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HANDBOOK // ESPON KARPAT

Handbook of recommendations

Determinants and opportunities for the
socio-economic and spatial development
of the Carpathian region

Handbook // June 2025

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ESPON EGTC:

Sandra Di Biaggio - Research and Policy Manager

Angela Emidio - Public Procurement Manager

Coordination:

Maciej Smętkowski, Euroreg, Poland

Outreach:

Piotr Miszczuk, Magda Grabowska, Euroreg, Poland

Authors

Maciej Smętkowski, Katarzyna Wojnar, Michał Czepkiewicz, Agnieszka Olechnicka, Katarzyna Romańczyk, Tomasz Kupiec, Ewelina Przekop-Wiszniewska, Justyna Orchowska, Jakub Rok, Mikołaj Herbst, Adam Płoszaj, Piotr Miszczuk, Ewa Zegler-Poleska, Roman Szul, Jakub Majewski, Artem Chumachenko, (all Euroreg, Poland)

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Disclaimer

The information contained herein is subject to change and does not commit the ESPON EGTC and the countries participating in the ESPON 2030 Cooperation Programme.

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Introduction

Introduction

The Carpathians are an extensive mountain system in Central and Eastern Europe, stretching approximately 1,500 km across seven countries: the Czech Republic, Slovakia, Poland, Hungary, Ukraine, Romania, and Serbia (**Map 0.1**). They are the second-longest mountain chain in Europe after the Alps, with their highest peak, Gerlach (2,655 m above sea level), located in the Slovak Tatras. The Carpathians are characterized by diverse landscapes, ranging from high mountains with alpine climates to forested ranges and valleys. This region holds significant natural and cultural importance, being a territory for numerous protected species of flora and fauna, as well as being home to various populations who have preserved unique traditions and folklore.

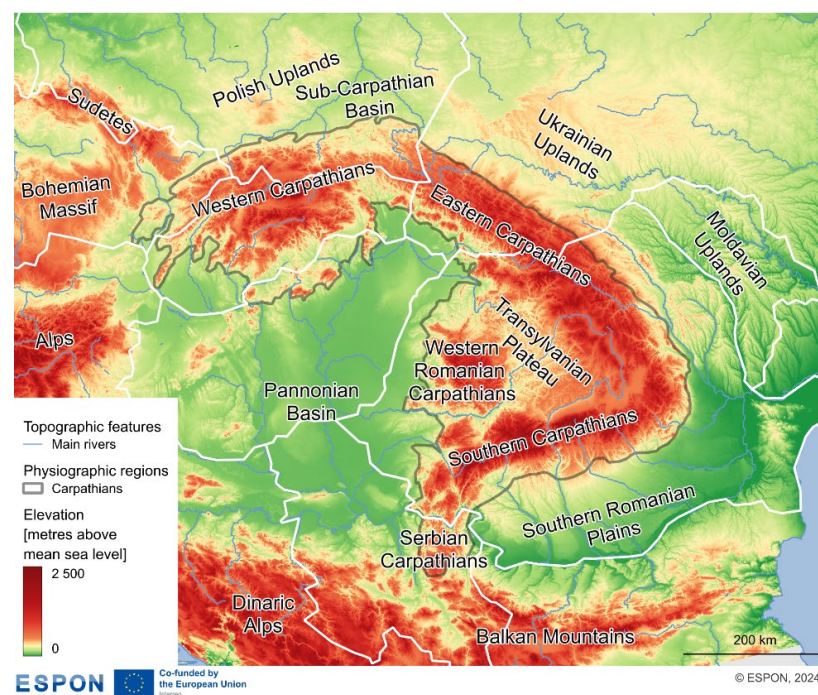
A review of existing studies on the conditions, trends and challenges the Carpathian macroregion is faced with, on the one hand, points to the need to supplement and/or deepen the state of knowledge on the socio-economic processes taking place there, while taking into account their spatial context, and, on the other hand, indicates the need to propose appropriate measures to solve existing problems and take advantage of available development opportunities. Therefore, one of the general objectives of the project was to provide recommendations for policy makers, taking into account a multi-level governance approach, for joint policy actions considering the territorial specificities of the Carpathians.

The research conducted within the ESPON KARPAT project enabled the formulation of a range of recommendations addressing various aspects of development in the Carpathian macroregion. Initially, thematic recommendations were developed for specific types of Carpathian regions, taking into account their unique needs and development potentials. The next step involved preparing spatial development visions and identifying development directions in functional areas. In this context, particular attention was paid to the interactions between different territorial capitals, allowing for a better understanding of the dependencies and synergies present in the Carpathian macroregion. Another key element of the research was the development of recom-

mendations concerning governance structures and territorial cooperation in the Carpathian macroregion. The analysis encompassed both the existing governance structures and the barriers and opportunities for territorial cooperation, which facilitated the creation of detailed recommendations for improving governance frameworks and enhancing territorial cooperation at various territorial levels.

Map 0.1

Carpathian Mountain range



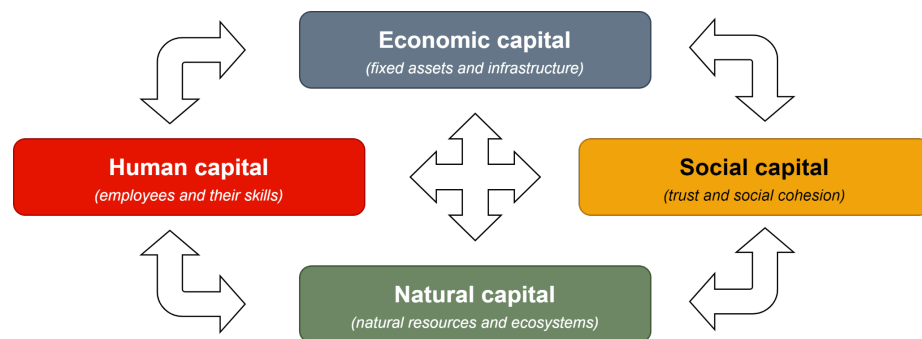
Territorial level: NUTS0, 90 metre grid
Source: ESPON KARPAT, 2024
Origin of data: Copernicus GLO-90, Ecrins
© EuroGeographics for administrative boundaries



Thematic recommendations for Carpathian regions

1 Thematic recommendations for Carpathian regions

Figure 1
Four capitals model



Source: Own elaboration based on Brink et al. 2006.

The development conditions of the Carpathian macroregion require a comprehensive synthesis that allow to identify various types of regions. For each of these types, policy recommendations aimed at minimising risks and utilising opportunities and synergies can then be proposed. To achieve this, the 4 Capitals Model (**Dahlstrom & Ekins, 2005**) was employed. This model extends the earlier concept of the three pillars of development—natural, manufactured, and human (**World Bank, 1995**)—by further distinguishing social capital within the human dimension. Consequently, these capitals can be defined as follows (**cf. Brink et al., 2006**):

- natural (or environmental) capital covering all forms of ecosystems and natural resources that provide services for social welfare,
- economic (or manufactured) capital, broadly synonymous with economic infrastructure and assets,
- human capital, relating to the stock of human productivity potential of individual people based on their health, motivation, talents and skills,
- social capital, relating to the stocks of social trust, norms and formal and informal networks that people can draw upon to access resources, solve common problems and create social cohesion.

Each of the four capitals of the Carpathian macroregion was operationalised using selected indicators developed specifically for assessing the region's development conditions. For each capital, two key dimensions of differentiation were identified, which were then used to develop regional typologies.

1.1 Economic capital

The Carpathian macroregion displays a complex spatial structure when it comes to economic capital. Using Principal Component Analysis (PCA), two types of factors were identified, together explaining roughly 70% of the total diversity in regional economic capital (**Map 1.1**).

These dimensions offer valuable insights into how regions differ in terms of:

- **Capital Accumulation** – the extent to which a region has built up long-term assets and infrastructure essential for economic activity.
- **Production vs. Consumption Orientation** – the dominant economic role a region plays, whether focused more on producing goods or providing consumer-related functions like housing.

These two components serve as a foundation for developing **tailored policy recommendations** across diverse regional contexts.

Capital Accumulation: Infrastructure, Assets, and Growth Potential

This dimension captures the degree to which economic capital has accumulated in the form of **fixed assets** — such as machinery, infrastructure, and built capital used in business and transport sectors. It also reflects the **enabling conditions** that support economic activity and competitiveness, including:

- **GDP per capita** (general level of economic development),
- **Fixed assets in business operations** (infrastructure that facilitates the production and exchange of goods and services),
- **Foreign direct investment inflows**,
- **Public transport infrastructure** (especially road and rail systems).

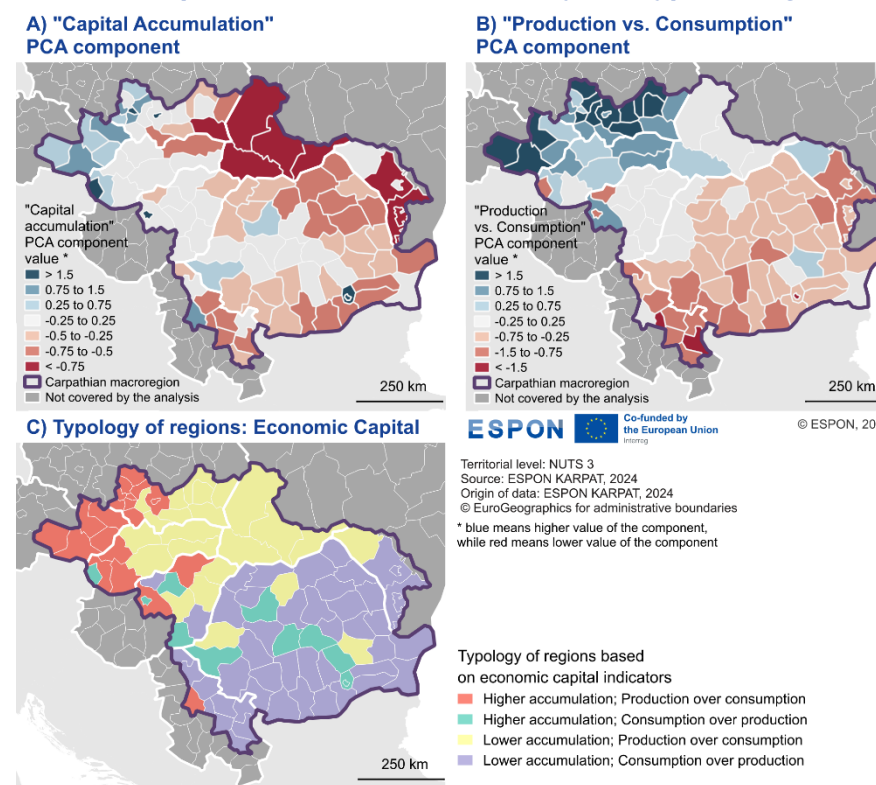
To a lesser extent, this dimension is also influenced by:

- **Agglomeration effects** (e.g., the population share in the largest urban centres),
- **Research and development intensity** (R&D expenditure relative to GDP).

Regions that score high in terms of capital accumulation — typically **larger cities and western parts of the macroregion** — benefit from a combination of advanced infrastructure, strong investment environments, and economic dynamism.

Map 1.1

Economic capital – dimensions of diversity and types of regions



For instance, in Romania, high capital accumulation aligns closely with regions located along major existing or planned transport corridors, especially **motorways connecting Bucharest to the Hungarian border**.

By contrast, **lower capital accumulation** is typical of:

- non-EU countries (Ukraine, Serbia, Republic of Moldova),
- Peripheral regions in Poland, Slovakia, Romania, and to a lesser extent, Hungary.

These areas often face limitations in infrastructure, investment attraction, and business capacity, which pose challenges for long-term economic growth.

Production vs. Consumption Orientation: Regional Economic Functions

The second, slightly less dominant dimension reveals whether a region leans more toward **production activities** (e.g., manufacturing, freight transport) or **consumption functions** (e.g., housing, domestic services).

Key indicators used for this analysis include:

- **Freight transport of manufactured goods per capita** (a proxy for export potential and industrial output),
- **Number of housing units per 1,000 residents** (a proxy for the availability and development of consumer infrastructure).

In **production-oriented regions**, freight volumes are high, but housing infrastructure tends to lag — indicating a stronger focus on industrial activity over domestic consumption. These regions often enjoy good **transport accessibility**, facilitating the movement of goods toward Western European markets.

In contrast, **consumption-oriented regions** tend to show better housing conditions but lower production output.

However, some metropolitan regions — such as **Bratislava and Budapest** — present a mixed picture, showing strong production alongside relatively good housing development, which suggests a more **balanced economic profile**.

Geographically, the **north-western parts** of the Carpathian macroregion are generally more production-oriented, while the **southern and south-eastern parts** exhibit stronger consumption functions.

A Typology of Regions: Linking Economic Profiles to Policy Responses

By combining the two main dimensions of economic capital, a typology of regional profiles emerges. This allows for the development of **targeted and differentiated**

policy measures suited to each region's specific strengths and needs. Four main regional types can be identified:

Type 1: High Capital Accumulation & Strong Production

Profile: Economically developed regions with well-established business infrastructure and a strong export-oriented production base.

Examples: Western parts of Poland, Slovakia, Hungary, Czechia; Belgrade region in Serbia.

Policy implications:

- Prioritise **social infrastructure investments**, especially in urban areas experiencing rising housing demand.
- Expand **municipal housing** initiatives and enhance public services (education, healthcare, childcare) to improve quality of life.
- Focus on **retaining skilled workers** and meeting the social needs of a growing urban workforce.

Type 2: Low Capital Accumulation & Strong Consumption

Profile: Less developed regions where the consumption sector (e.g., housing, services) is relatively more advanced than the productive base.

Examples: Republic of Moldova; Most Romanian regions; Selected areas in Serbia.

Policy implications:

- Invest in **technical and transport infrastructure** to improve connectivity and competitiveness.
- Support the **growth of local businesses** through business parks, incubators, and favourable regulatory frameworks.
- Offer **investment incentives** (e.g., tax breaks, streamlined permitting) to attract both domestic and foreign investors.

Type 3: High Capital Accumulation & Strong Consumption

Profile: Regions with high economic development and well-developed consumption functions, often metropolitan profile.

Examples: Bucharest, Cluj-Napoca, Braşov, Timisoara (Romania); Szeged and Heves (Hungary)

Policy implications:

- Improve the **utilisation of existing assets**, e.g., through tech transfer and productivity-enhancing investments.
- Develop **regional transport systems** to support labour mobility and economic integration.
- Encourage **brownfield redevelopment** and innovation-oriented investment via smart incentive schemes.

Type 4: Low Capital Accumulation & Strong Production

Profile: Production-focused regions with economic activity concentrated in manufacturing or transport but lacking broader development and investment.

Examples: Eastern regions of Poland and Slovakia; Certain areas in Hungary, Ukraine, and Romania

Policy implications:

- Promote **higher-value-added economic activities**, such as advanced manufacturing and knowledge-intensive services.
- Support **smart specialisation** strategies and regional innovation systems.
- Enhance the environment for **external investment**, which can help create quality jobs and stimulate local consumer demand.

Table 1.1

Recommendations for the regions - economic capital

	"Capital accumulation" – higher	"Capital accumulation" – lower
„Production over consumption”	Opportunity to strengthen the consumer dimension.	Smart specialisations
„Consumption over production”	Incentives for investors	Development of basic infrastructure and improvement of business climate

Source: Own elaboration (EUROREG)

This typology (Table 1.1) provides a foundation for **tailored regional development strategies**. However, it is important to note that these recommendations are **not fixed or exclusive** to a specific region type. With appropriate adaptation to local conditions, elements of each policy approach can be applied across different territories to support more balanced, inclusive, and resilient territorial development.

1.2 Human capital

Human capital in the Carpathian macroregion shows significant regional variation, shaped by both its **quality** and its **viability**. These two core dimensions, identified using Principal Component Analysis (PCA), explain approximately **77%** of the total differences in human capital levels across the region (**Map 1.2**).

This typology allows for a better understanding of how regions differ in terms of:

- **Quality of Human Capital** – the educational and innovation-related capacity of the workforce.
- **Viability of Human Capital** – demographic sustainability, particularly important in the context of population ageing and migration.

These components form the basis for targeted recommendations aimed at **improving educational systems, demographic sustainability, and labour market alignment**.

Quality of Human Capital: Education and Innovation Capacity

The **first dimension** reflects the overall **educational level, innovation potential, and R&D engagement** of a region's population. Key indicators include:

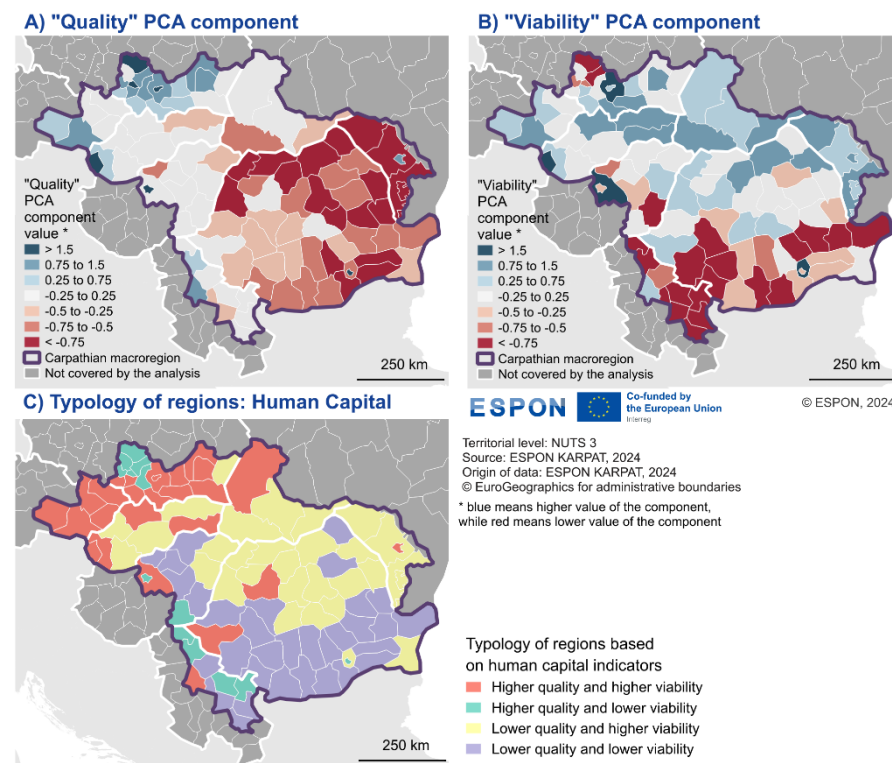
- The share of the population with higher education,
- The proportion of workers active in innovation-related sectors,
- Participation in research and development activities.

This type of high-quality human capital is strongly concentrated in **metropolitan areas** across all countries in the Carpathian macroregion. These urban centres benefit from access to universities, research institutions, and innovation ecosystems.

In contrast, **peripheral and rural areas** – particularly in northern, eastern, and southern parts of Romania and in the Republic of Moldova (except Chişinău) – display significantly **lower human capital quality**, often due to **out-migration and brain drain**. These dynamics create a spatial divide that follows a **northwest-southeast axis**, with the northwest generally exhibiting a stronger profile in this regard.

Map 1.2

Human capital – dimensions of diversity and types of regions



Viability of Human Capital: Demographic Sustainability and Growth

The **second dimension** of human capital variation focuses on its **demographic vitality**, capturing how well regions are positioned to maintain or grow their working-age population over time. It is measured using:

- Median age of the population,
- Natural population change (births minus deaths),
- Population growth (including migration balance).

Regions with high viability often have a **younger population**, sometimes supported by **positive migration trends**. This is particularly evident in:

- Carpathian regions of Poland and Slovakia,
- Parts of Ukraine and Moldova,
- Northern and western areas of Romania,
- Suburban areas surrounding major cities, where suburbanisation is contributing to demographic growth.

At the other end of the spectrum, the **southern part of the macroregion**, and some urban-industrial areas such as the **northern part of the Silesian Voivodeship (Poland)**, show demographic challenges, marked by ageing and population decline. By combining these two dimensions, a typology emerges that identifies regions with shared human capital challenges and opportunities. This provides a strategic foundation for **place-based, evidence-informed policies**:

Type 1: High Quality and High Viability

Profile: These regions benefit from a well-educated, innovation-capable workforce and a growing or demographically sustainable population.

Examples: Large cities and surrounding areas across the microregion; Northern Carpathian regions with higher population densities.

Policy implications:

- Invest in **spatial planning** to manage population growth and land use effectively.
- Prevent **urban sprawl** through strategies such as **transit-oriented development**.

- Protect **natural and landscape areas**, especially in zones at risk of being converted to construction land (e.g. for secondary homes).
- Strengthen **infrastructure and public services** to accommodate population growth sustainably.

Type 2: Low Quality, High Viability

Profile: Regions with young or growing populations but low levels of education and innovation potential.

Examples: Northern Romania; Most of Ukraine and the Republic of Moldova; Selected regions in Slovakia.

Policy implications:

- Improve access to and **quality of education at all levels**, from early childhood to higher and vocational education.
- Invest in **skills development and training** that aligns with local labour market needs.
- Focus on reducing **out-migration** by creating opportunities for **youth and returnees**.
- Encourage local **endogenous development** based on human capital potential.

Type 3: High Quality, Low Viability

Profile: These regions boast strong educational and innovation systems but face demographic decline or population ageing.

Examples: Certain subregions in the **Silesian Voivodeship (Poland)**; Some areas in **Serbia**; The **Szeged region** in Hungary.

Policy implications:

- Enhance **quality of life** to increase the region's attractiveness to new residents and reduce out-migration.
- Promote **affordable housing programmes** and improve local services to retain young families and skilled professionals.
- Foster **intra-regional mobility** and work-life balance to offset ageing trends.

- Support the development of creative and knowledge-based sectors to attract younger population.

Type 4: Low Quality, Low Viability

Profile: These regions are most vulnerable, showing both weak human capital indicators and negative demographic trends.

Examples: Eastern Hungary; Southern Romania; Southern Serbia.

Policy implications:

- Focus on **halting the loss of human capital** through strategies that improve living conditions, education, and job opportunities.
- Encourage the **return of emigrants** by creating attractive local environments (housing, education, jobs).
- Reform **education systems** to better respond to the needs of local economies and emerging sectors.
- Provide **incentives for businesses** to invest in these regions, creating local employment opportunities that retain and attract talent.

This typology (**Table 1.2**) is intended as a flexible tool. While it highlights specific region types, **the recommendations shall take into account the various territorial contexts and profiles**. Elements of each policy approach can be adapted and applied to other areas depending on the local context, development goals, and institutional capacities.

Table 1.2

Recommendations for the regions - human capital

	„Quality” - higher	„Quality” - lower
„Viability” - higher	Challenges related to spatial planning	Improving the accessibility and quality of public education
„Viability” - lower	Improving quality of life, including housing programmes	Halting the loss of human capital (including incentives for return migration). Significant strengthening of the education system

Source: Own elaboration (EUROREG)

1.3 Social capital

Social capital in the Carpathian macroregion exhibits clear regional patterns shaped by two key dimensions: **social cohesion** and the **potential for social interaction**. These components identified through Principal Component Analysis (PCA), jointly account for approximately **75%** of the total variation in social capital across the region (**Map 1.3**).

This typology enables a better understanding of regional social dynamics, reflecting differences in **socioeconomic inclusion**, **institutional trust**, **settlement patterns**, and **opportunities for community engagement**.

Social Cohesion: Stability, Trust, and Socioeconomic Inclusion

The **first dimension** of social capital variation is **social cohesion**, defined by low levels of poverty and social exclusion, low unemployment, and a strong presence of entrepreneurship and effective governance. High levels of cohesion are typically associated with:

- Low risk of poverty and exclusion,
- Dynamic local economies with entrepreneurial activity,
- High quality of governance and public institutions.

Favourable social cohesion is evident particularly in the **northwestern parts of the macroregion**, some **metropolitan areas**, **southern Hungary**, and **Transylvania** in Romania. These areas often benefit from stronger institutions, better access to services, and a higher level of economic opportunity.

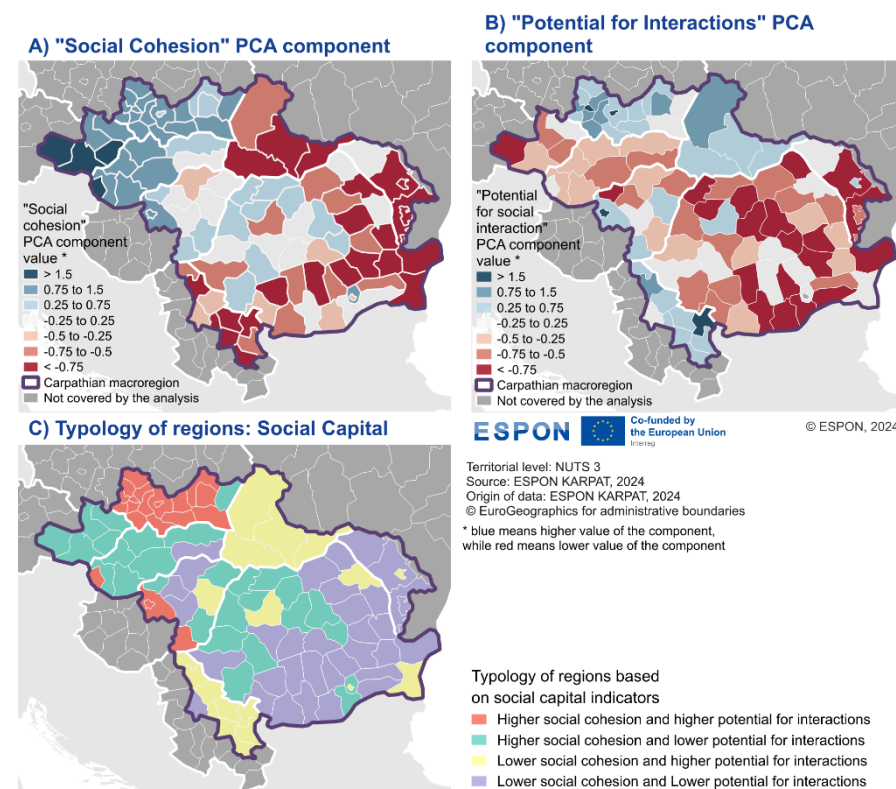
By contrast, **major challenges in social cohesion** are found in:

- **EU candidate countries** (notably parts of Serbia, Ukraine, and Moldova),
- **Southern and eastern Romania**,
- **Northern Hungary**,
- The **Košice region** in Slovakia.

These regions tend to face greater socioeconomic disparities, limited access to services, and lower levels of institutional trust.

Map 1.3

Social capital – dimensions of diversity and types of regions



Potential for Social Interaction: Density and Connectivity

The **second dimension** of social capital variation relates to the **potential for social interaction**. This is shaped by:

- Population density,
- The presence of larger urban centres,
- The structure and size of municipal and administrative units.

Densely populated areas offer greater opportunities for **bridging social capital** – diverse, outward-looking connections that often emerge in multicultural or urban environments. In contrast, rural and sparsely populated areas typically rely on **bonding social capital**, which is rooted in tight-knit, homogeneous communities.

This dimension also reflects the impact of **administrative reforms**, which in some countries (e.g., Poland) have created larger municipalities that enhance local governance capacity. Regions with high potential for social interaction include:

- Urban areas in Poland,
- Selected parts of Ukraine, Serbia, and Hungary,
- Specific zones in Romania, particularly around major cities.

Combining these two dimensions reveals four distinct region types. Each comes with specific challenges and policy needs, forming the basis for **evidence-based, policy interventions**:

Type 1: High Social Cohesion, High Potential for Interaction

Profile: These regions benefit from both strong social inclusion and vibrant social environments with high interaction potential.

Examples: Subregions in **Poland**, The **Bratislava**, **Budapest**, and **Szeged** areas.

Policy implications:

- Focus on **micro-targeting** vulnerable neighbourhoods, especially in larger cities where **segregation and socio-spatial polarization** may emerge.
- Implement **anti-segregation measures** (e.g. mixed housing policies, urban regeneration).
- Support **grassroots social capital** through initiatives like:
 - Community centres,
 - Participatory budgeting,
 - Local civic programmes and cultural hubs.

Type 2: Low Social Cohesion, High Potential for Interaction

Profile: These regions show strong potential for community engagement but lack inclusive institutions and widespread trust.

Examples: Regions in **Serbia and Ukraine**, **Chişinău** (Republic of Moldova), Selected cities and regions in **Hungary** (e.g. Debrecen) and **Romania** (e.g. Cluj-Napoca).

Policy implications:

- Focus on strengthening civil society and local governance capacity.
- Create networks of local leaders and facilitators to catalyse social engagement.
- Develop community spaces and encourage social entrepreneurship (e.g. co-operatives).
- Improve transparency and responsiveness of local institutions to rebuild social trust.

Type 3: High Social Cohesion, Low Potential for Interaction

Profile: These regions demonstrate strong social bonds and inclusion but face challenges due to low population density or fragmented administrative structures.

Examples: Rural parts of the **Czech Republic** and **Slovakia**, **Northern Romania**.

Policy implications:

- Consider **administrative reform** to enhance efficiency in service delivery.
- Develop **inter-municipal cooperation platforms**, particularly for education, healthcare, and transport.
- Address **transport exclusion** and **service inaccessibility**, especially in remote or mountainous areas.
- Support regional integration through **shared service centres** and **rural mobility schemes**.

Type 4: Low Cohesion, Low Interaction Potential

Profile: These are the most socially vulnerable regions, facing both limited inclusion and few opportunities for social engagement.

Examples: Large parts of **eastern Hungary, Southern and eastern Romania**, Much of the **Republic of Moldova**.

Policy implications:

- Prioritise **access to essential public services** (e.g. healthcare, education, social support).
- Support **targeted social programmes** addressing long-term disadvantage.
- Fund **grassroots initiatives** through grant schemes and capacity-building.
- Encourage **local leadership development**, community organizing, and **resident networks** to rebuild social capital.

As with previous typologies, these regional classifications (**Table 1.3**) are intended to **guide, not restrict**, the development of policy interventions. Recommendations should be **tailored to local conditions** and adjusted over time based on evidence, participation, and shifting regional dynamics.

Table 1.3
Recommendations for the regions - social capital

	"Social cohesion" – higher	"Social cohesion" – lower
"Potential for social interactions" – higher	Addressing issues of localised socio-economic deprivation concentration	Supporting social cohesion through strengthening institutions and fostering entrepreneurship
"Potential for social interactions" – lower	Administrative reforms to improve public service delivery	Improving access to public services and implementing social programmes

Source: Own elaboration (EUROREG)

1.4 Natural capital

The regional variation in **natural capital** across the Carpathian macroregion is observed within two primary dimensions: **natural environment assets** and **selected forms of environmental pollution**. These dimensions—identified through Principal Component Analysis (PCA)—together explain approximately **51%** of total regional differentiation in natural capital (**Map 1.4**).

It is important to note that other environmental indicators such as **CO₂ emissions** (linked to climate policy targets) and **livestock density** did not significantly correlate with these two dimensions. This suggests that they constitute distinct challenges and should be addressed through separate policy lenses.

Natural Environment Assets: Forests, Protected Areas, and Land Use

The **first dimension** reflects the **natural richness and ecological value** of an area, strongly influenced by:

- High forest coverage,
- High share of protected areas (e.g., Natura 2000),
- Low proportion of arable land.

This dimension aligns clearly with the **Carpathian Mountain range**, where ecological assets remain relatively preserved. Other areas with high values include the **Danube Delta**, a unique and ecologically significant wetland system.

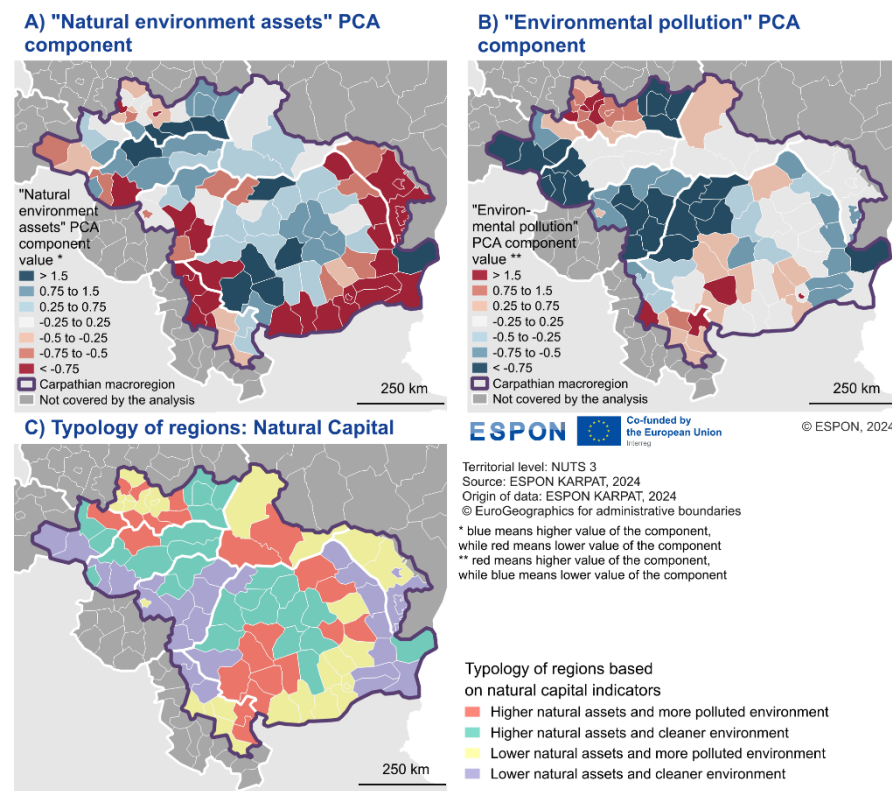
In contrast, **intensively farmed lowland regions**—notably in:

- The **Danube Valley** (Hungary, Serbia, Romania),
- The **Pannonian Basin**,
- Parts of **Republic of Moldova** and **Poland's highland areas** (Silesian and Lesser Poland Voivodeships),

—tend to score lower due to intensive land use, agriculture, and low forest coverage.

Map 1.4

Natural capital – dimensions of diversity and types of regions



Environmental Pollution: Emissions and Resource Extraction

The **second dimension** captures selected aspects of **environmental degradation**, especially:

- **PM2.5 air pollution** (fine particulate matter),
- The intensity of **mineral resource extraction**.

Regions with low pollution levels tend to combine favourable **topographic conditions**—which prevent smog accumulation—with **low industrial intensity** and a predominantly agricultural economy. These include:

- South-eastern Hungary,
- North-western Romania,
- Northern Serbia,
- Parts of western Slovakia, the Czech Republic, and Podkarpackie in Poland.

Meanwhile, pollution challenges are mainly concentrated in mountainous or high-land regions where **mineral extraction** supports resource-intensive industries.

The combination of these two dimensions was used to create a regional typology. This framework supports **tailored and context-sensitive environmental policies**, addressing both conservation and sustainable development territorial priorities:

Type 1: High Natural Assets, Low Environmental Pollution

Profile: These areas combine ecological richness with a relatively preserved environment—making them ideal for nature-based solutions and green economy initiatives.

Examples: The **Western and Eastern Carpathians** (Poland, Slovakia, Hungary, Romania), **Transylvania**, The **Danube Delta**.

Policy recommendations:

- Promote eco-certification schemes and sustainable agriculture (e.g. organic farming).
- Support community-based tourism and agri-tourism tied to local cultural and natural heritage.
- Strengthen local value chains that add economic value while preserving environmental assets.

Type 2: Low Natural Assets, Higher Pollution Risk

Profile: These areas are under pressure from pollution while also lacking significant ecological resources. Energy transition and pollution mitigation are relevant to be considered by policy actions.

Examples: Highland regions in **Silesian and Lesser Poland Voivodeships**, **Lviv and Chernivtsi oblasts** (Ukraine), Northern and central **Moldova**, **Wallachia** in Romania, **Southern Serbia** and **Belgrade**.

Policy recommendations:

- Accelerate the **energy transition** and reduce dependency on polluting industries.
- Improve **pollution control** measures, particularly for air and soil quality.
- Identify and **protect remaining ecological hotspots**, even in fragmented landscapes.

Type 3: High Environmental Value, Pollution Challenges

Profile: These regions boast strong ecological potential but face environmental threats—especially from emissions and extractive industries.

Examples: The **Western Carpathians** (Polish-Czech-Slovak borderlands), Central **Śląskie Voivodeship**, **Transcarpathia** and **Ivano-Frankivsk** (Ukraine), **Suceava** and **Neamț** (Romania), **Gorj** (Romania), **Borska Oblast** (Serbia).

Policy recommendations:

- Reduce **low-stack emissions**, especially from residential heating, through clean heating programmes.
- Monitor and **regulate natural resource extraction**, focusing on environmental restoration and mitigation.
- Encourage **renewable energy investments** while preserving high-value landscapes.

Type 4: Low Pollution, Limited Natural Assets

Profile: These regions have lower pollution levels but are not rich in ecological features. However, they offer potential for **green transformation** and **renewable energy deployment**.

Examples: The **Pannonian Basin** (Hungary), The **Danube Valley** (Serbia), The **Prut Valley** (Moldovan part of Romania).

Policy recommendations:

- Develop **wind and solar farms**, where land use can be optimized without threatening ecologically sensitive areas.
- Promote **biogas-based intensive agriculture**, integrating sustainability with economic development.
- Support **afforestation and soil regeneration** projects to gradually enhance natural capital.

- Build support for green policies,
- Encourage **pro-environmental behaviour** at all levels of society.

Efforts should be directed (**Table 1.4**) toward integrating these insights into regional development strategies and environmental action plans. These recommendations can be adapted and applied flexibly, depending on the unique characteristics of each region.

Table 1.4
Recommendations for the regions - natural capital

	„Natural environment assets” – higher	„Natural environment assets” – lower
“Environment pollution” – lower	Development of sustainable tourism	Development of sustainable agriculture and renewable energy production
“Environment pollution” – higher	Mitigating the negative effects of environmental pollution. Increasing the use of renewable energy sources	Significant energy transformation and enhanced protection of valuable natural assets

Source: Own elaboration (EUROREG)

Regardless of typology, the **promotion of environmental education and awareness is one key element to be considered by policymakers**. Increasing public knowledge of local and regional environmental challenges helps:

- Foster a **sense of stewardship** for natural resources,



Spatial development visions and territorial guidance for functional areas

2 Spatial development visions and territorial guidance for functional areas

Territorial capitals are inherently interconnected. These interrelations can be illustrated, on one hand, through a typology of regions that reflects the key spatial differentiation dimensions within the Carpathian macroregion. On the other hand, the main synergies and conflicts between the various forms of capital can be analysed based on stakeholder insights gathered through surveys and workshop discussions. Understanding these interactions enables the formulation of spatial development visions. These visions, in turn, highlight both potential threats—such as spatial conflicts, represented in a warning vision—and opportunities for sustainable territorial development, reflected in a sustainable spatial development vision. The latter is presented in multiple variants that account for the dynamic relationships between the economy, technology, and human capital, as well as society and the environment. Recognizing these opportunities supports the development of tailored guidelines for spatial development pathways within specific functional areas of the Carpathian macroregion.

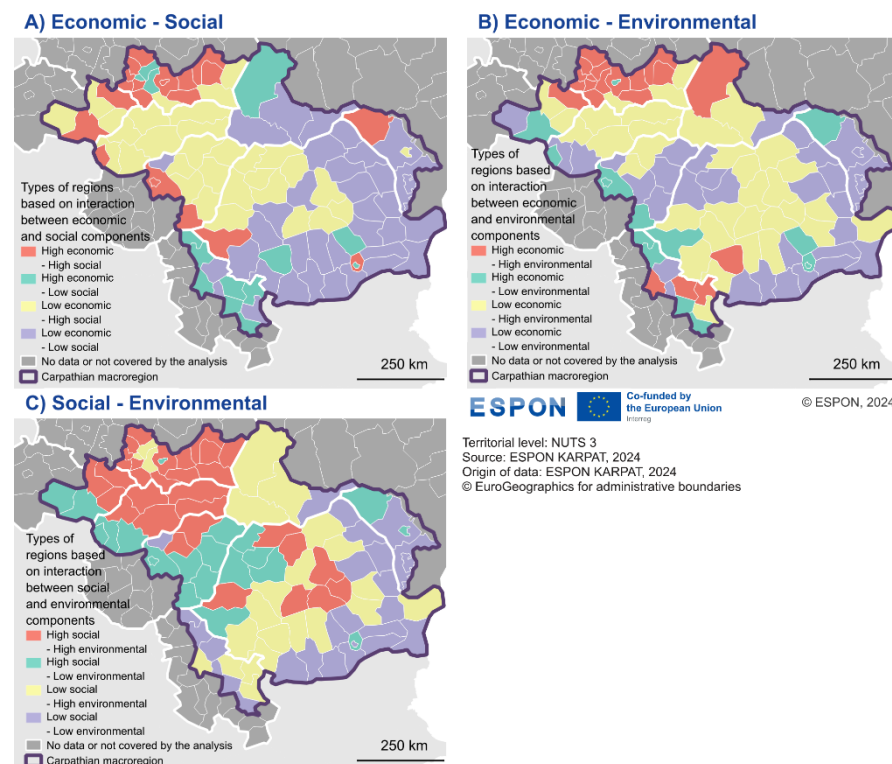
2.1 Interactions between territorial capitals

The most significant dimensions of regional disparities in the Carpathian macroregion—taking into account the above-mentioned variations in each of the four territorial capitals—are linked to economic, social, and environmental aspects (**Map 2.1**). The **economic** aspect pertains to the high accumulation of fixed assets, which enhances the productivity of the regional economy. This is further supported by the high quality of human capital and the potential for social interactions arising from high population density and the extent of urban development. Spatially, this factor highlights disparities along the axis of metropolitan areas versus peripheral, including

mountainous regions, as well as between the north-western and south-eastern parts of the macroregion.

Map 2.1

Typology of regions based on interactions between main components of diversity



The **social** aspect relates to social cohesion and the potential for social interaction, with a notable emphasis on the consumption, rather than production, as economic

development driver. Spatially, the pattern of social disparities resembles that of economic inequalities but shows a stronger alignment along the northwest–southeast (NW–SE) axis, rather than simply between metropolitan and non-metropolitan areas. The **environmental** aspect is primarily associated with the high natural assets that constitute a key component of this dimension of disparities. Spatially, this dimension of regional variation is most strongly reflected in the Carpathian mountain chain and, beyond it, the Danube Delta

By combining these three cross-thematic components in pairs, an another set of **regional typologies** was developed to capture the complex interplay between territorial capital dimensions and to identify context-specific development opportunities.

1. **Economic–Social** typology that classifies regions based on the interaction between economic potential and social conditions (**Map 2.1a**):

- **Strong performers (red)**: Regions with both high economic capacity and strong social dimension. These areas (e.g. urban regions in western Carpathians) may offer the most favourable environment for integrated, innovation-led development.
- **Double disadvantage (violet)**: Regions with weak economic performance and social challenges. These areas require comprehensive, multi-sectoral support, including infrastructure development, human capital investment, social inclusion programmes, and improved access to basic services.
- **Economically strong, socially vulnerable (green)**: Regions with sound economic indicators but facing social challenges. In these areas, redistributive policies, quality-of-life improvements, and inclusive governance can help convert economic success into broader well-being.
- **Socially strong, economically weaker (yellow)**: Regions with cohesive communities but limited economic opportunities. Here, development strategies should build on local resilience and social capital, while stimulating entrepreneurship and attracting investment.

2. **Economic–Environmental** typology that contrasts economic development levels with natural capital endowment (**Map 2.1b**):

- **High potential regions (red)**: Regions with both high economic performance and high natural assets. These areas (e.g. some Polish and Slovak urban areas adjacent to mountains) can lead in eco-innovation, sustainable tourism, and green technologies.
- **Low–low regions (violet)**: Regions lacking both economic and environmental assets. Development efforts should prioritise just transition mechanisms (policies that support communities during the move toward greener and more sustainable industries), infrastructure investment, and support for sustainable agriculture or energy.
- **Economically strong, environmentally limited (green)**: Urbanised regions with economic advantages but limited natural resources. These areas are suitable for the expansion of renewable energy infrastructure or circular economy models.
- **Environmentally rich, economically weak (yellow)**: Mountainous and peripheral areas with high ecological value but limited economic activity. These regions should be supported through conservation-linked development, such as eco-tourism, organic farming, and green entrepreneurship.

3. **Social–Environmental** typology that explores the link between social cohesion and environmental quality (**Map 2.1c**):

- **Balanced potential (red)**: Regions with both strong social and environmental capital. These areas are ideal for place-based, sustainable development strategies rooted in local identity and stewardship of natural resources.

- **Double disadvantage (violet):** Regions with social vulnerabilities and low environmental value. These areas may benefit from targeted support for community development, public service provision, and landscape restoration.
- **Socially strong, environmentally limited (green):** Regions with resilient populations but low ecological value. These are suitable for renewable energy investment, sustainable agriculture, and urban–rural connectivity improvements.
- **Environmentally rich, socially weaker (yellow):** Regions with significant natural assets but weaker social structures. Development policies should focus on strengthening local governance, engaging residents, and building inclusive economic opportunities.

The relationships between various types of capitals, as assessed by respondents¹, reveal both signs of synergy and areas of conflict (**Fig. 2**) Notable synergies were identified, particularly between economic and human capital. However, workshop discussions² highlighted issues such as weak linkages between the R&D sector and production activities, as well as the misalignment of academic programs with the needs of the regional economies —particularly the mismatch between graduates' skills and the demands of local labour markets or key industries. Another type of synergy involved the positive interaction between human and social capital. This included the impact of appropriate training for professionals on the quality of administration, as well as the potential to leverage the region's cultural resources for the development of human capital. The synergy between natural capital on other types of capitals was assessed

by survey respondents as weaker. It was largely characterised by the exploitation of natural resources, with less emphasis on the positive changes that socio-economic development could bring to the environment. Workshop participants raised concerns about industrial pollution, threats from intensive agricultural production, and the negative impacts of excessive tourism and transport infrastructure development in environmentally valuable areas. On the other hand, participants pointed to opportunities for developing ecotourism and sustainable tourism, highlighting the Carpathian region's potential to balance environmental preservation with economic and social benefits.

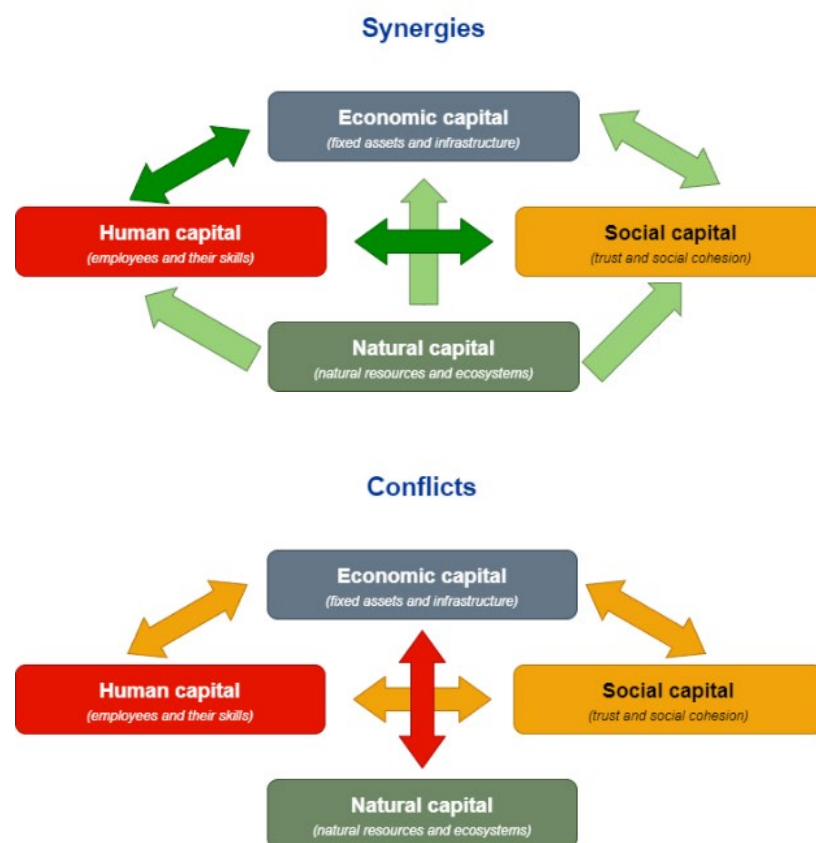
The primary manifestation of conflicts pertains to the relationship between economic and natural capital, highlighted by approximately half of the survey respondents. This primarily concerned issues related to uncontrolled suburbanisation —including unplanned residential sprawl and land-use change near urban areas—, mineral resources exploitation, the construction of new roads through environmentally valuable areas, excessive tourism, and unsustainable timber harvesting. Conflicts among the remaining capitals were assessed as significantly weaker, but 25%-30% of respondents recognized their presence. Conflicts between human and social capital and natural capital were observed only sporadically.

Survey respondents were also asked to evaluate the occurrence of synergies and conflicts across various functional areas (**Fig. 3**). These areas were categorized based on two criteria: (1) Structure of the settlement network (large cities and their functional areas, small and medium-sized towns, and rural areas) (2) Specific characteristics derived from location or specific resources or legal status (border areas, mountainous regions, and protected areas).

¹ ESPON KARPAT survey respondents were actors involved or potentially engaged in territorial cooperation in the Carpathian area, including representatives of local, regional, and national authorities, previous project participants, Carpathian macroregion partners (keep.eu), and networks such as the Carpathian Convention and Euroregions. Total: 370 responses.

² Participants of two ESPON KARPAT workshops (approx. 100) were regional stakeholders at various levels, actively engaged in assessing development factors, shaping future visions, and drafting governance and cooperation recommendations for the Carpathian macroregion.

Figure 2
Assessment of Relationships Between Territorial Capitals in the Carpathian Macroregion*



According to respondents, synergies between territorial capitals were most evident in the metropolitan areas of large cities, followed by the functional areas of small and medium-sized towns. Synergies in metropolitan areas were particularly noticeable in Poland, Serbia, and Hungary, while they were weakest in Ukraine (**Fig.3**). In Ukraine, greater synergies were observed rather in the functional areas of small and medium-sized towns, a trend also noted in the Czech Republic and Poland, though less so in Slovakia. In Slovakia, positive interactions between capitals in rural areas were rated particularly poorly, a finding echoed in Serbia and Hungary. Synergies between capitals were most frequently reported in border areas in Ukraine and Serbia, while Hungary showed the least recognition of such synergies. Similar patterns were observed in mountainous areas, where synergies were least frequently identified in Hungary. In protected areas, synergies between capitals were primarily reported in the Czech Republic and Slovakia, with significantly fewer observations in Romania and Hungary.

The perception of conflicts between territorial capitals varied significantly across countries. Conflicts in metropolitan areas and functional areas of small and medium sized cities were most frequently reported by respondents from Hungary, though similar observations, to a lesser extent, were made in Poland, Romania, and the Czech Republic.

Negative interactions between territorial capitals in rural areas were also noted in all these countries, particularly in Hungary. Such conflicts were less commonly reported in EU candidate countries and Slovakia. Conflicts between territorial capitals in border areas were primarily observed in the Czech Republic and Hungary. In mountainous regions, conflicts were most often reported in Romania, while in other countries, such conflicts were relatively rare. Protected areas were seen as arenas of conflict between capitals, particularly in Hungary, Romania, and Serbia, with some reports also from Poland, though to a lesser extent.

Figure 3
Synergies and Conflicts Between Territorial Capitals in Functional Areas by Country *

	Metropoli- tan areas	Small and medium cit- ies	Rural areas	Border areas	Mountain areas	Protected areas
SYNERGIES						
Czechia (N=18)	1.9	1.9	1.8	1.3	1.3	1.8
Poland (N=108)	2.2	1.8	1.5	1.5	1.5	1.5
Romania (N=77)	2	1.7	1.4	1.3	1.5	1.3
Serbia (N=12)	2.1	1.6	0.9	1.6	1.3	1.5
Slovakia (N=87)	1.8	1.4	0.9	1.3	1.4	1.6
Ukraine (N=20)	1.6	1.8	1.4	1.7	1.4	1.5
Hungary (N=40)	2.1	1.7	1.1	1.1	1	1.3
TOTAL (N=370)	2	1.6	1.3	1.4	1.4	1.5

	Metropoli- tan areas	Small and medium cit- ies	Rural areas	Border areas	Mountain areas	Protected areas
CONFLICTS						
Czechia (N=18)	1.4	1.4	1.6	1.8	1.2	1.1
Poland (N=108)	1.5	1.5	1.5	1.1	1.2	1.4
Romania (N=77)	1.6	1.7	1.5	1.1	1.5	1.5
Serbia (N=12)	0.9	1.4	1.3	1	1.1	1.4
Slovakia (N=87)	1.4	1.2	1.3	1.3	1.1	1.3
Ukraine (N=20)	1.1	1.1	0.9	0.9	1.2	1.2
Hungary (N=40)	2	1.6	1.9	1.5	1.3	1.7
TOTAL (N=370)	1.5	1.5	1.5	1.2	1.3	1.4

* Average based on ratings (0-3): 0 – no synergy/conflict. 1 – weakly visible. 2 – moderately visible. 3 – highly visible

Source: own elaboration based on ESPON KARPAT survey results N=370.

2.2 Spatial development visions

The determinants and opportunities identified in Chapters 2 and 3 of ESPON KAR-PAT Final Report provide a foundation for formulating visions for the future spatial development of the Carpathian macroregion. These visions were discussed with macroregional stakeholders during the second policy workshop, which was attended by representatives of public and non-public sectors at various levels, dealing with a range of thematic areas (regional development, environment and climate, transport, tourism, agriculture, and cross-border cooperation).

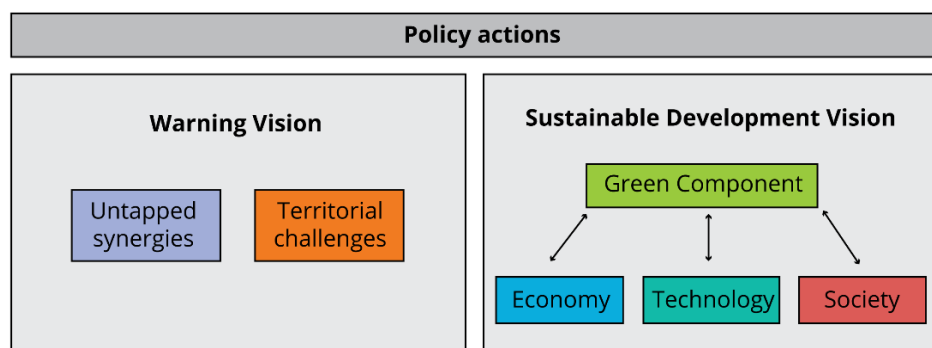
As a first step, it was decided that the development visions would be grounded in the activities of public authorities, whose actions largely determine the outcomes of current spatial trends and the region's ability to respond to external challenges. Based on this premise, two distinct visions were formulated: on the one hand, a "Warning Spatial Development Vision," emphasizing potential risks and negative trajectories; and on the other hand, a "Sustainable Spatial Development Vision," which highlights the opportunities associated with achieving sustainable development (Fig. 4).

The **Warning Spatial Development Vision** assumes that, in the face of ineffective public policies, certain adverse trends may persist or even intensify, posing specific territorial challenges. These include, for example, the depopulation of peripheral areas, uncontrolled urban sprawl, the unsustainable use of natural resources, and persistently low levels of innovation. At the same time, this vision highlights untapped development potentials associated with existing resources that are not always adequately organized or utilised. Examples include underexploited agglomeration effects - missed opportunities for collaboration and efficiency in densely populated areas (e.g. weak urban-rural linkages, fragmented service provision, limited growth diffusion to urban broader regions) or environmental assets being used in unsustainable ways. Thus, the Warning Spatial Development Vision serves not only as a projection of territorial risks and overlooked potentials, but also as a call for strategic intervention aimed at reversing negative trends and better harnessing the region's inherent development assets.

In contrast, the **Sustainable Spatial Development Vision** is built on the interactions between four key types of capital: natural, economic, technological, and social. Particular emphasis was placed on the natural environment, which—according to research

results—plays a foundational role in shaping the identity and development potential of the Carpathian macroregion. It was acknowledged that the condition of the natural environment sets the preconditions for achieving broader, cross-sectoral territorial development goals. This vision laid the groundwork for the development of three complementary sub-visions, each combining the natural environment with a different dimension of sustainability: "Natural Environment & Economy," "Natural Environment & Technology," and "Natural Environment & Society." These sub-visions were designed to leverage the region's endogenous potential while also addressing exogenous development stimuli, such as technological shifts, global market trends, and climate challenges.

Figure 4
Spatial development visions for Carpathian macroregion



Source: Own elaboration (EUROREG).

“Warning” spatial development vision

The warning vision is confined by the assumption that the current negative trends without major changes in economic, technological, social and environmental policies will linger. Within this vision countries and regions within the Carpathian macroregion are not at the forefront of innovations or sustainable development strategies, which may cause their ineffectiveness and lead to both economic and social stagnation, as well as compound their existing environmental and social issues. The lack of effective action in the areas of spatial planning, environmental protection, technological development, and efforts to halt population outflow leads to serious consequences for the economy, society, and the natural environment.

Main assumptions of the warning vision:

- **Limited innovation and investment:** The region is trailing behind technology-wise. Despite existing potential, the region enjoys low competitiveness on the national and international arena. Foreign investment stands at low levels and the economy is founded upon the traditional sectors of industry, such as agriculture and tourism.
- **Loss of human capital and depopulation:** Young, well-educated people are leaving the region in pursuit of better professional and educational opportunities. The shortage of suitable skilled job openings and the low level of technological advancement contribute to the loss of human capital. The region's peripheral areas bear the brunt of the ongoing depopulation; however, the population growth of metropolitan areas is also hampered by demographic processes.
- **Untapped synergies between territorial capitals:** The region does not take advantage of the synergies between natural, cultural, social, and human resources, as no linkages between economic, environmental and social sectors exist. The mismanagement of protected areas dampens their potential, not rarely brining about the overexploitation of natural resources and degradation of ecosystems.

- **Lack of coherent environmental policy:** The overexploitation of natural resources of the region, especially the mountain areas and the river valleys, continues. Excessive tourism, including the construction of second homes in naturally valuable areas, and uncontrolled suburbanisation cause degradation of the landscape and ecosystems. The lack of large investments in renewable energy sources underpins the primary role of carbon-intensive industries in the economy.
- **Conflicts between territorial capitals:** No harmony between the different forms of territorial capital (natural, human, social and economic) causes conflicts to grow further. Exploitation of nature, urbanisation pressures and, most importantly, conflicts of interest between investors and local communities create tensions that curtail the macroregion's development potential.

Effects of the warning vision for the Carpathian macroregion might be the following:

- **Economic stagnation:** The region's attractiveness for domestic and foreign investors wanes. Its economy, based on traditional sectors such as mining and mineral extraction, intensive agriculture and mass tourism, is consigned to economic stagnation, especially in peripheral areas. Limited innovation and low levels of investment translate into the region increasingly hinging upon external suppliers of modern technology.
- **High unemployment:** The scarcity of new job opportunities in innovative sectors coupled with economic stagnation fuels joblessness. Rural areas and smaller towns, stripped of access to sufficient new investment, are particularly affected. Skilled workers go abroad, weakening the region's human potential.
- **Depopulation and population outflow:** People, especially the young and educated, are leaving the region due to a lack of job and educational prospects. As a consequence, there is an ageing population in the region, leading to an increase in the social costs of caring for the elderly.
- **Weakening social ties in local communities:** Local communities are increasingly less integrated. Weak social ties and reduced involvement of residents

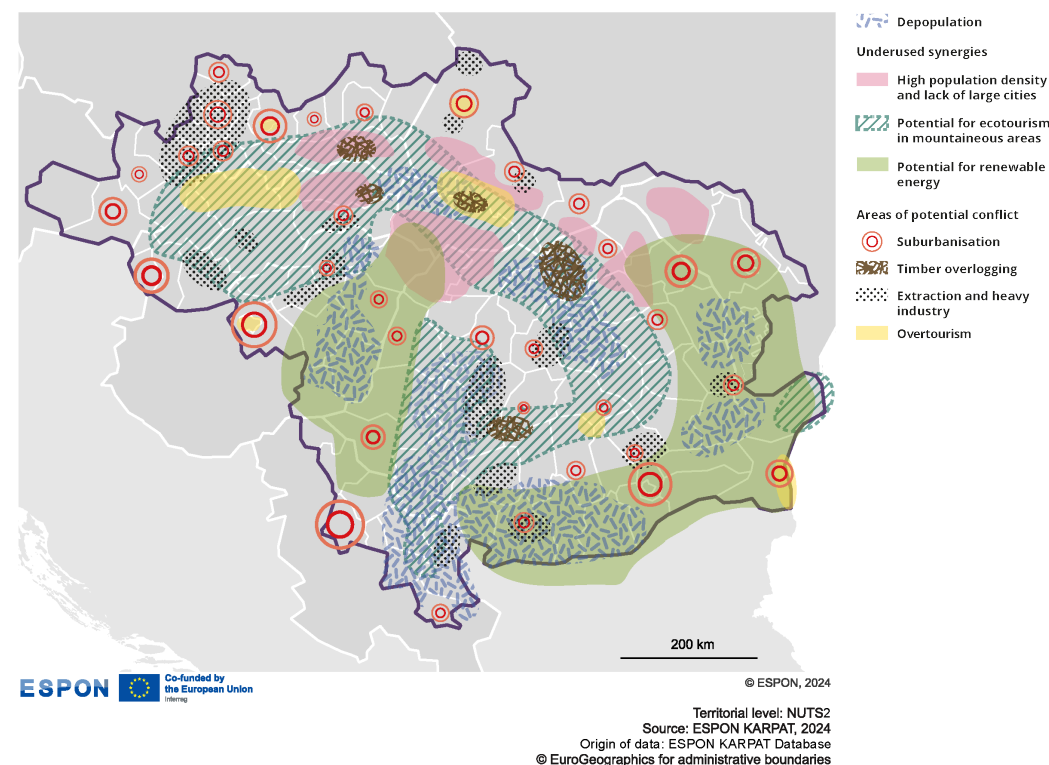
in local life lead to a weakening of regional and cultural identity. Towns and villages are becoming increasingly unattractive to live in, further exacerbating the problem of depopulation.

- Degradation of natural resources: Overexploitation of natural resources, especially in protected and mountainous areas, result in ecosystem degradation. Climate change and lack of action to protect mountain areas and renaturalise river valleys exacerbate environmental threats.
- Low investment in renewable energy sources: The share of renewable energy in the energy mix is low and the region relies heavily on carbon-intensive energy sources. This further increases greenhouse gas emissions and worsens air quality (including from low emissions).

Spatially, the following elements can be highlighted (**Map 2.2**):

- Key areas of depopulation grounded on population change over the last 20 years based on analysis of census data.
- Selected areas of untapped or underutilised synergies between territorial capitals such as: a) areas with high population density but a relatively dispersed settlement network with no large urban centres b) areas with potential for sustainable tourism development in mountainous areas, c) areas with relatively high potential for renewable energy development
- Selected areas of major conflicts between territorial capitals a) suburbanisation taking place in the surroundings of major urban centres b) risks associated with the extraction of natural resources c) risks associated with excessive timber extraction from mountain forests d) excessive tourism degrading the environmental and cultural values of the macroregion.

Map 2.2
Warning spatial development vision



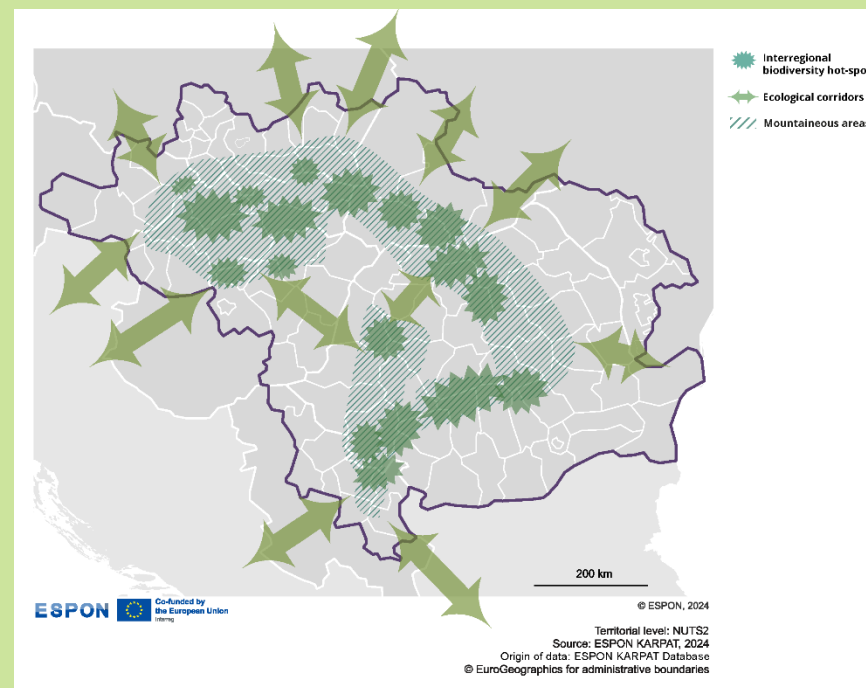
Sustainable spatial development vision – "natural environment" component

The classical conservationist approach to nature protection is insufficient to address the intertwined biodiversity and climate crises, as that would demand a more comprehensive strategy (**Map 2.3**). Tackling pressures beyond boundaries of sparsely distributed protection zones calls for the framework of an ecological network comprising functionally connected nodes. These nodes, or core areas, are biodiversity-rich zones with minimal human impact, acting as reservoirs of genetic diversity and ensuring the sustainable provision of critical ecosystem services. Ecological corridors connect these nodes, facilitating species movement, genetic flow, and allowing for adaptation across fragmented landscapes. Together, these interconnected networks bolster ecosystem resilience and sustain biodiversity amid accelerating ecological and climate crises.

The Carpathians as a whole represents a critical node within the Pan-European Ecological Network, and as such necessitates special measures for effective environment protection. To this end, intra-regional biodiversity hotspots should be identified. These hotspots include highly natural, biodiverse, large-scale, and unfragmented parts of the Carpathian ecosystem, irrespective of their current protection status. Their identification is based on data concerning (1) the conservation status of indicator species for natural ecosystems in Natura 2000 sites, (2) the locations of strictly protected areas designated under national conservation frameworks, and (3) the distribution of intact forest ecosystems according to the Carpathian Virgin Forest Inventory elaborated under the Carpathian Convention. These nodes are vital for ecosystem restoration in Carpathians and beyond, preserving rare species, genetic diversity, and natural habitats that have been degraded elsewhere. Thanks to their natural richness, these areas show resilience in face of climate and ecological challenges, being a source of key ecosystem services for the population of the region, such as carbon sequestration, water retention, and flood mitigation. By 2050, these core areas should be thoroughly studied and mapped (using new technologies, including remote

Map 2.3

"Natural environment" component of sustainable development vision



sensing), effectively protected (new protected areas will be established and some of the existing ones will have stricter protection regime), and supported by extensive buffer zones. Strict protection of the nodes will allow for renaturalisation in the neighbouring areas, and integrated management at the landscape level will foster territorial sustainable development between human communities and nature.

Viewing the Carpathians through a multi-scale lens highlights their importance within a broader ecological network, interconnected by green corridors, essential for connectivity and resilience. Using data from the Pan-European Ecological Network

project (Mücher et al. 2004) and analysing key ecosystems and protected areas in Central Europe, we identify vital corridors that link the Carpathians with other significant nodes - such as large protected areas, biodiversity hotspots, and key landscape features. The key linkages lead to the mountain ranges: Alps, Sudetes, Dinaric Alps, Balkan Mountains, and extensive wetlands such as Polesie and the Danube Delta. Enhancing connectivity between these areas is essential to support species migration, preserve biodiversity, and strengthen resilience to climate change, as emphasised in the Convention on Biological Diversity (Council of the EU 1993) and the EU Biodiversity Strategy (European Commission 2020). Shifts in habitat and species distributions due to climate change make adaptive capacity crucial for biodiversity protection.



Figure 5. CENTRALPARKS Communications Workshop in Budapest
Source: centralparks.eu

CASE STUDY

CENTRALPARKS – “green” component of sustainable development

CENTRALPARKS was a project implemented between 2019 and 2022 that revolutionized the management of protected areas in the Carpathian region. Its primary aim was to enhance cooperation among national parks and nature reserves and to develop tools supporting sustainable resource management. A key challenge was balancing environmental protection with economic pressures, especially in low-income areas where economic benefits were often prioritized. CENTRALPARKS introduced solutions based on advanced technologies, such as LiDAR, enabling precise ecosystem mapping and the identification of key conservation areas. This resulted in the development of an ecosystem services toolkit that facilitated strategic decision-making in management.

The project implemented three main training programs focused on landscape management, balancing mass tourism's impact on protected areas, and collecting and utilizing data for conservation purposes. These activities resulted in strategies to mitigate the negative impacts of infrastructure development in national parks. The initiative also led to the signing of protocols on biodiversity and sustainable tourism under the Carpathian Convention, highlighting the importance of international collaboration in conservation efforts.

The project's outcomes, including local community engagement and pilot implementations in Duna-Ipoly National Park and Slovakia, served as a model for similar initiatives in other regions. CENTRALPARKS not only exemplified effective natural resource management but also acted as a platform for raising ecological awareness and fostering cross-sector cooperation.

"Natural environment – Economy" sustainable development sub-vision

The "Natural environment-Economy" sub-vision focuses on environmentally sustainable economic development with an emphasis on job creation, attracting foreign investment and strengthening regional production systems, which emphasises reducing the negative environmental impact of economic processes. This vision also assumes the development of infrastructure, especially transport infrastructure, which will improve integration between metropolises as well as cities and rural areas. As a result, the mobility of the population should increase, trade in goods should increase and the region should become more attractive to investors.

Key assumptions of the "Natural environment-Economy" sub-vision:

- Foreign investment inflow: The region benefits from the process of nearshoring, i.e. the relocation of manufacturing activities to closer locations in Europe. The Carpathian macroregion is attracting foreign companies that are looking for new locations for their production, especially in sectors related to the green economy, renewable energy and green technologies.
- Development of regional production systems: The creation of local supply chains and the development of regional production systems promotes cooperation between companies, which increases the economic autonomy of the region and reduces dependence on imports from distant markets.
- Circular economy: Implementing the principles of a (circular) economy reduces the consumption of raw materials and waste, while increasing production efficiency and environmental protection. Minimising the loss of raw materials and emissions is a priority, especially in sectors related to industry, agriculture and energy.
- Development of transport infrastructure: The development of road and rail infrastructure (including with environmentally friendly modes of transport), especially links between the region's main cities, increases the mobility of people and goods, which supports trade, tourism and the regional economy.

- Reducing CO₂ emissions: Reducing carbon-intensive industries, promoting renewable energy sources (especially solar energy) and implementing modern low-carbon technologies in production.

Potential effects of the "Natural environment-Economy" sub-vision for the Carpathian macroregion:

- Strong economic development: The Carpathian macroregion is becoming attractive to external investors, especially in the context of the nearshoring process. Attracting investment from the sustainable manufacturing, renewable energy and green technology sectors promotes job creation, growth in the region's GDP and its international competitiveness.
- Reducing the consumption of natural resources: Increasing production efficiency that in turn increase macroregional competitiveness coincides with reducing waste and reusing raw materials that improve the environment and promotes sustainability.
- Job creation: Increased investment and the development of regional production systems lead to the creation of new, stable jobs in the sustainable production, renewable energy and green technology sectors. This in turn leads to a reduction in unemployment, especially in rural areas and smaller towns.
- Halting depopulation: With new jobs, especially for skilled labour, the region stops losing inhabitants. Young people see career opportunities in the region and stop leaving in search of better opportunities abroad. Stopping brain drain promotes the strengthening of the region's human capital.
- Increased social mobility: With better transport infrastructure, residents have better access to work, education and public services. Connections between cities and rural areas foster greater social integration and improve accessibility to various resources.
- Reducing emissions and protecting the environment: Reducing carbon-intensive industries and investing in renewable energy sources lead to a reduction in greenhouse gas emissions. Investments in solar, wind and other low-carbon technologies support the sustainable development of the region.

CASE STUDY**Holiday tourist train 'Wojak Szwejk' / 'Vlak Vojak Švejk'**

The "Wojak Szwejk" initiative is a prime example of leveraging tourism to revive cross-border railway connections and support the local economy. The project began in 2015, when local activists persuaded the Podkarpackie Voivodeship authorities to launch weekend connections on the Jasło-Komańcza route, which had been inactive since 2011. The train quickly gained popularity thanks to its scenic route and its historical ties to the Hungarian-Galician Railway, attracting tourists and railway enthusiasts alike.

Subsequent phases included extending connections to Slovakia and Ukraine, developing dedicated services for cyclists, and organizing events to promote local tourist attractions. A key aspect of the initiative was collaboration with local entrepreneurs who co-developed tourism packages combining transport, accommodation, and gastronomy. The project also inspired the development of new routes, such as a retro train line to Hungary, and highlighted the critical role of railways during crises, such as evacuating refugees from Ukraine in 2022.

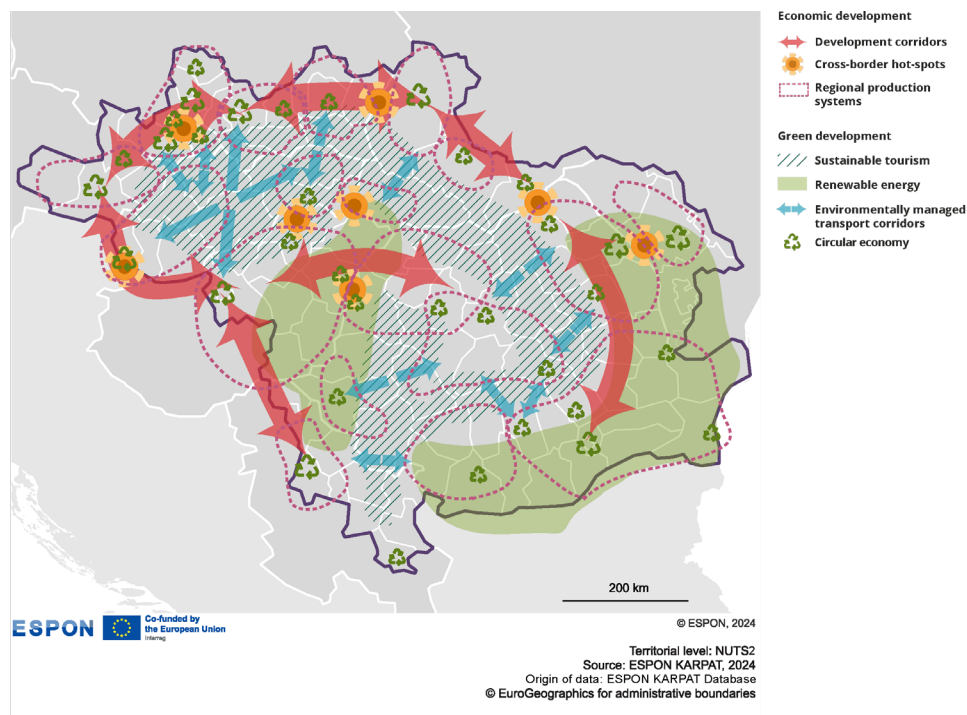
Through the cooperation of regional governments, non-governmental organizations, and local residents, "Wojak Szwejk" became a model example of integrating tourism, transportation, and local economic development. The project has been incorporated into Podkarpackie's development strategy and serves as an example for other border regions..



Figure 6. Holiday tourist train 'Wojak Szwejk' / 'Vlak Vojak Švejk'

Source: ezapiski24.blogspot.com

Map 2.4
“Natural environment-Economy” spatial development sub-vision



In spatial terms (**Map. 2.4**), this makes it possible, among other things, to distinguish:

- Development corridors in which economic integration processes may be particularly attractive for the inflow of new investments,
- Transport corridors passing through environmentally valuable areas and crossing existing ecological corridors that will require integrated environmental and landscape management to minimise the environmental impact of infrastructure development,
- Cross-border economic integration areas in which the degree of use of complementary development resources will depend on the scale of the various administrative and legal barriers
- Regional production systems, which will be based on links between major urban centres and medium-sized and small towns leaving their sphere of influence
- Areas for the development of sustainable tourism, especially in mountain and foothill areas based on the region's natural resources (including, inter alia, spa tourism, ecotourism, agrotourism, ecotourism)
- Areas identified for renewable energy development—particularly zones with intensive agriculture and favourable conditions for photovoltaics and wind power—offer opportunities to integrate clean energy production without significantly disrupting current land uses. This approach supports the diversification of the regional energy mix while promoting sustainable land use.
- Conservation of natural resources: Although the main focus is on economic development, the protection of natural environmental resources is becoming an integral part of the region's strategy. The sustainable exploitation of resources, especially in mountainous and agricultural areas, contributes to improving the quality of soils and water and reduces pressure on the environment.

“Natural environment – Technology” Sustainable Development Sub-Vision

The “Natural environment-Technology” sub-vision envisions a transformation towards sustainable economic growth driven by technology, implemented in line with the Quadruple Helix model, engaging companies, scientific institutions, local authorities, society, and ecological stakeholders. Scenario emphasises the development of regional innovation systems that encourage collaboration among diverse actors, fostering the advancement of green technologies in renewable energy, modern agriculture, and sustainable transport. As a result, the region will experience dynamic investment growth, the emergence of innovative start-ups, and the retention of skilled residents, boosting the macroregion’s competitiveness and resilience.

Main assumptions of the “Natural environment-Technology” sub-vision:

- **Development of regional innovation systems:** The Carpathian macroregion is becoming an innovation hub through collaboration among companies, scientific institutions, local authorities, civil society, and environmental stakeholders following the Quadruple Helix model. The regional innovation systems support the development of technologies in renewable energy, precision agriculture, environmental protection, and sustainable transport, fostering long-term regional growth and competitiveness. The emergence of dynamic start-up initiatives further enriches this landscape, contributing to the advancement and implementation of green technologies.
- **Academic cooperation networks:** The Carpathian macroregion is becoming a key factor in an academic collaboration network that connects universities, research institutions, and technology centres to advance green technologies and sustainable solutions for mountainous areas. This network facilitates joint research, knowledge exchange, and innovation in the fields as renewable energy, climate resilience, and environmental protection while fostering spin-off companies' growth that transform research outcomes into practical, market-ready solutions.
- **Smart specialisations:** The region leverages its unique natural resources to develop smart specialisations, focusing on sectors with the highest growth potential and competitive advantage. Key areas include among others renewable energy technologies, sustainable water and soil management, and the renaturalisation of ecosystems. These targeted specialisations drive innovation, enhance resource efficiency, and promote sustainable development by aligning regional strengths with global environmental and economic trends.
- **Green Technologies:** The priority is to implement green technologies horizontally across various sectors of the economy, enabling reduced emissions, more efficient energy management, and the protection of natural resources. Agriculture, renewable energy, and industry are the main sectors driving this shift. This cross-sectoral approach enhances regional competitiveness and accelerates the transition towards sustainable, resilient economies that can effectively adapt to environmental challenges and drive long-term growth.
- **Interdisciplinary Educational Programs:** Universities and colleges in the region are becoming leaders in creating educational programmes that combine natural sciences, engineering, social sciences and economics. The development of these programmes and youth exchange initiatives attracts students and scientists, strengthening the region's human capital. The universities and colleges offerings will also be directed at diverse resident groups – adults, seniors, and children – to raise awareness of green technology development and enhance skills.

CASE STUDY**S4C-Science for Carpathians**

Science for the Carpathians (S4C) is a research platform that, since 2008, has brought together scientists and practitioners working on sustainable development in the Carpathian region. The core mission of the network is to foster interdisciplinary research and to strengthen the dialogue between science, policy, and practice..

S4C has developed a Strategic Research Agenda for the period 2022–2030, focusing on key issues such as climate change adaptation, water resource management, social innovation, and biodiversity conservation. The agenda also addresses emerging challenges stemming from the war in Ukraine and the COVID-19 pandemic.

A cornerstone of the platform's activities is the Forum Carpaticum, a biennial conference that gathers hundreds of participants from across the globe. S4C also supports early-career researchers by organising summer and winter schools, promoting interdisciplinary learning and career development in Carpathian studies. Through its collaboration with the Carpathian Convention, S4C ensures that scientific recommendations inform regional policymaking, advancing environmental protection and sustainable development goals.

Despite challenges such as the lack of stable funding and the limited visibility of the Carpathians in international scientific discourse, S4C continues to inspire other mountain regions—such as the Caucasus—to adopt similar models of cooperation. The platform exemplifies how regional human capital can be effectively mobilised to drive both local development and global impact.

Figure 7. Forum Carpaticum POSTER

Source: carpathianscience.org

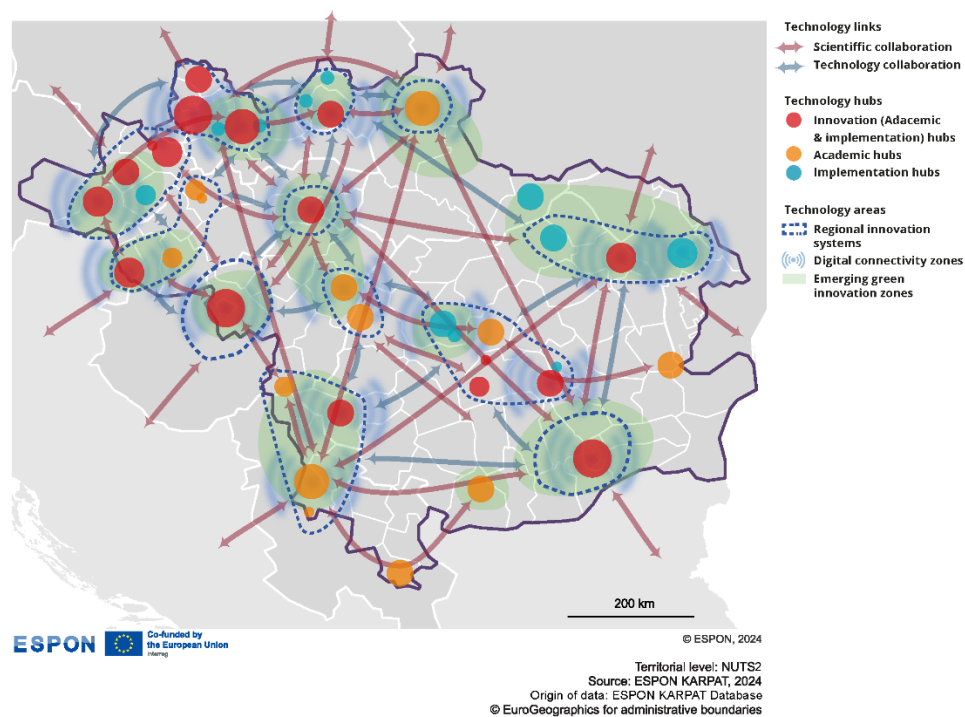


Effects of the “Natural environment-Technology” sub-vision for the Carpathian macroregion may be the following:

- **Modern economy based on innovation:** The Carpathian macroregion is becoming a centre of technological innovation in Central and Eastern Europe. Investments in research and development and the use of green technologies increase the region's competitiveness in international markets.
- **Dynamic growth of investments:** Thanks to favourable conditions for the development of innovation (renewable energy technologies, sustainable water and soil management, and the renaturalisation of ecosystems), the region attracts domestic and foreign investors who invest their capital in sectors related to green technologies. The region is becoming an attractive place for investment, accelerating the development of companies operating in sustainable development industries.
- **Retention of talents:** The region retains young talent and skilled residents thanks to interdisciplinary educational programmes and cooperation with universities and research institutes. Innovation sectors offer career growth for youth, while mature residents can redefine their paths through reskilling and upskilling programmes driven by new technologies, fostering active participation in the evolving economy.
- **Innovative society:** Growing ecological and technological awareness among the inhabitants, supported by educational institutions, leads to the creation of innovative communities actively involved in the region's development. This foundation fosters a society open to new technologies and projects related to the green economy and innovation.
- **Sustainable resource management:** The use of advanced technologies in managing natural resources, especially water, soil and forests, contributes to their protection and efficient use. Modern technologies allow for better protection of resources and the development of smart specialisations. Investments in renewable energy technologies and sustainable production contribute to a significant reduction of greenhouse gas emissions in the region.

Spatial effects of the “Natural environment-Technology” sub-vision for the Carpathian macroregion might be the following (**Map 2.5**):

- **Metropolises as centres of technological innovation:** Metropolises in the region, such as larger cities in the Carpathians, are becoming major innovation hubs. The development of R&D centres, technical universities, and technology enterprises transforms them into technological nodes in the region. These centres attract investors, specialists and students from other countries, contributing to their dynamic growth. Additionally, they foster international scientific collaboration, enabling the exchange of knowledge, joint research projects, and the development of cutting-edge technologies.
- **Smaller cities as centres of technological support and production:** Although they do not play a central role in the innovation process, they are becoming important support centres for technological hubs. They can play a key role in local production and services related to the implementation of new technologies, especially in precision agriculture and renewable energy.
- **Emerging green innovation zones:** Emerging zones around metropolitan areas and smaller cities act as incubators and diffusion points for green innovations in agriculture, industry, and tourism. These zones foster the initial development and spread of green technologies, radiating innovation outward from urban centres and gradually integrating surrounding areas into the green transition.
- **Technological collaborations:** New technological corridors are emerging between regions, facilitating the creation of innovation systems, including cross-border. These corridors enhance knowledge, technology, and resources flow, strengthening regional cooperation and fostering sustainable development through shared innovation initiatives.

Map 2.5**“Natural environment-Technology” spatial development sub-vision**

- Digital connectivity zones: Investments in digital infrastructure, such as broadband internet, environmental monitoring systems, and renewable energy networks, create digital connectivity zones that enhance the functioning of cities, towns, and rural communities. These zones ensure equitable access to technology, bridging the digital divide and fostering inclusive devel-

opment. By supporting the development of human capital, these investments empower individuals and communities to fully participate (including remote working) in the digital economy, driving innovation and long-term growth.

- Regional innovation systems: Links between metropolises, smaller towns and rural areas are supported by the development of regional innovation systems that connect businesses, research institutions and local authorities. Within these ecosystems, new products and technologies related to environmental protection, precision agriculture and renewable energy are developed. Strong links between scientific institutions and industry allow for knowledge transfer, accelerating the implementation of innovations in various sectors of the economy.

“Natural environment – Society” sustainable development sub-vision

The “Natural environment-Society” sub-vision focuses on building a sustainable society based on local communities, strong social ties, trust and sustainable spatial management. The priority of this vision is to strengthen local communities, develop sustainable agriculture and strive for greater participation of residents in the management of the region. In this vision, the Carpathian macroregion becomes an example of a community development model, in which decisions are made jointly by local communities, and the protection of natural and cultural resources goes hand in hand with economic development. Local economic initiatives, organic farming and the development of participatory cities are of key importance here, where residents have a direct influence on decisions regarding spatial planning and resource management. Improving quality of local governance assures fairness in economic and climate transition preventing most vulnerable social groups from harmful effects.

The vision emphasizes the importance of strengthening urban-rural links to ensure balanced development and equitable sharing of the benefits of sustainable growth. Rural areas contribute high-quality, sustainably produced food and ecosystem services, while urban areas act as hubs for education, innovation, and markets, supported by improved transport networks and digital infrastructure. Addressing the socio-economic challenges of a green transformation, this vision incorporates fair transition policy programmes designed to assist communities and workers dependent on carbon-intensive industries and facing limited growth opportunities due to nature conservation. These programmes include reskilling opportunities, financial support for green job creation, and measures to ensure inclusivity and prevent social inequalities.

Additionally, the vision highlights the role of targeted cohesion programmes in assuring social inclusion such as housing accessibility in urban areas or social and economic deprivation in peripheral regions, improving access to education, healthcare, and employment while fostering sustainable livelihoods and reducing regional disparities. This holistic approach weaves together sustainable community development, ecological stewardship, and equitable socio-economic opportunities to create a resilient and inclusive society in the Carpathian macroregion.

Key assumptions of the “Natural environment-Society” sub-vision:

- **Strengthening local communities:** In the “Natural environment-Society” sub-vision, the main goal is to strengthen social ties and regional identity, especially in small towns and rural areas. Local communities become responsible for resource management and economic development of the region, which promotes building bonds between residents. Cooperatives are significant element of bridging entrepreneurship, participation and inclusion.
- **Participatory cities:** In cities and smaller towns, a model of participatory cities is developing, in which residents actively participate in decision-making processes, especially in the context of spatial management, environmental protection and local economy. With growing international immigration cities provide necessary governance frameworks for integrating migrants in social participation via schools, cultural institutions and local community centres.
- **Organic and sustainable agriculture:** Organic and extensive agriculture is becoming the dominant economic model in rural areas integrating food producers in cooperatives. Farmers tap into renewable energy potential by developing renewable energy cooperatives in rural areas. This type of agriculture not only protects natural resources, but also helps build local supply chains that support the development of the regional economy.
- **Protection of cultural resources and regional identity:** The vision assumes the promotion and use of cultural resources of the region to strengthen the Carpathian identity and the development of tourism based on local culture and traditions, which promotes greater involvement of residents and their pride in the region. Heritage-based cultural tourism is linked with sustainable tourism based on natural attractions.

CASE STUDY**The Route of the Wallachian Culture – “Natural environment – Society”**

The Route of the Wallachian Culture is a long-term initiative aimed at revitalizing the pastoral heritage of the Wallachians, a shared cultural identity of the Carpathian region. The project, implemented between 2017 and 2018 with support from the INTERREG PL-SK program, involved creating tourism infrastructure, organizing workshops and cultural events, and publishing travel guides dedicated to the Wallachian heritage. The route is non-linear, highlighting places associated with Wallachian culture in Poland and Slovakia, such as museums, viewpoints, and pastoral farms.

A critical component was engaging local communities, who became active participants in the project. Events included shepherds' gatherings, handicraft workshops, and festivals promoting local culture. These activities not only preserved cultural heritage but also created opportunities for local entrepreneurship by fostering the development of gastronomy and agritourism services. Partnerships formed during the project, both between Poland and Slovakia and with Ukraine, contributed to building lasting cross-border relationships.

The project's impact extends beyond its original scope – new elements of the route were developed in Ukraine, and similar initiatives, such as the Oscypek Trail, were introduced in Poland. The Route of the Wallachian Culture not only supports heritage preservation but also serves as a catalyst for social integration and regional development, promoting sustainable tourism in the Carpathians.



Figure 8. Lemko Culture Museum - Zydranowa: information boards (Poland, Podkarpackie)



Figure 9. Exhibition in a Boyko hut in Zatwarnica (PL, Podkarpackie Voivodeship)
Source: M. Smętkowski

Potential effects of the “Natural environment-society” sub-vision for the Carpathian macroregion:

- **Resilient Local Economies based on SMEs:** The main economic driver in this vision are local economic initiatives, including small and medium-sized enterprises that are strongly linked to local resources, such as organic farming, handicrafts, local processing, renewable energy cooperatives and sustainable tourism.
- **Green jobs in sustainable agriculture and services:** Rural areas thrive on organic and extensive farming, which protects natural resources while providing high-quality local products. The growth of short supply chains and direct sales strengthens the regional economy while reducing the negative impact on the environment. Investments in reskilling and green industries diversify local economies, particularly for workers transitioning from traditional sectors.
- **Eco-Tourism:** The macroregion is becoming an attractive destination for ecotourists who are looking for authentic cultural and natural experiences. The development of tourism based on local culture, traditions and natural resources supports local communities and provides sustainable income. Sustainable, heritage-based tourism increases regional income while protecting cultural and natural resources, reinforcing pride in local traditions.
- **Strong local communities and greater involvement of residents:** The society of the region becomes strongly integrated, and residents actively participate in decision-making processes at the local level. Participatory cities become places where residents have a direct influence on local policies, especially in the areas of spatial management, environmental protection and resource management.
- **Carpathian identity:** Strengthening the Carpathian identity and rejuvenating local culture leads to greater involvement of residents in the life of the region. Cultural development and promotion of traditions help build regional pride and improve the quality of life in the region.

- **Protection of natural resources through extensive agriculture:** Thanks to the development of extensive and ecological agriculture, the natural environment is effectively protected. Extensive forms of farming support biodiversity and the protection of natural resources, including water, soil and forests.
- **Fair and inclusive green transition:** The region focuses on the renaturalisation of degraded areas, especially river valleys and mountain areas. The introduction of financial support programmes for areas that perform key ecosystem functions, such as water retention, additionally promotes nature conservation. Fair green transition policies and cohesion programmes address inequalities, ensuring vulnerable groups are included in governance and economic opportunities.

Spatial effects of the “Natural environment-Society” sub-vision for the Carpathian macroregion might be the following (**Map 2.6**):

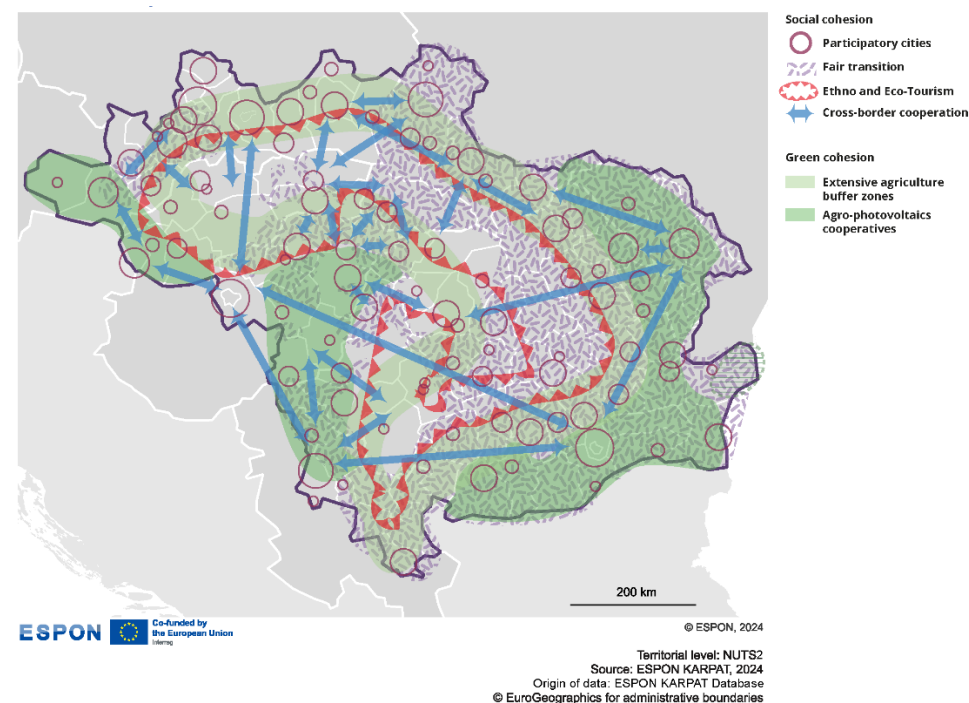
- **Extensive agriculture buffer zones:** Extensive agriculture zones act as ecological buffers, preserving biodiversity and protecting natural resources such as water, soil, and forests. These areas prioritize organic and low-intensity farming methods that coexist harmoniously with the surrounding environment. By integrating local farmers into cooperatives, these zones support regional food security and build resilience against climate change. Their strategic placement helps mitigate urban sprawl, safeguard ecosystems, and enhance the connectivity of green infrastructure in the Carpathian macroregion.
- **Local energy and agriculture cooperatives / Intensive agriculture:** Local cooperatives are the cornerstone of sustainable rural economies, bringing together farmers, renewable energy producers, and small businesses to pool resources and share benefits. These cooperatives promote renewable energy solutions, such as solar or biomass projects, while supporting sustainable agricultural practices. They also strengthen local supply chains, enabling farmers and producers to directly reach markets, reduce waste, and increase economic self-sufficiency. The cooperative model enhances social ties and ensures fair economic participation for all community members.

- **Participatory cities:** Cities in the Carpathian macroregion adopt participatory governance models, allowing residents to actively engage in spatial planning, resource management, and local economic decisions. These urban areas serve as hubs for innovation, education, and multicultural integration, fostering strong connections between local and international communities. Participatory cities also integrate sustainable infrastructure, including improved public transport and green spaces, and provide frameworks for equitable access to housing and services, enhancing overall urban resilience.
- **Eco-Tourism hotspots:** Focused on heritage-based and nature-friendly tourism, these hotspots celebrate the Carpathian region's rich cultural and ecological diversity. They integrate local traditions, crafts, and gastronomy with sustainable tourism practices, drawing visitors to authentic experiences such as eco-lodges, cultural festivals, and guided nature tours. These hotspots generate sustainable income for local communities while promoting environmental conservation and pride in regional identity, ensuring minimal ecological footprint and long-term socio-economic benefits.
- **Fair transition zones:** Transition zones are designed to support communities and workers affected by the shift from traditional sectors to green economies. These areas prioritize inclusive development through reskilling programmes, financial assistance for green job creation, and investments in nature-based solutions. By focusing on the revitalization of degraded lands and promoting ecosystem services such as water retention, these zones ensure a just transition for vulnerable populations while contributing to the region's climate adaptation goals.
- **Cross-border governance clusters:** These make the top-down and bottom-up foundations of collaboration between Carpathian regions and countries emphasizing coordinated efforts in economic development, social integration and ecological conservation. These clusters enhance regional connectivity through improved transport and digital infrastructure while harmonising policies to address shared challenges such as cross-border access to services of general interest, cross-border collaboration in providing emergency services, labour mobility, entrepreneurship, biodiversity protection, water

management, and climate resilience. This cooperative approach strengthens social cohesion, resilience, and the overall quality of life for communities across the region, reinforcing the Carpathians as a model of transnational sustainability and inclusivity.

Map 2.6

“Natural environment-Society” spatial development sub-vision



2.3 Development directions in different types of functional areas

After synthesising regional differentiation typologies in the Carpathian macroregion, it is necessary to focus on identifying the development directions of various functional areas (see below) in light of the three distinguished variants of a sustainable development sub-visions. Functional areas were distinguished on one hand based on their role within the settlement system structure (metropolitan areas, small and medium-sized cities, rural areas) and on the other hand, specific characteristics stemming from their unique location (border areas), resources (mountain areas), or legal status (protected areas). For each of them, desirable development directions were identified, considering economic, technological, and social aspects, with the aim of mitigating risks and leveraging underutilised potentials highlighted in the warning spatial development vision (**Table 2.1**).

Table 2.1

Sustainable spatial development vision in different functional areas: effects and development directions

Functional areas	Sustainable Spatial Development Vision		
	“Natural environment – Economy”	“Natural environment – Technology”	“Natural environment – Society”
Metropolitan areas	Owing to the inflow of foreign investment and the development of local production systems, metropolises are becoming economic centres where innovative activities in manufacturing and services are concentrated. Modern business centres and technology parks are emerging. The renewable energy, green technology and sustainable production sectors are developing.	Due to their established leadership in knowledge production and technological advancements, metropolitan areas are pivotal drivers of technology-driven regional growth. These cities attract investors and talent, fostering dynamic collaborations within regional innovation systems that connect businesses, academic institutions, and local authorities. They will evolve into technological hubs that enhance the region's competitiveness and accelerate the diffusion of technologies, especially in renewable energy, sustainable transport, and precision agriculture.	Metropolitan areas are leaders of economic growth, access to education opportunities, innovative jobs and affordable housing. In metropolitan areas and cities, both larger and smaller, a model of participatory cities is developing, in which residents have a greater influence on spatial management and planning. The increased involvement of local communities in decision-making leads to better spatial planning, sustainable urban development and care for the quality of life in cities.
Small and Medium size cities	Smaller urban centres are an integral part of regional production systems, which counteracts their peripheralisation and loss of function. Logistical functions and manufacturing activities, including agri-food industries thanks to their links with rural areas, are developing in them.	Smaller cities will play a crucial role as support centres for technological hubs, mainly focusing on precision agriculture and renewable energy. They will provide essential local production and services tied to the implementation of advanced technologies, bridging the gap between large innovation centres and rural areas.	Smaller and medium sized cities and towns are becoming important community centres, where the local economy, based on small businesses, plays a key role. Residents of cities cooperate in cooperatives and other local economic initiatives, which increases their self-sufficiency and promotes economic development without overexploitation of natural resources.

Functional areas	Sustainable Spatial Development Vision		
	“Natural environment – Economy”	“Natural environment – Technology”	“Natural environment – Society”
Rural areas	Areas of intensive agriculture are being modernised with the introduction of precision farming technology and elements of circular economy, which promotes a reduction in the use of water, pesticides and chemical fertilisers. In extensively farmed areas, organic farming is being developed, which minimises environmental impacts and promotes biodiversity. Investments in agricultural infrastructure, farmer education and organic certification help to increase the profitability of these areas. At the same time, afforestation and restoration of parts of the land, such as river valleys, is being promoted.	Through strengthened collaboration between local communities, agricultural stakeholders, and scientific institutions, rural areas will benefit from a knowledge transfer focused on sustainable agriculture, renewable energy, and ecosystem protection. These areas will become practical testing grounds for innovative resource management solutions, such as sustainable water and soil management practices, which can then be scaled to other regions. Rural areas might enhance regional resilience and drive community-based innovations by fostering job creation linked to sustainable industries.	The use of sustainable agricultural practices, such as crop rotation, agroforestry and minimal use of chemicals, helps protect the environment while increasing production efficiency. Extensive agricultural areas are supported by programmes for the development of organic agriculture and local economic initiatives. Thanks to sustainable agriculture, these areas become more self-sufficient, and the development of local supply chains provides better access to markets for small farmers. Local communities are becoming more self-sufficient and autonomous, which encourages the development of small economic centres and reduces the problem of depopulation.
Mountain areas	Exploitation of resources in mountain areas is reduced, their impact minimised. Emphasis is placed on developing modes of development that do not damage the environment (e.g. ecotourism, agritourism). The increase in renewable energy reduces pressure on traditional natural resources.	Mountain areas will leverage specialised knowledge and technologies from regional innovation systems to address their unique environmental challenges effectively. Academic collaboration will facilitate the development and implementation of technologies for the renaturalisation of river and mountain ecosystems, reducing environmental impact, increasing resource efficiency, and supporting sustainable development.	Natural resources, especially mountain areas and river valleys, are protected through the support of sustainable development programmes and organic farming. These resources become the basis for ecotourism and the development of local economic initiatives, drawing inspiration from the traditional culture of the Wallachian people in the Carpathians, which emphasized harmony with nature and sustainable pastoral practices.
Border areas	Cross-border cooperation is being developed in border areas, particularly in the context of sustainable economic development. Investment in local infrastructure and joint projects related to the green economy. Border areas are becoming more integrated through improved cross-border transport links and cooperation on nature conservation and organic farming.	In border areas, the establishment of cross-border innovation corridors will strengthen regional cooperation and facilitate the exchange of knowledge and technology across national borders, supporting the integration of sustainable technologies in sectors such as renewable energy and eco-friendly industries.	Local networks of cross-border cooperation are being created, which promote joint economic and social initiatives. Cooperation with neighbouring regions promotes the exchange of experiences, technologies and resources, especially in the field of sustainable management of natural resources (e.g. protection of water and forests in border areas). Thanks to this, border areas become well-integrated elements of the macroregion, and their marginalisation is effectively limited.

Functional areas	Sustainable Spatial Development Vision		
	“Natural environment – Economy”	“Natural environment – Technology”	“Natural environment – Society”
Protected areas	The protection of natural areas is strengthened, including the introduction of extensive forms of development (e.g. sustainable tourism) in the buffer zones of protected areas. A system of subsidies for areas providing ecosystem services is introduced.	In protected areas, technological innovations will play a critical role in optimising the management of natural resources, ensuring efficient conservation efforts, and promoting sustainable use of water, soil, and forests. These areas will benefit from cutting-edge solutions such as smart monitoring systems and sustainable tourism practices, enhancing ecological preservation and economic sustainability.	Local communities, in cooperation with regional authorities, carry out renaturalisation initiatives that help preserve biodiversity and improve the quality of the natural environment. These include creation of ecological corridors and the protection of natural areas, especially in mountain and river areas. The links between settlement nodes and protected areas are strengthened by the development of ecotourism, which is becoming an important element of the local economy, while contributing to environmental protection.

Source: Own elaboration (EUROREG).



**Governance structures
and territorial
cooperation
recommendations in
Carpathian microregion**

3 Governance structures and territorial cooperation recommendations in Carpathian macroregion

The governance structures in the Carpathian macroregion are complex and diverse, presenting a significant challenge for territorial cooperation. Below is a summary of the institutional frameworks and selected examples of territorial cooperation practices. This is followed by an overview of the main barriers and opportunities for cross-border cooperation. Practical tips are guiding conclusions that lead to recommendations.

3.1 Guide to Territorial Cooperation Instruments in the Carpathian Macroregion

Administrative structures

The Carpathian macroregion spans countries with diverse governance frameworks. While all follow a unitary parliamentary democracy model, their subnational governance structures vary (see **Table 3.1**):

- **Three-tier systems:** Poland and Ukraine (regions, counties, municipalities)
- **Two-tier systems:** Czechia, Slovakia, Hungary, Romania, Serbia, Republic of Moldova (regions/districts, municipalities).



Practical tip: When planning joint actions, verify which governance level holds the decision-making power for your project domain in each country.

Table 3.1
Competencies at different levels of governance in the Carpathian countries, 2024

Sectors and sub-sectors	Levels of governance	CZ	SK	PL	HU	RO	RS	MD	UA
Transport and economic affairs	Local								
	Intermediate								
	Regional								
Environment protection	Local								
	Intermediate								
	Regional								
Housing	Local								
	Intermediate								
	Regional								
Planning and Community amenities	Local								
	Intermediate								
	Regional								
Health	Local								
	Intermediate								
	Regional								
Culture and recreation	Local								
	Intermediate								
	Regional								
Education	Local								
	Intermediate								
	Regional								
Social welfare	Local								
	Intermediate								
	Regional								

Source: Elaborated based on OECD/UCLG data (2022).

Fiscal Power and Governance Capacity

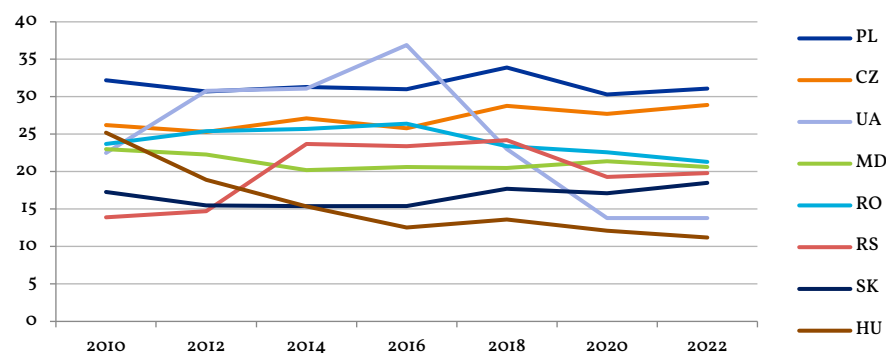
The degree of decentralization influences how much autonomy subnational governments have in project design and implementation. **Chart 3.1** shows that in 2022, Poland (31.1%) and Czechia (28.9%) had the highest shares of sub-national government expenditure, indicating higher local capacity. Hungary (11.2%) and Ukraine (13.8%) reported the lowest, highlighting centralization challenges.



Practical tip: Capacity constraints may limit action at local level; if this is the case support partnerships with higher-tier institutions or cross-border structures when needed.

Chart 3.1

Dynamics of sub-national government expenditure as % of general government expenditure in the Carpathian countries, 2010-2022*



Source: Elaborated based on OECD/UCLG and IMF data (2022).

*subnational level (regional, intermediate or municipal); an intermediate tier of government between the local, municipal tier and national government.

Territorial Cooperation: Euroregions

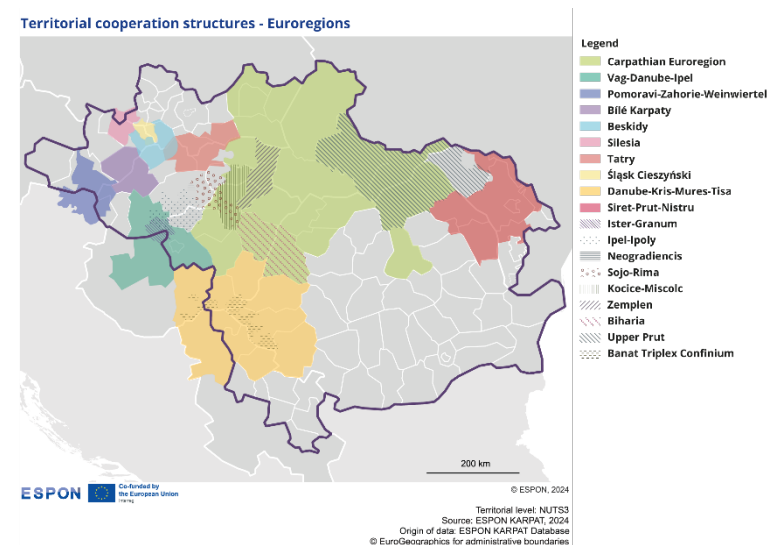
Euroregions are a form of cross-border cooperation based on political agreement between local governments of neighbouring countries at different administrative levels. This is a flexible form of cooperation without a legal personality. As for 2023 there are 19 Euroregions in the Carpathian macroregion (**Map 3.1**).



Practical tip: Euroregions are great for dialogue and coordination among local actors with limited institutional barriers.

Map 3.1

Map of Euroregions in the Carpathian Macroregion



Source: own elaboration based on national government data portals, Euroregion official websites

Territorial Cooperation: EGTC

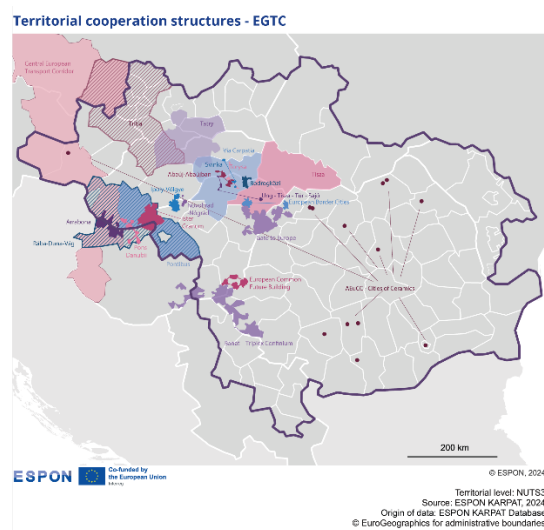
The European Grouping of Territorial Cooperation (EGTC), enabled in 2006 by a regulation of the European Parliament, is the main instrument for cooperation that requires legal personality. By 2023, 25 EGTCs in the Carpathian macroregion have been created. **(Map 3.2)**



Practical tip: EGTCs are great for legal contracting, project implementation, and institutional funding.

Map 3.2

Map of European Groupings of Territorial Cooperations (EGTC) in Carpathian Macroregion



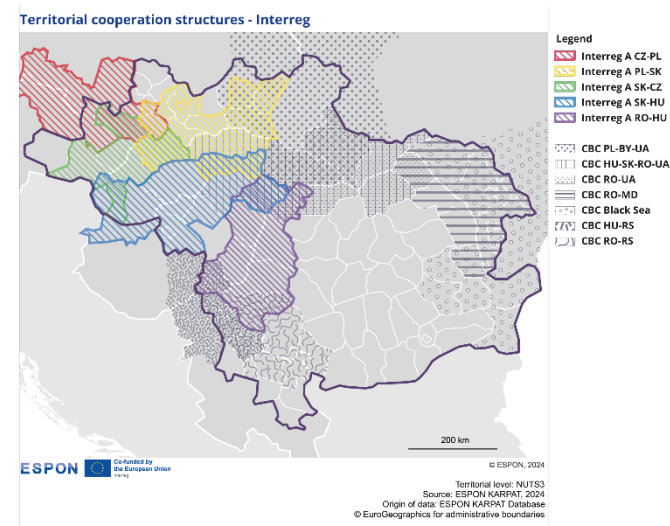
Source: Own elaboration based on Committee of the Regions, CESCO, EGTC websites

Territorial Cooperation: Interreg Programmes

Interreg programmes offer a range of frameworks in multi-level governance bringing together actors from the public, private and NGO sectors. **Map 3.3** reveals a complex and interconnected network of eligible areas with 5 Interreg A programmes between EU member states and 7 Interreg CBC programmes covering also candidate countries like Ukraine, Serbia and the Republic of Moldova.

Map 3.3

Map of INTERREG cooperation structures in Carpathian Macroregion, 2014-2020



Source: own elaboration based on European Commission

Territorial Cooperation: Transnational programmes and initiatives

Transnational cooperation in the Carpathians began before the 2004 EU enlargement, with early efforts focused on regional development and multilevel partnerships (**Map 3.4**). A key initiative is the **International Visegrad Fund** (est. 2000), promoting collaboration among Czechia, Slovakia, Hungary, and Poland.

In recent years, **Interreg transnational programmes** (strand B) have played a central role, though coverage across the macroregion is uneven. **Interreg Central Europe** serves the northwest (aligning with the Visegrad Fund), while **Interreg Danube** targets the southeast, but excludes Polish and Lviv-based partners—limiting coordinated action, especially in mountain-specific contexts.

The **Carpathian Convention** (signed 2003, ratified 2006) remains the only framework covering the entire mountain range. Signed by seven countries, it promotes environmental protection and sustainable development, acting as a unique legal and governance platform for integrated regional cooperation.

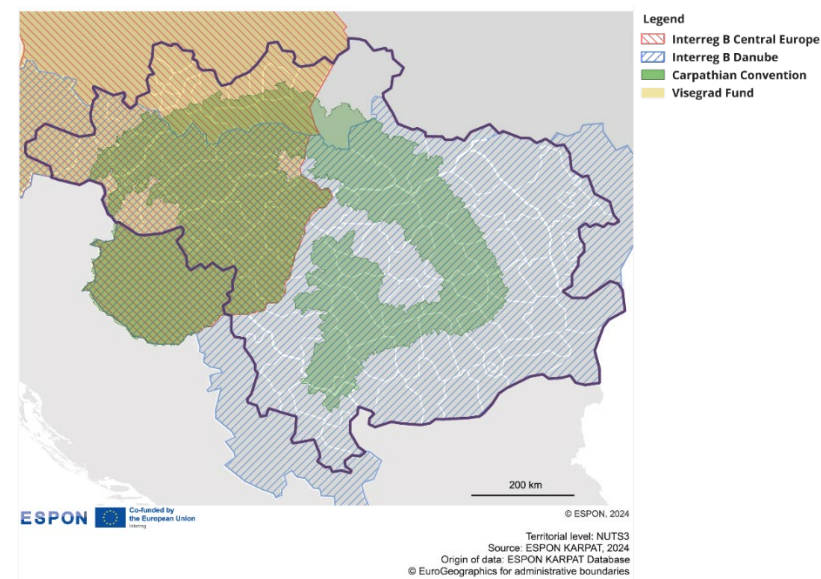
Complementing this, the **Carpathian Interregional Group** was created in 2016 within the European Committee of the Regions. Chaired by Władysław Ortyl, it advocates for a **Carpathian Macroregional Strategy**, fostering collaboration among EU and non-EU partners (including Serbia and Ukraine). It takes inspiration from the EU Alpine Strategy, especially regarding its emphasis on sustainability, the protection of cultural heritage, and the promotion of cross-border governance.



Practical Tip: Identify the transnational programmes that include your region and partners, and use frameworks like the Carpathian Convention and Interregional Group to build strong cross-border networks. This helps align goals, access funding, and ensure inclusive cooperation across EU and non-EU areas.

Map 3.4

Transnational programmes and initiatives in the Carpathian Macroregion, 2014-2020

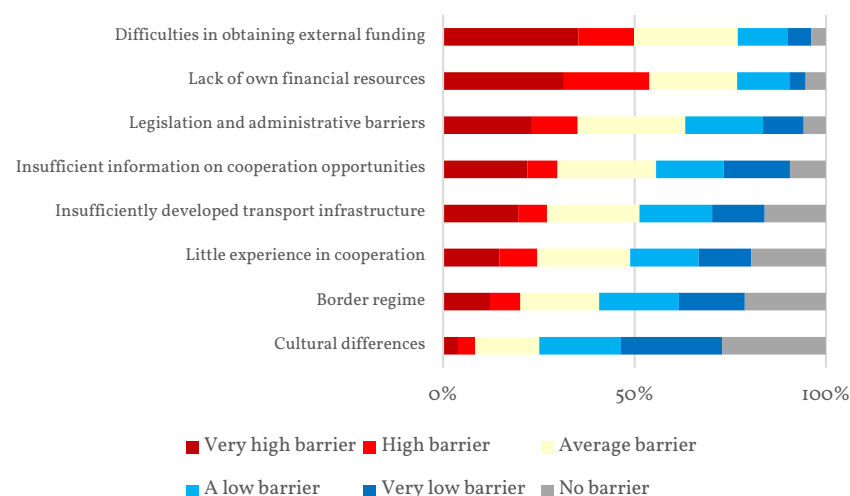


Source: Own elaboration based on European Commission, Carpathian Convention, Visegrad Fund.

3.2 Barriers and opportunities for transnational territorial cooperation

This part presents a structured overview of the key barriers (**Chart 3.2**) and opportunities for cooperation in the Carpathian macroregion based on data collected from the KARPAT survey and stakeholder interviews. The section is arranged by order of importance, starting with the most pressing challenges and ending with enabling factors and practical support mechanisms.

Chart 3.2
Barriers in transnational cooperation in the Carpathian macroregion according to the KARPAT survey



Source: Own elaboration based on KARPAT survey [N=355] (EUROREG).

Financial barriers

Survey participants overwhelmingly pointed to financial constraints as the primary barrier to cross-border cooperation in the Carpathians.

- External Barriers: Difficulty accessing EU funds (e.g., Interreg, NDICI, IPA).
- Internal Barriers: Lack of own resources to co-finance projects or develop proposals.



Practical Tip: Establish dedicated pre-funding mechanisms or technical assistance to support project preparation and application, particularly for less-resourced municipalities.

Current EU programmes (e.g., Interreg A/B) are fragmented and do not support all Carpathian countries in a single project, creating structural inefficiencies.

Stakeholders highlighted the urgent need for a dedicated Carpathian cooperation programme or better adaptation of current funding streams to match the macroregional realities.



Opportunity: establishing a dedicated Interreg programme specific to the Carpathians, which could enable unified project implementation across the entire macroregion.

Legal and Administrative Barriers

Legal and administrative mismatches remain a **major barrier** to cooperation in the Carpathian macroregion. They are especially pronounced at **EU–non-EU borders**, where differences in law, administrative powers, and governance structures complicate joint action. These challenges are amplified by **Schengen vs. non-Schengen divides**, and varying levels of **political decentralisation**.

This asymmetry means **non-EU partners** like Ukraine often **cannot lead EU-funded projects**, limiting their engagement and influence. The problem goes beyond international borders — even within the same country, **differences in budget autonomy, responsibilities, or administrative capacity** across regions hinder collaboration.



Practical Tip: Strengthen decentralised cooperation mechanisms where possible, and use dialogue with higher-level governments to push regional needs onto the national agenda. Document and advocate for specific legal bottlenecks from the local level upward.

Ukraine's **martial law** added another layer of complexity. Interviewees noted sectoral legal differences (e.g. in agriculture or forest management), though these were generally seen as manageable.

Recognising the severity of these barriers, the EU has developed several instruments to mitigate them. Among the most notable is the **b-solutions initiative (Association of European Border Regions, 2024)**, launched in 2018 and praised by KARPAT interviewees. This instrument supports **case-by-case legal analysis** and **pilot actions** to resolve specific cross-border obstacles.

Yet, interviews made clear that **many local actors are unaware** of such instruments or lack the capacity to use them effectively. Furthermore, several of the legal issues identified — especially those involving national legislation — are **beyond the mandate of regional authorities** and require **direct engagement from state governments**.



Practical Tip: Legal frameworks don't need to be identical, but mutual recognition and coordination mechanisms can reduce friction.

Compounding the legal and administrative barriers is a significant **information and knowledge gap**. Many stakeholders noted they lack access to **comparative information on regulatory regimes**, or even clarity about **which authority holds what power** across the border. This lack of transparency hinders both **project design** and **implementation readiness**.

Institutional Capacity and Coordination Deficits

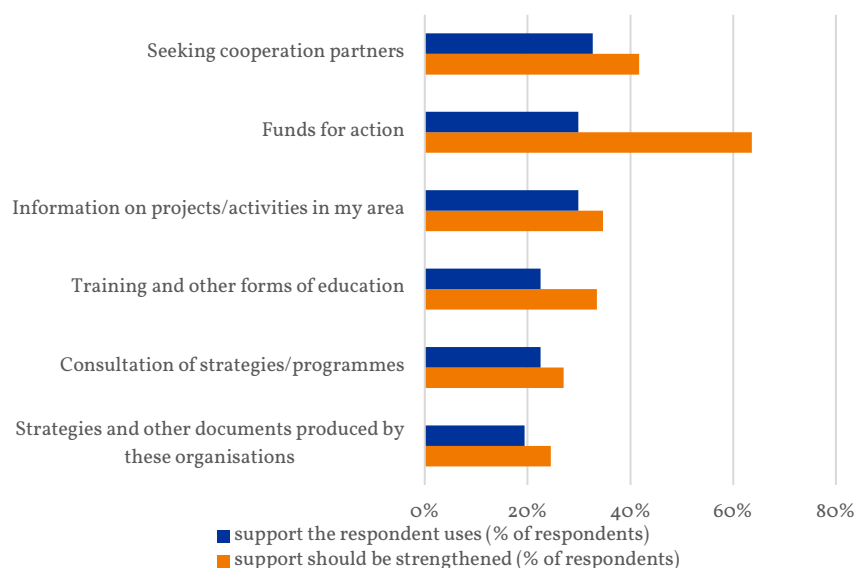
Even where funding and legal frameworks are navigable, many stakeholders lack the **institutional capacity** to engage effectively. Among key factors it's possible to identify key barriers. **Lack of skilled staff** was seen as an issue especially at the local level, where resources to manage EU projects are limited. Another is **absence of stable cooperation** structures outside EU-funded projects. Moreover, there are **organisational misfits** including variability in the size, autonomy, and responsibilities of local governments across countries.



Practical Tip: Introduce training programmes and long-term funding to develop permanent transnational cooperation units within local and regional authorities.

Chart 3.3

Support Used from Transnational/Cross-Border Organisations and Views on Strengthening Them*



* multiple answers were allowed

Source: Own elaboration based on KARPAT survey [N=355] (EUROREG).

Development of the support in the most needed forms presents an opportunity to strengthen the Carpathian cooperation potential. It could be implemented along with

the establishment of the specialised Carpathian contact point – a “one-stop” informational point on various Carpathian cooperation forms. Such networking platform, with adequate funding and projects inventories would enable organisations to contact, plan common projects and exchange good practices, taking into account the national specificities and facilitating the process of cooperation.



Opportunity: Establishing a Carpathian Contact Point which would gather, clarify, and disseminate cross-border legal information, coordinate with national authorities, and support project developers in navigating complex governance environments.

Political Commitment

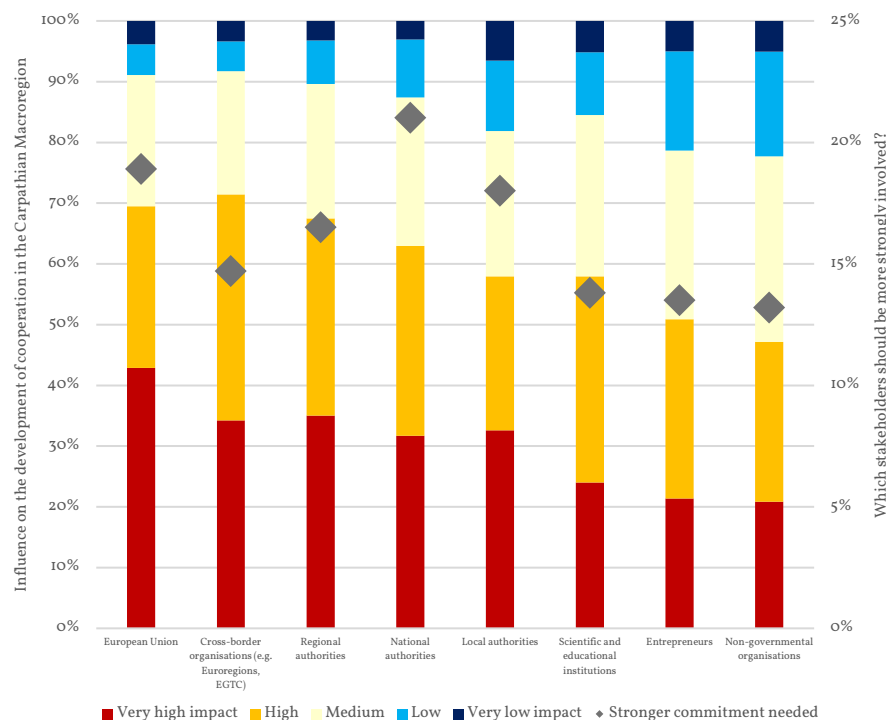
Another aspect of the Carpathian institutional environment that may be seen as a political barrier is the insufficient political commitment or engagement of various stakeholders, giving territorial cooperation little priority (**Sienkiewicz, 2021; Shuliak and Shuliak, 2021**).

A key structural issue identified is the **lack of sustained political will**, especially among national-level authorities. Cross-border cooperation often takes a **backseat to national priorities**, and there is a need for **better coordination and engagement** across EU, national, regional, and local levels (**Chart 3.4**). This issue is improving.



Practical Tip: Encourage multi-level governance frameworks and align national legislation with grassroots initiatives and cross-border objectives.

Chart 3.4
Stakeholder influence on Carpathian cooperation and areas needing stronger commitment



Source: Own elaboration based on KARPAT survey [N=355] (EUROREG).

Non-Critical barriers: Infrastructure, Cultural Differences, Strategic Vision

While infrastructure is not the most serious barrier, **transport limitations** do hinder personal interaction and project delivery in some regions. **COVID-19 disruptions** worsened this situation in certain corridors, delaying cross-border connection projects.



Practical Tip: Integrate cross-border infrastructure needs into national recovery and regional development plans, especially under EU Green and Digital strategies.

Interestingly, **cultural barriers ranked lowest** in both surveys and interviews.

- Less than 10% of respondents saw them as a major issue.
- Stakeholders often described cultural diversity as an **asset**, not a problem.

However, **low cooperation culture and mistrust** were still mentioned as **latent social barriers** in certain regions. Stakeholders identified a **lack of formally adopted macroregional strategy**, common identity and coordinated planning tools as a constraints to long-term cooperation.



Practical Tip: Even without formal EU endorsement, develop a shared narrative and select pilot projects to kickstart cooperation and promote visibility.

High-Potential Thematic Areas

Despite these challenges, there are **clear opportunities** to build a strong cooperation agenda, aligned with EU policy goals (Green Deal, Recovery, Digital).

Based on survey results (**Chart 3.6**), the most promising in terms of potential for development of transnational cooperation in Carpathian macroregion are:

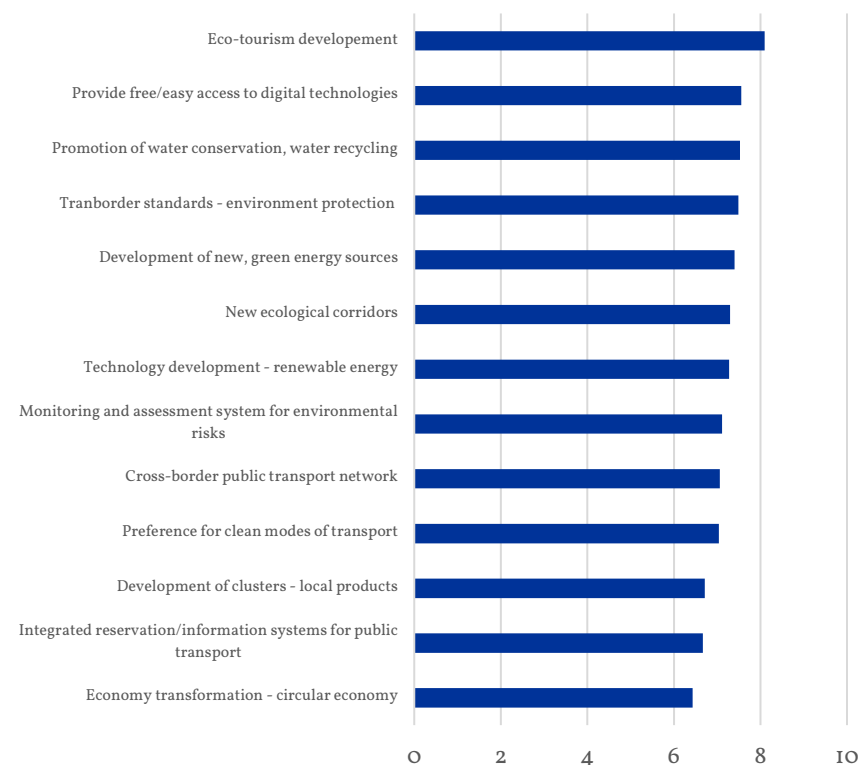
- **Eco-tourism** that was identified as the standout area, receiving significantly higher ratings than other sectors.
- Other top-ranked areas are related to **facilitating access to digital technologies, promotion of water conservation and water recycling** as well as **transborder standards for environment protection and development of new green energy sources**.

In contrast, the following areas were seen as having relatively lower potential for such cooperation:

- **Circular economy initiatives** (possibly due to limited infrastructure and implementation conditions in mountainous and rural areas)
- **Local product clusters** (which may suggest potential regional competition in some areas)
- **Cross-border ticketing systems** (likely reflecting underdeveloped public transport connections in the Carpathians)

Chart 3.5

Potential for development of transnational cooperation in Carpathian macroregion



Source: Own elaboration based on KARPAT survey [N=355] (EUROREG).



Figure 10. Survey among border residents #ACCESS fieldwork.

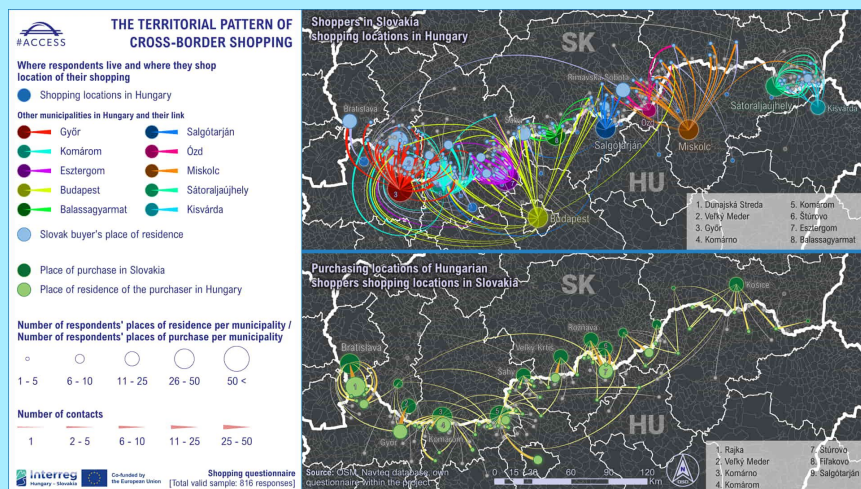


Figure 11. Survey among border residents – results of “shopping” questionnaire. Source: CESCI. (2024b)

CASE STUDY

#ACCESS Promotion of legal accessibility across the Slovak-Hungarian border – “Territorial Cooperation”

The #ACCESS project addresses the problematic legal and administrative barriers hindering cooperation and mobility along the Slovak-Hungarian border. Implemented between 2023 and 2029, the initiative combines research, expert consultations, and citizen engagement to identify and resolve issues such as the lack of qualifications recognition, difficulties in accessing public services, and restrictions on cross-border mobility. A key tool is an innovative platform that allows residents to report legal and administrative obstacles, such as employment or healthcare challenges.

The project focuses on analysing reported barriers, developing legal recommendations, and conducting educational campaigns to raise awareness among local authorities. So far, over 30 key obstacles have been identified and are being analysed to develop long-term solutions. The project’s activities are supported by information campaigns that engage local communities and emphasize the benefits of overcoming such barriers.

#ACCESS exemplifies how innovative approaches, combining technology and cross-sector collaboration, can improve the quality of life in border regions. Its scalable model can be applied in other regions facing similar challenges.

3.3 Recommendations for territorial cooperation and governance structure

A set of strategic recommendations aimed at overcoming existing barriers and unlocking the territorial cooperation potential of the Carpathian macroregion are focused both on **governance structure and territorial cooperation**. These recommendations take into account different dimensions of governance, including institutional structures, coordination mechanisms, and thematic orientation. Their formulation is grounded in the analysis of cooperation barriers and opportunities outlined in Subchapter 3.2 based on stakeholder surveys and in-depth interviews, with an emphasis on both structural (framework of cooperation) and functional (practical cooperation) aspects of macroregional cooperation.

The **recommendations for governance structure** are presented across three inter-related levels of intervention (**Table 3.2**). The first group focuses on key **strategic choices necessary for establishing an integrated framework for territorial cooperation**. These are addressed through a dual-track approach: on the one hand, recommendations that support the pathway toward the formalisation of a Carpathian macroregional strategy requested by the stakeholders participating in the ESPON KARPAT project; on the other, recommendations that offer alternative directions which may be pursued even in the absence of such a formalised framework. The **second group of proposals concerns the institutions, mainly enforcing already existing ones**. Even the Carpathian contact point may be established within the institutional framework already in place. The potential scope of such a Carpathian contact point's activities (if it was to be established) was one of the topics discussed during the policy-focused workshop (**see Scientific Report**). The last part is **addressing the operational level focused on various instruments and activities, involving different types of stakeholders**, that would facilitate Carpathian cooperation progress and reach for its untapped opportunities.

It is important to note that a draft of the macroregional strategy has been already developed by macroregional stakeholders (**Strategy 2018**); however, it has not yet been

adopted at the intergovernmental level. Therefore, the proposed course of action should take into account both the potential implementation of this draft strategy and the feasibility of initiating cooperation measures independently of its formal adoption. In this context, the recommendations also specify the levels of public authorities that should be involved in initiating and implementing the proposed actions—ranging from the European level, through national, to regional and local levels.

At the strategic level, the recommendations emphasize the need for a shared vision and collective objectives to guide the development of the Carpathian macroregion. This entails the development and adoption of a Macroregional Strategy as agreed by the stakeholders of this ESPON project, which should be developed in collaboration with all participating countries and with input from regional stakeholders. This strategy would act as a framework, ensuring alignment of national and regional priorities with broader European Union objectives. **An essential component of this effort is the formal endorsement and acceptance of the strategy by all involved countries and the European Union.** This endorsement would establish a foundation for coordinated action, providing the legitimacy and support needed to mobilize resources and implement projects. The need for a greater involvement of national states and the European Union in the Carpathian cooperation was made apparent in the results of the KARPAT survey. The Individual In-depth Interviews results shed additional light on this question. The respondents pointed out the necessity of drawing a cohesive strategic vision and creating the framework that will ensure its implementation as well as regular institutional activities, systematically monitored in terms of the objectives achieved. Another aspect of the involvement of national states is linked to the elimination of legal and administrative barriers to cooperation (i.e. law and regulations adjustments at the national level) that are not possible to overcome at the local level.

Table 3.2**Recommendations for enhancing Carpathian governance structure for transnational cooperation**

Organisational level	Recommendations				
		European	National	Regional	Local
Strategic level – endorsed by the ESPON KARPAT stakeholders: <i>- to share a common vision of the Carpathian macroregion and objectives for its development,</i> <i>- to diagnose and pursue the joint implementation of specific pilot initiatives within the adopted strategic framework</i>	Development of the Macroregional Strategy in cooperation with all countries involved and with the participation of the regions		x	x	
	Endorsement and acceptance of the Macroregional Strategy by the EU and all countries	x	x		
	Elaboration of the definition/story of the macroregion, shared by all countries involved (useful also for the international promotional purposes)		x	x	
	Selection and implementation of specific pilot actions in the areas already agreed upon by the Carpathian entities		x	x	x
Institutional level – endorsed by the ESPON KARPAT stakeholders: <i>- to invest in the long-term institutional stability of Carpathian governance structures and platforms that are not dependent on external project funding,</i> <i>- to stimulate thinking and acting in the framework of common Carpathian initiatives at local and regional level</i> <i>- to strengthen institutions engaged in Carpathian cooperation</i>	Establishing a central Carpathian contact point		x	x	
	Ensuring regular and stable operation of Strategy-related institutions with coordination, monitoring and decisive powers, involving all relevant members	x	x	x	
	Setting up Strategy-related working groups in different thematic areas with regular meetings (sectorial networking)		x	x	x
	Engaging and coordinating different local/regional stakeholders, increasing their participation (e.g. enterprises, NGOs, local communities) and facilitating joint cross-border problem-solving			x	x
	Providing support to EGTCs, Euroregions and other cross-border structures		x	x	
	Developing the Carpathian Convention's activities	x	x	x	x
	Participating and bringing together Carpathian actors in different networks, e.g. city networks			x	x
	Involvement in international organisations, e.g. Euromontana, to share knowledge and find specific solutions for the mountain areas			x	x

Organisational level	Recommendations				
		European	National	Regional	Local
	Engaging experts and scientists in the development of policy solutions in the Carpathian macroregion, increasing the role of research and educational institutions		x	x	
Operational level – endorsed by the ESPON KARPAT stakeholders: <i>-to ensure legal, financial, and organisational framework supporting the implementation of Carpathian projects, according to the needs, and involving actors from all relevant territories</i>	Establishing a transnational Carpathian INTERREG Programme	x	x		
	Coordinating and introducing changes in different EU-funded programmes to find a way to finance Carpathian projects with the participation of all Carpathian countries	x	x	x	
	Facilitating the creation of functional cross-border areas, implementing a territorially integrated approach		x	x	x
	Adjusting legal regulations to minimise the barriers in Carpathian cooperation (intergovernmental agreements, laws, border regime)		x		
	Encouraging and financing the cooperation of Carpathian entities with more advanced units outside the region to facilitate knowledge-sharing	x	x	x	x
	Encouraging businesses and employers to seize opportunities for profitable cross-border economic cooperation, strengthening public-private partnerships			x	x
	Providing information on the Carpathian macroregion and cooperation opportunities to all relevant stakeholders			x	x
	Establishing a dedicated fund for preparatory strategic activities and organising the initiation of pilot actions and stable functioning of common institutions during the period when the Carpathian Strategy/Programme is not adopted	x	x		

Source: Own elaboration (EUROREG).

As it was stated in the Subchapter 3.2, it would be a good practise to rely on the EU experience and special instruments concentrated on finding solutions well suited to particular cases of barriers, elaborated in the thorough process of analysis with the participation of various stakeholders.

Additionally, especially while the formal strategy is not in place, it is important to create a **shared narrative or identity for the Carpathian macroregion, based on its unique characteristics and the goals all the parties are devoted to**. Such a unifying story would not only promote the region internationally but also foster a sense of shared purpose among stakeholders. The selection and implementation of pilot projects in areas already agreed upon by Carpathian entities further operationalizes this vision, providing tangible examples of cooperation and success. Both those aspects are worth being internationally promoted.

The institutional recommendations focus on establishing and maintaining stable governance structures that are independent of external project funding. This stability is critical for ensuring long-term cooperation and the effective implementation of strategic goals. **A central Carpathian contact point is a possible way to facilitate coordination and communication across various levels and stakeholders.** It would respond to the informational needs of stakeholders and help overcome one of the barriers that were subject of the study analysis. In order to operationalise the recommendation concerning the Carpathian contact point, its potential activities' scope was discussed in detail during the IDIs. On that basis, the list of possible functions was composed and their importance was validated by the participants of the second workshop, giving the priority to the networking platform, followed by funding and projects inventories as the most valuable (the process described in detail in the Scientific Report of the ESPON KARPAT project). Regular and structured operations of strategy-related institutions are essential (in case the strategy is formalised). These institutions should have clear mandates for coordination, monitoring, evaluation, and decision-making and should actively involve all relevant members. The formation of working groups in thematic areas is also recommended, with a focus on sector-specific networking and problem-solving.

Stakeholder engagement plays a pivotal role at this level. The recommendations emphasise the **importance of engaging local and regional governments and actors,**

such as enterprises, non-governmental organizations, and local communities, in joint problem-solving and cross-border initiatives. This approach not only increases participation but also fosters ownership and commitment to regional development goals. Support for existing cross-border structures, such as European Groupings of Territorial Cooperation (EGTCs) and Euroregions, should be highlighted, alongside strengthening the activities of the Carpathian Convention. These measures aim to enhance institutional capacity and foster collaboration across borders.

The recommendations also advocate for **participation in international organisations, such as Euromontana, to facilitate knowledge exchange and the development of innovative solutions for the challenges faced by mountain areas.** Finally, the involvement of experts and scientists in policy development is important. By leveraging the expertise of research and educational institutions, the region can create evidence-based solutions and strengthen the role of knowledge in decision-making.

The operational recommendations address the practical aspects of implementing projects and ensuring cooperation within the region. As the KARPAT survey results clearly pointed out, the financial barrier is seen as the most important factor hindering cross-border projects and initiatives. The analysis of the Carpathian projects in the Interreg programmes in the 2014-2020 programming period showed their mostly cross-border (CBC) character. The possibilities of the transnational cooperation in the macroregion were limited by the lack of one Interreg B programme in which all the Carpathian countries could have participated together. At the same time, the prevailing influence of the EUE (the biggest number of answers to the question which actor has the greatest influence on the development of cooperation in the Carpathian macroregion pointing at the EU – see Chart 3.4) and an expectation of its greater involvement in the Carpathian cooperation, was expressed by the stakeholders in the KARPAT survey. In this context, the establishment of a transnational Carpathian Interreg Programme would be a key recommendation endorsed by the ESPON KARPAT stakeholders, providing a dedicated mechanism for financing projects that involve all Carpathian countries, explicitly taking into account the specific needs of the Carpathian macroregion to which the programme would be devoted – some-

thing that is not feasible under the current framework. In the absence of such a mechanism, adjustments to existing EU-funded programmes European Territorial Cohesion and horizontal/communitarian funds are suggested to better align them with the needs and priorities of the Carpathian macroregion. As the ETC forms only a part of the financing options, it is necessary to pay attention to and encourage parallel cooperation formats, depending on other financial mechanisms and sources (as listed in Table, 3.2, responding to various sets of challenges and objectives, based on the Individual in-Depth Interviews conducted in the KARPAT project findings, covering i.e. profit-driven business cooperation).

Creating **functional cross-border areas** is another important operational goal. This includes enhancing cross-border mobility, developing shared infrastructure, and coordinating spatial planning across borders. This involves implementing **territorially integrated approaches**, which combine different policy sectors — such as transport, environment, economy, and public services — and promote coordinated action across administrative levels and national borders.

The recommendations also focus on **fostering economic cooperation**, encouraging businesses and employers to explore opportunities for cross-border partnerships. Strengthening public-private partnerships beneficial is assessed to be important by the stakeholders. Providing comprehensive information to stakeholders about the Carpathian macroregion and its cooperation potential is deemed critical for building awareness and driving engagement.

A unique aspect of the operational recommendations is the proposal to dedicated **fund to support preparatory activities and organisational work (i.e. preparing pilot projects)** during periods when the Carpathian Strategy or Programme has not yet been adopted, or is still in its initial phase. This recommendation is based on the experiences of other macroregional strategies. The ARPAP (Alpine Region Preparatory Action Fund) facilitated the development actions of Working Groups within the framework of the EU Strategy for the Alpine Region. In the case that the Carpathian Strategy is not adopted, such a fund would enable the implementation of pilot actions and provide essential support.

The above-mentioned activities may support the development of transnational cooperation in the Carpathian macroregion and are also confirmed by earlier analyses

concerning development programming in the area (Smętkowski et al., 2022). Among these activities, one can distinguish those with the greatest potential for enhancing cross-border cooperation, as well as those for which stakeholders expect the most tangible outcomes. In general, they can be grouped into three categories (based on how frequently it was indicated in the survey results):

- **Key actions:** This group emphasizes the importance of **people-to-people cooperation, especially involving youth**. This is closely linked with other proposed measures, such as the **development of cross-border education programmes**, as well as student, pupil, and staff mobility schemes. Another priority identified by stakeholders is the creation of a **joint programme for attracting foreign investments**. According to respondents, the last two actions could bring the most measurable economic outcomes, whereas the first two are seen primarily as laying the groundwork for soft social integration within the macroregion.
- **Important actions:** These include a variety of thematic areas, ranging from the **coordination of healthcare-related activities, training for services responsible for addressing environmental and other risks**, to programmes aimed at **attracting qualified professionals to the macroregion**. Again, stakeholders expect more concrete and quantifiable results from the last two actions in this group compared to the first.
- **Supporting actions:** These refer, on the one hand, to improving the **functioning of border control**—especially relevant in the parts of the macroregion where EU regions interact with candidate countries. On the other hand, they include issues related to **security**, such as the fight against crime, which could benefit from better coordination among relevant services and the development of appropriate digital systems.

From a thematic perspective, the analysis of pilot actions (see also Chapter 7 of Final ESPON KARPAT Report) identifies **several key areas of cross-border cooperation** that align with the principles of the European Green Deal, the EU Next Generation recovery plan, and the EU's digital priorities. These are considered by the ESPON KARPAT stakeholders to be particularly promising in terms of cooperation potential and expected impacts:

- **Economic development**, especially in the field of **sustainable tourism based on local natural and cultural resources** (see good practice on the route of the Wallachian culture), development of **renewable energy and related technologies**, support for resource efficiency through **circular economy models**, and the creation of **local clusters based on regional agricultural and environmental assets**.
- **Environmental protection**, particularly through the implementation of common **cross-border nature conservation standards** (e.g. joint management of national parks and reserves, coordinated protection of migratory species, harmonised rules for tourism and land use in border regions) (see good practice on national parks management), maintaining ecological continuity critical for biodiversity through **ecological corridors**, reducing pollution through the development of **low-emission energy sources** (e.g. solar, wind, hydro, and sustainably sourced biomass and bio-gas), and establishing systems for **monitoring environmental risks**.
- **Transport connectivity**, involving in particular the development of **clean transport modes in cross-border relations** (e.g. rail services, electric public buses, and integrated cycling infrastructure) (see good practice on cross-border rail connections), supported by organisational measures such as the **introduction of unified ticketing systems**, and **improving residents' access to modern digital technologies** (e.g. high-speed internet, e-government services, digital literacy programs, and public access points like telecentres or digital libraries).

In a **horizontal dimension**, the implementation of these activities could be strengthened by enhanced **scientific cooperation** (see good practice on research collaboration), which provides knowledge to increase the effectiveness of joint efforts (e.g. joint biodiversity monitoring programmes, cross-border climate impact studies, or collaborative research on sustainable land and water management), as well as **actions aimed at eliminating remaining administrative and legal barriers to cross-border cooperation** (see good practice example from the Slovak-Hungarian border).

The survey results clearly point to the need for a multilevel and flexible governance structure to support territorial cooperation in the Carpathian macroregion (e.g. coordination platforms between local, regional, and national authorities; cross-border working groups on sustainable development; or joint decision-making bodies involving various stakeholders such as municipalities, NGOs, and scientific institutions). Actions should combine both formalised institutional support—such as the potential establishment of a Carpathian Interreg programme or a cross-border coordination body—with practical, operational measures targeting specific thematic areas (e.g. joint flood prevention systems, harmonised eco-tourism development strategies, coordinated biodiversity monitoring, or shared emergency response protocols in mountainous regions). Cooperation should be driven not only at the national and regional levels but also include active engagement of local authorities and civil society actors. At the same time, promoting people-to-people initiatives and joint programmes in education, investment attraction, and mobility are crucial for building trust, cohesion, and long-term integration. Strengthening existing structures, enhancing coordination, and removing legal and administrative barriers will be key to unlocking the full potential of territorial cooperation in the Carpathians.

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ESPON 2030

ESPON EGTC

11 Avenue John F. Kennedy

L-1855 Luxembourg

Grand Duchy of Luxembourg

Phone: +352 20 600 280

Email: info@espon.eu

www.espon.eu

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