are shared concerns. Effective governance in this regard requires mechanisms for continuous monitoring, technological oversight, and prompt responses to illegal practices that threaten both marine ecosystems and food security (Fernandes, 2018).

CPLP member states also exhibit varying degrees of definition and recognition of their maritime boundaries. In some cases, such as Timor-Leste, unresolved negotiation processes continue to generate uncertainty (Pacheco, 2024). Currently, CPLP maritime spaces comprise approximately 196,701 sq. km of internal and archipelagic waters, 350,430 sq. km of territorial sea, and 7,347,355 sq. km of EEZ. Brazil, Mozambique, and Portugal account for the largest shares of territorial waters, while Brazil, Portugal, and Cape Verde possess the most extensive EEZs.

The total estimated water volume across CPLP maritime spaces amounts to approximately 24,133 billion cubic metres. In most cases, the continental shelf extends up to 200 nautical miles, overlapping with the EEZ. However, only a subset of countries has submitted formal claims for extension beyond this limit. Among these are Portugal, Brazil, and a joint submission by Cape Verde and Guinea-Bissau. The total claimed area for extended continental shelf amounts to approximately 5,554,841 sq. km (Pacheco, 2024).

With regard to maritime search and rescue (SAR), five CPLP countries – Angola, Brazil, Cape Verde, Mozambique, and Portugal – hold internationally recognised responsibilities, with designated zones totalling approximately 24,960,534 sq. km. The largest areas under SAR jurisdiction are overseen by Brazil, Portugal, and Angola. Considering all areas of sovereignty, jurisdiction, territorial claims, and operational obligations, the maritime spaces under CPLP responsibility encompass a substantial portion of the Atlantic and Indian Oceans.

Despite disparities in territorial extent and technical capacity, CPLP countries share structural challenges in protecting biodiversity, ensuring the sustainable use of marine resources, and combating illicit activities. These commonalities underscore the need for enhanced integration of surveillance systems and data sharing mechanisms (Leandro and Martínez-Galán, 2023). In this context, the blue economy – anchored in ocean energy, sustainable tourism, and marine biotechnology – emerges as a shared agenda with significant growth potential (Cardoso, 2023). The alignment of maritime policies with spatial technologies will depend on the consolidation of a regional infrastructure for ocean observation and governance, capable of addressing asymmetries through cooperation and system interoperability (Ashby, 2017), enabling the CPLP to evolve from a linguistic community to a jointly operational maritime presence (Pavia, 2015).

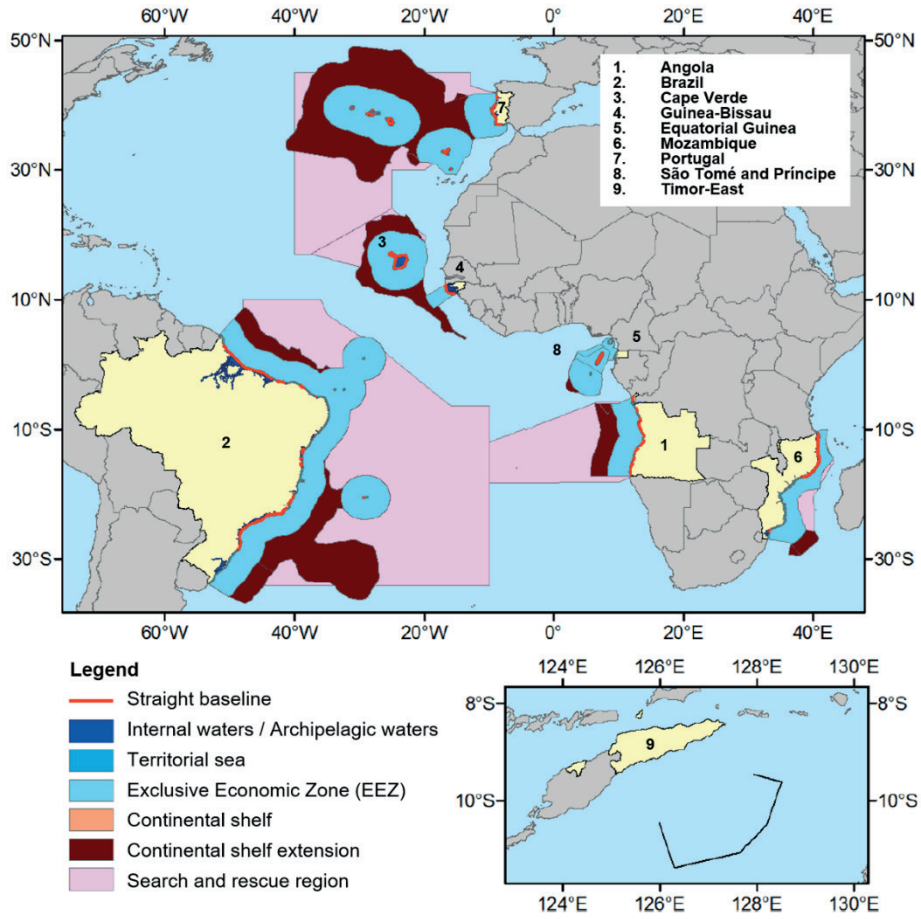

Fig. 1. Maritime areas under the sovereignty, jurisdiction, or responsibility of CPLP countries
Source: adapted from Pacheco (2024).

Integrating satellites and remote sensors into national maritime governance can enhance data-driven decision-making in fisheries management, environmental monitoring, and responses to extreme events (Duarte, Albuquerque and Tavares, 2024), thereby reinforcing a shared geospatial identity and expanding the cooperative engagement of Lusophone countries in ocean governance.

On the basis of this vision, the CPLP is well positioned to structure itself as a coordinated maritime bloc, guided by data-informed governance and interoperable technologies. In this model, the sea ceases to be merely a symbolic interface among nations and becomes a geopolitical space endowed with shared analytical, operational, and normative capacities (Leandro and Li, 2023).

2.2. Maritime Spatial Planning (MSP): Concept and applications

Maritime Spatial Planning (MSP) may be defined as a model for organising the occupation and use of ocean spaces under the sovereignty, jurisdiction, or responsibility of a State. This model integrates maritime and space infrastructures and is grounded in the articulation between international maritime law, space law, and national legislation governing resource exploitation, surveillance, and the use of remote sensing technologies (Sutherland and Nichols, 2006).

The implementation of an MSP system within the context of the Community of Portuguese-Language Countries (CPLP) requires, at a minimum, the harmonisation of legal frameworks among member states. It also demands the establishment of regulatory mechanisms enabling the sharing of geospatial data and interoperability across technological systems for ocean observation and control (Ntona and Schröder, 2020).

MSP operates at the intersection of sovereign rights over Exclusive Economic Zones (EEZs) and the legal constraints placed on the use of outer space. The United Nations Convention on the Law of the Sea (UNCLOS) affirms the sovereign rights of coastal states over resources in their jurisdictional waters, while the 1967 Outer Space Treaty establishes the peaceful and non-appropriable nature of outer space. The deployment of sensors, satellites, and other orbital technologies in maritime monitoring thus requires a legal foundation that simultaneously upholds state autonomy and respects the principles of space law (Roe, 2023).

The institutional structure of MSP can vary. Potential models range from a coordinating technical agency with regulatory and operational functions to an intergovernmental consortium in which states retain full autonomy while adhering to cooperation commitments formalised through multilateral agreements (Meiner, 2010; Abramic *et al.*, 2018). In the CPLP context, any institutional arrangement would need to be compatible with national legislation and capable of supporting both technical and legal interoperability (Rajabifard *et al.*, 2006; Guerreiro, 2021).

MSP may also function as a tool for legal predictability and support the implementation of environmental regulations, licensing procedures, and fisheries monitoring. Harmonising legal frameworks with technological capacities enhances the precision with which biodiversity protection, fisheries regulation, and natural resource governance are enforced (Schaefer and Barale, 2011; Norton and Sarretta, 2023). Adherence to multilateral environmental treaties and the incorporation of international legal principles can strengthen the CPLP countries' ability to engage effectively in relevant global forums (O'Connor and Cooper, 2024).

The effectiveness of environmental and climate monitoring relies heavily on the systematic collection of data regarding oceanic variables. The combination of ocean sensors with satellite data can support the identification of patterns in temperature, acidification, pollutant concentrations, and changes in marine currents (Klemas, 2013; Reggiannini *et al.*, 2019). The ability to detect such variations in

advance is fundamental for reducing risks to vulnerable ecosystems, such as coral reefs and mangroves, and for mitigating impacts on economic activities dependent on environmental stability (Mahrad *et al.*, 2020).

This data is also relevant for the planning of responses to extreme weather events. Orbital imagery and predictive models can assist adaptation measures in coastal cities and port logistics (Rodger and Guida, 2020). Public policies aimed at coastal zoning and integrated coastal zone management can be more effectively grounded in such information (Schwartz-Belkin and Portman, 2023).

Fisheries monitoring faces operational limitations in CPLP countries, particularly due to the vast extent of their Exclusive Economic Zones (EEZs). Satellites can aid in identifying anomalous patterns in vessel movements, enabling the tracking of fleets and the automatic issuance of alerts in cases of illegal fishing or the use of prohibited techniques (Rowlands *et al.*, 2019; Papadimitriou *et al.*, 2019).

Beyond fisheries, other illicit activities on the high seas – such as smuggling and human trafficking – require the integration of operational data with behavioural analytics. The application of artificial intelligence to monitoring systems can enhance the identification of suspicious routes and support coordinated responses among CPLP States (Xing *et al.*, 2014; Dineshbabu *et al.*, 2019).

The use of space-based technologies in ocean governance includes remote sensors, maritime drones, and high-resolution satellite imagery. These tools are essential for the monitoring of economic activities, the safety of navigation, and responses to threats such as piracy and environmental degradation (Pandey and Kaneria, 2024; Pekkanen, Aoki and Mittleman, 2022). Their integration into an MSP system could enhance the effectiveness of maritime governance mechanisms, particularly in contexts with limited technical capacity.

International programmes offer transferable models applicable to the CPLP context. Initiatives led by the European Space Agency (ESA) and the United Nations demonstrate the use of orbital data for environmental surveillance, fisheries control, and maritime risk management. Adapting these methodologies to the specific legal and operational contexts of Lusophone countries may provide a robust foundation for structuring a tailored maritime spatial planning system (Muto *et al.*, 2012; Racetin *et al.*, 2022).

2.3. Legal and institutional foundations

The legal viability of Marine Spatial Planning (MSP) within the framework of the Community of Portuguese-Language Countries (CPLP) depends on its compatibility with international treaties governing the use of maritime and outer space domains. The United Nations Convention on the Law of the Sea (UNCLOS) sets parameters for the delimitation of maritime boundaries, the exploitation of resources, and cooperation in the monitoring of jurisdictional zones (Singh, 2022).

The definition of Exclusive Economic Zones (EEZs), the regulation of resource extraction, and the dispute resolution mechanisms provided by UNCLOS form the foundational pillars of maritime governance (Mossop, 2018).

Additional international legal instruments complement this framework. The International Convention for the Prevention of Pollution from Ships (MARPOL) establishes environmental standards applicable to maritime navigation, while the International Ship and Port Facility Security Code (ISPS) defines maritime safety protocols (Bigagli, 2016; Spalding and de Ycaza, 2020). Integrating these frameworks into the structure of MSP may enhance legal certainty in enforcement, conservation, and licensing activities across oceanic areas under the responsibility of CPLP member states.

Aligning MSP with multilateral environmental agreements also broadens its potential for integration into international funding programmes. Instruments such as the Paris Agreement on climate change and the United Nations 2030 Agenda provide normative guidance for actions aimed at mitigating environmental risks, protecting marine biodiversity, and combating illegal fishing (von Schuckmann *et al.*, 2020; Arora and Mishra, 2023). Coordination with these frameworks can support the eligibility of CPLP projects for access to multilateral funds targeting ocean governance and technological innovation.

Legal cooperation among member states may be formalised through bilateral or multilateral agreements governing the sharing of geospatial data, joint monitoring protocols, and the coordinated development of infrastructure. Experiences from regional organisations such as the African Union and Mercosur offer models of cooperative governance based on non-binding commitments and shared technical standards (Reynhardt, 2019; Talberg *et al.*, 2018).

To support the technical implementation of MSP, the establishment of an institutional structure dedicated to inter-state coordination is advisable. A governance centre with a specific mandate could perform liaison functions with international bodies, standardise procedures, and monitor compliance with agreed protocols (Borgen, 2022). Such an arrangement may serve as a technical reference body and facilitate the flow of information among CPLP countries.

In contexts of legal diversity and institutional asymmetries, soft law mechanisms provide pragmatic alternatives to the rigidity of formal treaties. Technical guidelines, interoperability standards, and memoranda of understanding enable functional cooperation without requiring immediate legislative harmonisation (Byers, 2019). The adoption of soft law also supports the gradual integration of space technologies into national maritime monitoring systems, while respecting the specificities of each state. Technical cooperation agreements may promote the exchange of operational practices and the shared use of digital infrastructures. These instruments contribute to strengthening the institutional capacities of the CPLP and may enhance its ability to forge strategic partnerships within the context of the blue economy (Charles, 2014).

2.4. National case studies

The development of a maritime spatial data infrastructure within the framework of the Community of Portuguese-Language Countries (CPLP) can be informed by national experiences that, although heterogeneous, provide relevant examples of institutional organisation, technological application, and alignment with legal frameworks in the field of Marine Spatial Planning (MSP). Some countries have already established normative and operational instruments that contribute to shaping a model for regional integration.

In Portugal, MSP has been regulated since 2010 through the *Plano de Situação do Ordenamento do Espaço Marítimo Nacional* (PSOEM). The country was the first in the European Union to adopt a comprehensive plan that considers ecological, economic, and security aspects. Technical coordination is carried out by the National Maritime Authority and the Directorate-General for Natural Resources, Safety and Maritime Services, based on geospatial data produced and shared among governmental bodies and research centres (de Oliveira Ferreira, 2017). The Portuguese model is characterised by interinstitutional coordination, legal certainty, and the systematic use of space technologies in maritime spatial planning.

In Brazil, the policy of maritime spatial planning still reveals gaps in terms of integration between data repositories, regulatory frameworks, and strategic objectives. The *Interministerial Commission for Marine Resources* (CIRM) functions as a coordinating body, yet the operationalisation of MSP remains fragmented. Brazil's Exclusive Economic Zone (EEZ) is one of the largest in the world, which presents significant challenges for surveillance and continuous monitoring. Initiatives such as the *Blue Amazon Project* and remote sensing systems developed by the Navy indicate the potential for linking MSP with space-based technologies for the purposes of enforcement and resource protection (Wiesebron, 2013).

On 26 March 2025, the United Nations Commission on the Limits of the Continental Shelf (CLCS) recognised Brazil's extension of its continental shelf in the Equatorial Margin, adding approximately 360,000 sq. km to the country's maritime territory – an area equivalent to that of Germany. Located between the states of Amapá and Rio Grande do Norte, this new zone extends beyond the 200-nautical-mile limit of the EEZ and borders the French Guiana, an overseas territory of the European Union.[4] The decision is the result of a technical/diplomatic process initiated in 2017 and coordinated by the Brazilian Navy under the Continental Shelf Survey Plan (LEPLAC), with the support of institutions such as Petrobras and the National Agency for Petroleum, Natural Gas and Biofuels (ANP). This constitutes a significant geopolitical advancement for Brazil, with strategic implications for the exploration of natural resources and the delimitation of sovereign maritime spaces in the North–South Atlantic.

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[4] Referred to as the *Continental shelf extension* in northern Brazil, highlighted in Fig. 1.

In Cabo Verde, the *National Maritime Spatial Planning Plan* (PNOEM) was developed with the support of the FAO and the European Union. The country faces operational limitations, including a shortage of specialised human resources and the absence of integrated data platforms. Nevertheless, the plan prioritises fisheries management, biodiversity conservation, and the development of the blue economy (Madeira, 2023). The existing technical structure is compatible with future connections to the LMSDI and can offer useful inputs for defining regional standards.

Mozambique is currently at an early stage of structuring its Marine Spatial Planning system, with technical support from multilateral organisations. The main challenges include the lack of interoperability between databases, limited financial resources, and a scarcity of qualified technical staff. Nevertheless, initiatives focused on coastal mapping, marine conservation, and participatory management of protected areas have progressed through partnerships with universities and non-governmental organisations (Ceita and Ribeiro, 2020). Angola, in turn, has not yet implemented a formal and fully operational MSP system. In this context, both Mozambique and Angola present favourable conditions for a gradual approach to integration into the LMSDI, provided that this is supported by consistent investment in technical capacity building and digital infrastructure.

Taken together, these national case studies demonstrate that, despite significant differences in technical and institutional capacities, there are ongoing initiatives that may be articulated into a regional model of interoperability and data sharing. The consolidation of the LMSDI depends on the integration of space agencies, research centres, and maritime management authorities of the member states, grounded in reliable, up-to-date, and accessible data (Abreu, 2015; Antunes *et al.*, 2022).

3. TECHNICAL PROPOSAL: LUSOPHONE MARITIME SPATIAL DATA INFRASTRUCTURE (LMSDI) AND LUSOPHONE GEOPORTAL

The Lusophone Maritime Spatial Data Infrastructure (LMSDI) constitutes a technical integration proposal among CPLP countries, aimed at the collection, management, and analysis of spatial data relating to the maritime domain. The existence of a shared language reduces operational barriers and enables the construction of an interoperable architecture for georeferenced data (Varona, 2016). The functional foundation of the LMSDI involves the establishment of a Lusophone Geoportal, conceived as a centralised access point to data on Exclusive Economic Zones (EEZs), continental shelves, search and rescue areas, shipping corridors, and other components of Marine Spatial Planning (MSP). This geoportal will host thematic layers provided by national institutions, including data

on fisheries, resource use, maritime traffic, and environmental variables (Ferreira *et al.*, 2021; Oliveira Ferreira, 2017).

The technical structure for supplying data to the geoportal should mobilise hydrographic institutes, research centres, and space agencies from the member states, drawing upon remote sensing, satellite imagery, and maritime drones as primary data sources. These elements are to be processed using analytical tools based on geospatial modelling and scenario prediction, with applications in resource management, environmental monitoring, and coastal planning (Abreu, 2015; Antunes *et al.*, 2022). The dissemination of information will be facilitated by standardised metadata protocols and interoperability between distributed databases.

Beyond the collection and dissemination of data, the LMSDI may incorporate a technical training module, developed in partnership with universities and research institutions from the CPLP. This module would include open-access courses, technical reports, repositories of best practices, and normative materials on MSP and geospatial technologies (Nunes *et al.*, 2015; Sierra-Correa *et al.*, 2020). The technical governance of the LMSDI could be assigned to a technical committee composed of representatives appointed by the member states, with responsibilities for defining minimum quality standards, monitoring the updating of national systems, and coordinating interactions between information producers and users (Cavallo *et al.*, 2020).

The establishment of a shared database with access managed through permission levels would allow for the cross-referencing of information concerning maritime use, environmental conservation, and security. This, in turn, would facilitate the production of comparative diagnostics, risk analysis, and the formulation of evidence-based public policies (Fidélis *et al.*, 2022).

4. GOVERNANCE AND COOPERATION MODELS

The development of a Marine Spatial Planning (MSP) system within the CPLP requires alignment with the main treaties and international instruments governing the use of the oceans and outer space. The United Nations Convention on the Law of the Sea (UNCLOS) provides the legal foundations for the delimitation of maritime boundaries, the exploitation of resources, and interstate cooperation in jurisdictional waters (Singh, 2022). Complementary instruments such as the MARPOL Convention, the ISPS Code, and the Convention on Biological Diversity (CBD) contribute to the normative framework required for ocean governance (Mossop, 2018; Bigagli, 2016; Spalding and de Ycaza, 2020).

The following table presents a summary of relevant international agreements and their potential applications in the CPLP context:

Table 1. Summary of international legal instruments on the sea and possible applications to the CPLP

Year	Legal instrument	Entity	Description	Application in CPLP
1972	**International Convention for the Safety of Life at Sea (SOLAS)**	**International Maritime Organization (IMO)**	Establishes minimum safety standards for vessels, including requirements for construction, equipment, and operations	Creation of an integrated maritime safety system among Lusophone countries
1972	London Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter	**International Maritime Organization (IMO)**	Regulates waste disposal into the ocean, preventing marine pollution from harmful substances	Establishment of joint regulations for waste disposal control in the Atlantic and Indian Oceans
1973	**International Convention for the Prevention of Pollution from Ships (MARPOL)**	**International Maritime Organization (IMO)**	Sets environmental rules to prevent pollution caused by ships and establishes international waste disposal standards	Harmonization of maritime pollution control policies among CPLP countries
1979	**International Convention on Maritime Search and Rescue (SAR)**	**International Maritime Organization (IMO)**	Defines cooperation between states for the search and rescue of vessels and crews in distress at sea	Cooperation between Lusophone navies and coast guards for search and rescue operations
1982	**United Nations Convention on the Law of the Sea (UNCLOS)**	**United Nations (UN)**	Defines maritime zones, navigation rights, and resource exploitation, while regulating coastal states' jurisdiction over their waters	Definition of a common CPLP geospatial identity within the framework of the Law of the Sea
1992	Convention on Biological Diversity (CBD)	**United Nations (UN)**	Includes guidelines for the conservation of marine biodiversity and the sustainable use of ocean resources	Development of joint strategies for biodiversity protection in Lusophone EEZs
1994	**Agreement on the Implementation of Part XI of UNCLOS**	**United Nations (UN)**	Regulates mineral exploitation in the international seabed, ensuring a balance between economic development and environmental preservation	Scientific and technological cooperation for the sustainable exploration of seabed resources

Year	Legal instrument	Entity	Description	Application in CPLP
1995	**Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks**	**United Nations (UN)**	Establishes guidelines for sustainable fishing and the conservation of migratory species, encouraging international cooperation	Coordination of policies for the sustainable management of fish stocks in the South Atlantic
2001	**UNESCO Convention on the Protection of Underwater Cultural Heritage**	**UNESCO**	Regulates the preservation of submerged archaeological sites, protecting historic shipwrecks and other underwater structures	Joint protection and mapping of Lusophone underwater cultural heritage
2002	**International Ship and Port Facility Security (ISPS) Code**	**International Maritime Organization (IMO)**	Establishes maritime security standards for ports and vessels, preventing illicit acts and threats to navigation	Development of common maritime security protocols for CPLP ports
2018	**Nairobi Summit Agreement on Marine Plastic Pollution**	**United Nations Environment Programme (UNEP)**	Aims to reduce plastic pollution in the oceans through waste control policies and incentives for the circular economy	Adoption of a joint program to combat plastic pollution in CPLP oceans

Source: own work.

The coordinated application of these treaties may enhance the legal predictability of marine spatial planning (MSP) initiatives, facilitate access to international financing mechanisms, and strengthen engagement with multilateral organisations such as the United Nations (UN), the International Maritime Organization (IMO), the United Nations Educational, Scientific and Cultural Organization (UNESCO), and the United Nations Environment Programme (UNEP) (von Schuckmann *et al.*, 2020; Arora and Mishra, 2023).

Legal cooperation among CPLP countries can be formalised through bilateral or multilateral agreements focused on the sharing of spatial data, the definition of technical protocols, and the development of joint infrastructure. Institutions such as the African Union and Mercosur provide relevant institutional models for shared governance and the formulation of supranational policies grounded in intergovernmental commitments (Reynhardt, 2019; Talberg *et al.*, 2018).

The creation of a specific regulatory framework for Lusophone MSP may be guided by the progressive harmonisation of national legislation on matters such as environmental licensing, maritime enforcement, georeferenced data sharing,

and the use of space-based technologies (Doorn and Veloso, 2023). To support the implementation of LMSDI and the broader MSP agenda, the establishment of a technical governance centre linked to the CPLP is recommended. This body would be responsible for international coordination, the definition of operational standards, and the assessment of national system compliance (Borgen, 2022).

The experience of institutions such as the International Maritime Organization (IMO) and the European Space Agency (ESA) provides valuable operational insights for the design of the model, enabling the adoption of international standards for ocean monitoring and risk management (Markiewicz-Stanny and Szuniewicz-Stępień, 2022). Normative coordination within the CPLP could initially take the form of soft law instruments – such as technical guidelines and memoranda of understanding – thus facilitating cooperation in settings marked by institutional asymmetries (Byers, 2019).

Finally, the establishment of a permanent technical forum among member states could promote joint projects in research, capacity-building, and monitoring, thereby enhancing the CPLP's institutional and technical maturity in the use of space-based technologies applied to the marine domain. Strengthening national capacities and developing a shared legal foundation are both essential for positioning the Lusophone world as a credible actor in the global governance of the oceans (Charles, 2014).

5. FUNDING STRATEGIES

The implementation of Marine Spatial Planning (MSP) and the Lusophone Maritime Spatial Data Infrastructure (LMSDI) within the Community of Portuguese-Language Countries (CPLP) requires a funding strategy that is compatible with the fiscal, institutional, and technological diversity of the member states. This strategy must combine internal and external funding sources, integrating national budgets, multilateral financing, and public-private partnerships (Coker *et al.*, 2020).

Multilateral development banks offer specific credit lines for projects related to technological innovation, digital transformation, and data-based territorial management. Institutions such as the African Development Bank (AfDB), Brazil's National Bank for Economic and Social Development (BNDES), and the World Bank have programmes focused on the integration of space technologies and the strengthening of ocean monitoring capacities (Santos, 2023; Madeira, 2023). Negotiating dedicated agreements with these organisations could enable medium and long-term financing for the LMSDI and for the integration of national systems into global spatial data platforms (Leandro and Lobo, 2020).

The establishment of a CPLP Fund for the LMSDI, with proportional contributions from Member States and investments from international partners, could ensure the continuity of the system's structural actions. This fund could be linked to ongoing multilateral programmes on digital transformation, environmental sustainability, and technological innovation (Cardoso, 2023). Decentralised management by a multilateral board would allow participating countries to define priorities and allocate resources according to their national agendas (Barros-Platiau and Barros, 2022).

Public-private partnerships (PPPs) represent a viable alternative for the development of technological solutions, particularly in remote sensing, data interoperability, and automated geospatial platform management. Companies in the aerospace sector, big data analytics, and specialised software development could contribute with technology and co-financing for the development of LMSDI modules. Technological concession models and cooperation contracts may expand access to advanced solutions, reduce operational costs, and accelerate the implementation of strategic components of the system (Ceita and Ribeiro, 2020).

The LMSDI can also be structured to align with international thematic funding mechanisms. Programmes such as the Green Climate Fund (GCF) and the Global Fund for the Oceans (GFO) prioritise projects focused on climate change adaptation, marine conservation, and digitalisation of ocean governance. Initiatives addressing illegal fishing, biodiversity protection, and environmental change monitoring may be eligible for these funding lines (Ventura *et al.*, 2020).

The financial governance of the LMSDI could adopt a decentralised model, in which member states contribute in accordance with their fiscal capacity. The creation of a governing board with national representatives would enable joint administration of resources and ensure transparency in decision-making processes (Bernal *et al.*, 2006). This structure would support the financial sustainability of the system and enable equitable participation of countries, even in the face of budgetary constraints, thereby contributing to the consolidation of a cooperative geospatial infrastructure (Leandro and Li, 2025).

6. CONCLUSION

The Portuguese language was born and expanded across the oceans, and it is precisely in the maritime domain that the geostrategic dimension of the Community of Portuguese-Language Countries (CPLP) becomes evident. However, this oceanic presence still lacks common mechanisms for technical, legal, and institutional coordination that would underpin a data-driven model of governance. The proposed creation of the Lusophone Maritime Spatial Data Infrastructure (LMSDI) offers

an integrated response to this gap by combining interoperable technical standards with multilateral legal frameworks and a cooperative institutional architecture among member states.

Inspired by normative models such as Directive 2007/2/EC (INSPIRE), which establishes spatial data infrastructures in the European Union, and Directive 2014/89/EU, which defines a framework for Maritime Spatial Planning (MSP), the LMSDI applies these principles analogously to the Lusophone context. Similarly, it draws upon United Nations General Assembly Resolution A/RES/66/206, which recognises the United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM) as the technical body for global geospatial governance. By aligning with these established frameworks, the LMSDI positions itself as a normative and adaptable proposal, grounded in internationally recognised standards.

The consolidation of a Lusophone Geoportal as the operational interface of the LMSDI will allow for structured and shared access to critical geospatial data on Exclusive Economic Zones (EEZs), continental shelves, navigation corridors, and other areas of strategic common interest. This structure will enable evidence-based environmental management, enhance maritime security, and foster the blue economy, thereby reducing technical asymmetries and strengthening the digital sovereignty of the CPLP.

The viability of this model requires the mobilisation of financial resources, adherence to international standards, and the strengthening of national institutional capacities. The sharing of data, methodologies, and infrastructures among countries with varying levels of technical development promotes economies of scale, collective efficiency, and greater engagement of the CPLP in multilateral platforms for financing, science, and ocean governance.

The LMSDI is not merely a technical proposal; it is a political-normative arrangement rooted in solidarity, interoperability, and the strategic use of geoinformation by countries that share a common cultural heritage. Building a shared geospatial data base among Lusophone countries can reduce dependency on sensitive technologies, promote scientific diplomacy, and consolidate the CPLP as a relevant actor in the global regulation of maritime spaces. By applying internationally established normative experiences to the Lusophone context, the project reinforces technological equity and regional leadership in the digital transformation of the oceans.

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BOOK REVIEWS

Laura VAUGHAN, John PEPONIS, Ruth Conroy DALTON (eds), *Space Syntax: Selected Papers by Bill Hillier*, UCL Press, London 2025, 728 pages

Spatial configuration plays a foundational role in shaping patterns of human interaction and social behaviour. One of the most enduring challenges in the spatial disciplines has been the development of systematic, replicable methods to analyse these relationships. *Space Syntax: Selected Papers by Bill Hillier*, edited by Vaughan, Peponis, and Dalton, offers a timely and rigorous synthesis of Bill Hillier's major contributions to spatial theory and urban morphology. More than a retrospective, this volume anchors the evolution and application of space syntax theory over the past four decades.

The book comprises twenty chapters/papers selected from Hillier's extensive body of work, ranging from early explorations into design cognition to more recent interventions in urban theory and spatial analysis. Each paper is framed by a scholarly commentary that contextualises its intellectual origins, methodological innovations, and contemporary relevance. This structure allows the book to function simultaneously as an intellectual archive, a teaching tool, and a research guide. It bridges Hillier's original formulations with ongoing debates about space, society, and urban futures.

The book's value can be articulated across three core dimensions:

First, it offers a systematic theoretical framework for understanding the social logic of spatial form. Hillier's early writings – especially those drawn from *The Social Logic of Space* (1984, with Julienne Hanson) – introduced core analytical tools such as axial maps, integration values, and syntactic measures that link spatial configuration to patterns of movement and encounter. These concepts

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are further developed in landmark chapters such as "Natural Movement" (1993) and "The City as a Socio-Technical System" (2012), which articulate how urban morphology not only reflects but actively structures social behaviour, economic flows, and collective life. Hillier's work remains vital for understanding how spatial design can promote or hinder interaction, inclusion, and affective well-being.

Second, the volume exemplifies interdisciplinary synthesis, reflecting space syntax's evolution as a cross-cutting research paradigm. Hillier's engagement with such disciplines as mathematics, psychology, geography, and sociology is evident throughout the selected papers. His approach is both rigorous and generative, integrating formal spatial analysis with empirical research and theoretical reflection. The editorial commentaries deepen this interdisciplinarity by drawing connections to contemporary work in architecture, planning, and urban studies. In doing so, the book positions space syntax not just as a technical method but as a dynamic framework capable of responding to complex urban challenges.

Third, the book demonstrates the practical and policy relevance of spatial analysis. Hillier's critiques of low-permeability and fragmented urban design – exemplified in essays such as "Against Enclosure" (1988) – highlight the consequences of spatial segregation for social cohesion, public safety, and urban conviviality. His emphasis on visibility, accessibility, and permeability anticipates current concerns with walkability, inclusivity, and the right to public space. Moreover, his methodological innovations in syntactic modelling and simulation remain instrumental for practitioners engaged in urban regeneration, spatial justice, and participatory planning.

Nonetheless, the collection invites further engagement and critique. While the focus on the configurational properties of space provides valuable insights, some readers may find the lack of sustained attention to issues of power, identity, and affect to be a limitation. Topics such as racialised spatial practices, gendered experiences of space, and emotional geographies are not explicitly addressed in the selected papers. This absence invites scholars – particularly those interested in the affective, intersectional, and political dimensions of space – to extend and adapt space syntax theory into these critical and underexplored areas. Additionally, the selection of contributors/commentators, while authoritative, leans heavily on institutions in the Global North. A more inclusive representation of voices from the Global South would have further enriched the volume's relevance and applicability across diverse urban contexts.

The book's editorial design enhances its pedagogical value. Diagrams are redrawn with clarity, chapter introductions are concise and informative, and Hillier's original texts are preserved without unnecessary modification. While the absence of a concluding chapter may initially seem like a missed opportunity, it is a deliberate decision that reinforces the volume's open-ended orientation: it invites readers to carry forward and reimagine Hillier's ideas in light of contemporary spatial and social transformations.

In short, *Space Syntax: Selected Papers by Bill Hillier* is a landmark publication that consolidates Bill Hillier's pioneering influence in spatial theory while remaining open to future interpretation and application. It is a must-read for students and practitioners of architecture, urban planning, geography, and spatial cognition. For researchers interested in the social textures of space, it offers both a robust methodological foundation and a critical springboard. It challenges readers not just to understand cities, but to rethink how spatial form shapes the very conditions of human co-presence, care, and community.

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BEYOND INDUSTRIAL HERITAGE: READING THE FUTURE OF POST-INDUSTRIAL CITIES

With a review of:

Matthew E. KAHN and Mac McCOMAS, *Unlocking the Potential of Post-Industrial Cities*, Johns Hopkins University Press, Baltimore 2021, 148 pages, Daniel CAMPO, *Postindustrial DIY: Recovering American Rust Belt Icons*, Fordham University Press, New York 2024, 384 pages, and Silvia BARBERO and Axel TIMPE (eds), *Nature-Based Solutions for Urban Renewal in Post-Industrial Cities*, Routledge, New York/London 2025, 342 pages

1. INTRODUCTION

Manchester, Dortmund, Łódź, Ostrava… Just a few examples of post-industrial cities that used to be powerhouses in the 19th and 20th century. Mining, steel, textiles, and other manufacturing sectors were the lifeblood of the economy then. Factories, smoke, and noise dominated the urban landscape, but people had jobs and were proud of what they achieved. Ironically, after their heydays most of these industrial hotspots faced economic decline, unemployment and restructuring. The lagging development of post-industrial cities is often related to the so-called 'lock-in' phenomenon: a place becomes stuck in outdated socio-economic structures, technologies or mindsets, making it difficult to adapt to new economic realities (Goodman, 1999; Hassink, 2010; Kozina *et al.*, 2021). How to break this lock-in?

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Meanwhile, we know that there are no universal recipes to re-invent post-industrial cities. All places have their own challenges demanding their own place-specific solutions. However, in general, it seems that diversifying the urban economy, investing in education, and new business development, as well as the redevelopment of run-down industrial sites are helpful. But what is effective and what is not? Which local stakeholders are best equipped to implement which measures? And are there any cities looking beyond the 'mainstream' restructuring strategies? With these questions in mind, we focus here on three recently published books on post-industrial cities: a work by two economists on the possible comeback of these cities, a treatise that argues for more citizen involvement in restructuring industrial-era sites, and a book on nature-based interventions in revitalising post-industrial cities.

2. CORRECTING COORDINATION FAILURE

Under the promising title *Unlocking the Potential of Post-Industrial Cities* (2021) Matthew E. Kahn and Mac McComas – two economists linked to the Johns Hopkins' 21st Century Cities Initiative – published a concise book in which they explore the challenges faced by Baltimore, Cleveland, Detroit, Philadelphia, Pittsburgh, and St. Louis. These six American cities used to be thriving manufacturing hotspots, but have experienced severe population loss and economic decline due to deindustrialisation. The disappearance of manufacturing jobs over the years has induced, among other things, high unemployment and poverty levels and an outdated housing stock and infrastructure. How to reverse this trend? In the authors' view the major problem is underinvestment and coordination failure in these cities, leading to a kind of catch-22 situation. The stakeholders in charge – think of business investors, real estate developers, banks, and local authorities – are waiting for each other: few are willing to be a first mover in making investments in run-down neighbourhoods and in the people living there. What is needed, Kahn and McComas stress again and again, is the development of cost-effective human capital-strategies, i.e., policies to help young people build their skills in safe, green, and attractive residential areas. In this way, a solid urban middle class may emerge that provides the basis for fruitful private and public investments that allow cities to find their way up. When such strategies are implemented in a context where local politicians are open to experimentation and innovation, while being honest about what works and what does not, Baltimore, Cleveland, Detroit, Philadelphia, Pittsburgh, and St. Louis might face a bright future. Or, as the authors put it optimistically: 'The historical obstacles that our six cities must overcome to enjoy economic success are immense but not insurmountable. The right set of investments in people and places will unlock the full potential of these post-industrial cities,' (p. 12).

This book is a refreshing contribution to the body of literature on old industrial cities. Despite the American context on which it is based, European readers will find much recognition in the topics that pass in review. In no more than 148 pages and 8 chapters, Kahn and McComas manage to provide a hopeful perspective for post-industrial cities. One of the merits of the book is that it is easy to read. Also for non-economists, the book is crystal clear, as it is free of jargon. Moreover, it contains a pleasant mix of theory, empirics and real-life examples. Furthermore, it is good that the authors pay attention to the connection between the economic life of cities and the social and physical environment in which it takes place. At the same time, the analysis remains (as is so often the case in economic studies) rather general, superficial, and predictable: if we let the market do its job, take a long-term perspective and encourage private and public parties to work together more productively, post-industrial cities will make a comeback in the end. However, this typical economic mantra ignores the particularities of time and place ensuring that what works in one city does not necessarily work in another. And even though the authors have a close eye for the connection between economic, social, and physical challenges in post-industrial cities, it is questionable whether the cities can simply rely on the laws of supply and demand. However, we completely agree with the authors that successful urban revitalisation requires the correction of coordination failure, as well as an open culture of experimentation and cooperation between government, businesses, and citizens.

3. FROM PROFITS AND POLITICS TO PASSION

Postindustrial DIY: Recovering American Rust Belt Icons (2024) is both a supplement and a critique to the book we discussed above. Its author, urbanist Daniel Campo, based at Morgan State University in Baltimore, argues that it is important to look beyond profit-driven investors and politically motivated authorities when searching for ways to restructure old industrial cities. In shaping urban futures, he stresses, there is one group that is often overlooked, namely engaged citizens. Unlike the market and government, they are guided by the driving force of passion. In his beautifully illustrated treatise, Campo tells the stories of these creative individuals – be it former workers, preservationists, artists or locals with heart for their community – and their attempts to reshape former industrial sites. Often, these enthusiasts lack formal training, institutional support, or financial resources – but that does not hinder them in renewing parts of their cities. For this grassroots do-it-yourself work Campo introduces the concept of 'postindustrial DIY' which '…aims to recover, preserve, interpret, reuse, and celebrate significant industrial-era places through locally directed and mostly hands-on building and landscape practices, cultural programming, and a range of smaller and itinerant activities,'

(p. 32). To illustrate the power of this approach, Campo presents detailed case studies of iconic projects, such as the story of a former automobile plant in Detroit, an iron foundry in Pittsburgh, and grain elevators and train stations in Buffalo. Postindustrial DIY in these places often manifests itself in temporary uses in the educational, artistic and cultural domain, aesthetic improvements, and other low-cost interventions. It is evident that the author has also a mission from his 'manifesto for postindustrial protagonists' at the end of the book.

If there is one thing that will stick with the reader, it is that passionate non-professionals can be crucial in renewing parts of post-industrial cities. Engaging citizens in the urban transformation process automatically brings in local memories, original insights, and creative ideas. The DIY practices of ordinary people offer a useful complement or even alternative to formal urban restructuring strategies conducted by business and government actors. Campo shows that grassroots urbanism tends to focus on improvisation, temporality, and open end-solutions. That is also the reason why he thinks it more realistic to strive for 'recovering' rather than 'reviving' post-industrial places. We can only concur with that, because in our perspective it is illusory to revitalise an entire smokestack city at once – the multiple challenges facing this type of territories are simply too complex for that. In this light, it is somewhat surprising that Campo suggests that no industrial-era place is 'too far gone' to be saved by everyday people. After all, some locations in a city are more suitable for recovery than others, while the business case of re-use is not always viable. In other words, the question is whether an approach of 'let a thousand flowers bloom' in old industrial cities always works. Sometimes it is inevitable to make clear choices and prioritise one recovery project in one part of the city over other initiatives. Having said this, the book offers a very useful contribution to the discourse on bottom-up strategies in urban studies, spatial planning, and cultural geography. Campo vividly demonstrates how ordinary people are co-shapers of the built environment. He points to the potential of informal, citizen-led practices to foster alternative modes of urban restructuring. Thus, Campo's *Postindustrial DIY* challenges readers to reconsider what the transformation of old industrial cities is all about and who should be involved in this process.

4. PRODUCTIVE GREEN SOLUTIONS

Whereas in the previous book DIY is the magic word, the edited volume *Nature-Based Solutions for Urban Renewal in Post-Industrial Cities* (2025) is all about NBS. This abbreviation stands for Nature-Based Solutions, a concept that the authors, in line with the European Commission (2020), define as 'Solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmen-

tal, social and economic benefits and help build resilience,' (p. 2). Telling examples of NBS are green infrastructure on former industrial land (e.g., parks, gardens, and aquaponics systems), community-based urban farms and green roofs or walls on public and private buildings. The book, which is edited by the Italian associate professor of systemic design Silvia Barbero and the German landscape architect Axel Timpe, starts with a short introduction and is followed by 17 chapters that address the question of what role NBS can play in supporting the transformation of post-industrial cities. All of the contributions to the book are the result of the Horizon 2020 project proGIreg ('productive Green Infrastructure for post-industrial urban regeneration'), in which a variety of nature-based solutions were tested with the aim to renew industrial-era territories. The NBS were implemented in Living Labs in Dortmund, Turin, Zagreb, and Ningbo (China), while policy experiences were also gained in Cluj-Napoca, Piraeus, Cascais (Portugal), and Zenica (Bosnia and Hercegovina). The common thread of the chapters is that green infrastructure can indeed enhance biodiversity, climate resilience, and the well-being of residents. However, to be effective, NBS requires both local leadership and models of participatory thinking and co-design. Ideally, urban policymakers and local communities work closely together in implementing the nature-based interventions.

Although published by the respectable publishing house Routledge, the book reads primarily like a research report. This is both advantageous and disadvantageous. One of the advantages is its emphasis on concrete applications of NBS in urban practice, both in words and images. For example, the reader learns in detail about the success factors of urban gardening-projects, such as the one set-up in Turin's Mirafiori Sud district (chapter 9). Or one can learn about the experiences with a therapeutic garden, modular urban farm, and pedestrian/cycling path in the Living Lab Zagreb and what these interventions hold for the future (chapter 6). Thanks to this real-world focus the book has a close eye for the complexities of implementing NBS in post-industrial contexts, such as institutional fragmentation, land ownership issues, and the risk of socio-spatial inequalities. Another strong point is that the book, like many research reports, is set-up as an open access publication, which enables the results achieve a broad distribution in both academic and professional circles. But the research report-like character of the book also has downsides. The main drawback is that the editors Barbero and Timpe have made little effort to embed NBS in academic literature, relate the findings from the cases to earlier studies or reflect on the overall message of the book. The introductory chapter is brief and superficial, and at the end there is no concluding reflection from the lessons learned. The editors have even failed to include basic information on the institutional affiliations of the more than 50 (!) authors of the various chapters of the book. Despite these imperfections, *Nature-Based Solutions for Urban Renewal in Post-Industrial Cities* is a valuable work. For even if it had deserved better editing, the volume demonstrates that implementing nature-based solutions in restructuring old industrial cities is both a productive and future-oriented strategy.

5. THE NEED TO LOOK BEYOND INDUSTRIAL HERITAGE

When it comes to old industrial cities, most of us initially think of industrial heritage, such as factories, infrastructure, and other physical remnants of the manufacturing sector. However, the three books we discussed in this review convincingly show how important it is to look beyond industrial heritage. Post-industrial cities deserve special attention from local authorities and other stakeholders, not only because of their physical appearance, but above all because of their idiosyncratic socio-economic challenges. And since the physical, social, and economic features of these cities are often closely interrelated, an integrated approach is necessary. For example, to bring new jobs to an old industrial city, it is not enough to look at it solely from an economic perspective – attention must also be paid to the physical and social state of the city's neighbourhoods and the opportunities for people to advance. From policy makers and other urban actors this requires alignment, coordination, and cooperation.

In practice such an integral governance approach is difficult, not only in post-industrial cities. Unfortunately, there is still a lot of 'silo thinking': departments, agencies, and other organisations tend to work in isolation from one another, which can lead to fragmented, inefficient or even contradictory policies. For the future of post-industrial cities 'correcting coordination failure,' as Kahn and McComas call it, should therefore be a top priority. And while doing that, policymakers should not forget to make use of citizens' intrinsic motivation to contribute to the recovery of parts of the industrial past, as Campo highlights. After all, to put it in the words of the American writer, historian and media personality Studs Terkel (1912–2008): 'Ordinary people are capable of doing extraordinary things.' It would be a shame if city authorities failed to make further use of this powerful local resource. Finally, Barbero and Timpe's edited volume shows that post-industrial cities have another resource that is often overlooked: abandoned and thus abundant space. Space that lends itself for a variety of green, nature-based solutions. Seen in this light, post-industrial cities have a more prosperous future than one might expect.

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