FLUVIAL TOURISM CORRIDORS FOR SUSTAINABLE DEVELOPMENT AND ECONOMIC RESILIENCE IN THE REPUBLIC OF MOLDOVA

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Abstract: *In the context of global economic and climatic transformations, sustainable tourism represents a key instrument for enhancing regional economic resilience. River networks, as components of natural infrastructure, can function as tourism corridors that connect natural and cultural resources at the territorial level, thereby contributing to the sustainable use of space. This article examines recent European models of the touristic valorization of river networks and identifies opportunities for the Republic of Moldova, taking into account local specificities and the orientation toward sustainable development.*

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1. Introduction

The river network of the Republic of Moldova is entirely integrated within the Black Sea drainage basin and is structured around two major fluvial systems – the Dniester River and the Prut River – complemented by a dense network of small and medium-sized rivers and streams. In total, this network comprises approximately 3,621 watercourses, with a cumulative length of around 16,000 km (Vasilean et al., 2024). Morphologically, the majority of these rivers are typical lowland systems, characterized by reduced channel gradients, pronounced meandering patterns, low flow velocities, and extensive floodplains. The prevailing northwest–southeast flow direction is controlled by the regional geomorphological structure, which has facilitated the development of wide, mature valley systems.

The mean density of the hydrographic network is estimated at 0.57 km/km², displaying notable spatial variability (Cazac et al., 2003). Higher densities are observed in the northern sector of the Dniester – Prut interfluve, where increased terrain fragmentation and higher precipitation levels prevail, whereas lower densities characterize the southern and southeastern regions, marked by more arid climatic conditions and a comparatively sparse drainage network. This hydrographic configuration exerts a significant influence on territorial development patterns. Despite the apparent agricultural potential associated with low-relief landscapes and fertile soils, the interfluve areas shaped by internal river systems remain underutilized, reflecting structural constraints related to limited accessibility, insufficient infrastructure, and suboptimal resource integration.

2. Literature Review

Recent literature on river systems increasingly emphasizes their role beyond hydrological functions, positioning them as integrated spatial structures that support transport, tourism,

ecological connectivity, and regional development. This shift is reflected in both European policy frameworks and academic studies, which conceptualize rivers as multifunctional corridors embedded in territorial systems rather than isolated natural elements (European Commission, 2024b; Inland Navigation Europe, 2025).

A significant strand of research focuses on the development of fluvial tourism and river corridors as instruments of sustainable regional development. Cooper and Prideaux (2009) highlight that river tourism has evolved into a distinct segment of the tourism industry, characterized by slow mobility, experiential travel, and strong links with local landscapes and cultural heritage. This perspective is reinforced by studies on the Danube, which demonstrate how river cruises and waterfront development contribute to regional economic growth and the valorisation of cultural resources along the corridor (Danilović Hristić et al., 2020).

At the European policy level, the development of transnational river corridors such as the Rhine–Danube Corridor illustrates the importance of integrating inland waterways into multimodal transport networks. The European Commission emphasizes that such corridors are essential components of the TEN-T network, ensuring connectivity, economic cohesion, and sustainable freight transport across the European Union (European Commission, 2024a, 2024b). In this context, rivers are treated as strategic infrastructure that supports both economic efficiency and territorial integration.

From a geographical and environmental perspective, river systems are also understood as dynamic ecological networks. The literature on water resources in the Republic of Moldova highlights the importance of hydrological balance, sedimentation processes, and seasonal variability in determining the functional capacity of rivers (Cazac et al., 2003; Vasilean et al., 2024). These studies underline that the usability of rivers for navigation and tourism depends not only on physical characteristics but also on environmental management and infrastructure development.

Furthermore, UNESCO-related conceptual frameworks on cultural corridors provide an important theoretical background for understanding rivers as spatial axes of interaction. These frameworks stress the continuity of exchange, mobility, and cultural transmission along historical routes, which can be reinterpreted in contemporary contexts as foundations for tourism and regional development strategies (Cultural Corridors of South East Europe, 2005).

Overall, the literature converges on the idea that river corridors function as multidimensional territorial systems, combining transport infrastructure, tourism potential, cultural heritage, and ecological value. However, their effective development depends on navigability conditions, infrastructural investment, and integrated territorial planning, which remain uneven across different regions.

3. Methodology

This research employs a qualitative-descriptive methodology combining content analysis of policy documents and scientific literature with direct field observations in Moldovan riparian localities. The research also integrates a SWOT analysis to synthesize internal and external factors influencing river tourism development. Comparative case studies from EU countries are used as best practice models.

4. Results and Discussion

Dysfunctions and Constraints in the Socio-Economic Valorization of the River Network of the Republic of Moldova

The territory of the Republic of Moldova is located within the Dniester – Prut interfluve. The analysis of demographic and socio-economic indicators reveals the presence of pronounced structural imbalances within this interfluvial space, characterized by a predominance of rural areas.

The data highlight the existence of significant territorial disparities among the development regions of the Republic of Moldova. First, the predominance of rural areas at the national level (57%) is evident, with even higher values recorded in the South (68%) and Centre (65%) regions, confirming the predominantly agrarian character of the interfluvial space (Biroul Național de Statistică, n.d.).

Table 1. Socio-Economic Indicators by Development Regions, 2024

Region	Population	% Urban	% Rural	Density (inh./km²)	Average Monthly Income (MDL)	Employment Rate (%)
North	870,000	38	62	85	8,000	38
Centre	980,000	35	65	95	8,500	39
South	650,000	32	68	70	7,800	37
Gagauzia	155,000	35	65	85	9,000	41
Chișinău	720,000	85	15	1,100	15,000	48
Total	~2,430,000	43	57	83	~10,000	40

Source: *NBS, http://statbank.statistica.md*

The Chișinău region clearly stands out from the rest of the country through its high level of urbanization (85%), very high population density (1,100 inhabitants/km²), and significantly higher average monthly income (15,000 MDL), reflecting the concentration of economic activities and infrastructure in the capital.

In contrast, the North, Centre, and South regions register lower income levels (7,800-8,500 MDL) and lower employment rates (37-39%), indicating a lower level of economic development and limited employment opportunities. The South region appears to be the most vulnerable, with the lowest population density and the lowest income levels. Although Găgăuzia records a relatively higher average income compared to other rural regions, it remains characterized by a predominantly rural structure and a moderate level of employment.

Overall, these data reflect a polarized development model, in which the capital concentrates economic resources, while the interfluvial regions remain marked by insufficient development, pronounced rurality, and limited access to economic opportunities.

The hydromorphological characteristics of the river network of the Republic of Moldova condition its functional profile, which includes:

- maintenance of biodiversity;
- provision of drinking water;

- irrigation;
- supply of industrial and domestic water;
- wastewater discharge;
- transport;
- tourism.

According to the National Bureau of Statistics, the largest share of water abstracted from natural reservoirs (approximately 70% of total use) is allocated to drinking water supply, with over 70% of this volume being consumed by the population. The remaining water consumption is attributed primarily to industrial uses, including wastewater discharge and other economic activities (Biroul Național de Statistică, n.d.).

Fluvial transport, permitted only on certain river segments, accounts for a negligible share - less than 1% of total freight transport and approximately 0.03% of passenger transport in the Republic of Moldova. The statistical data highlight several important structural aspects:

- Inland waterway transport has an extremely low share. In 2025, a total of 131.2 thousand passengers were transported by water, compared to 333 million passengers in total public transport, representing approximately 0.04%;
- Freight transport on Moldova's inland waterways amounted to 140 thousand tonnes in 2025, accounting for only 0.7% of the total volume of goods transported. By contrast, road transport dominates, representing approximately 87% of the total freight volume in the Republic of Moldova. These figures reflect the marginal role of inland navigation within the overall structure of the national transport system.

Table 2. Status of Inland Waterway Transport in the Republic of Moldova

Indicator	2024	2025	Remarks
Passengers transported (thousand persons)	128.2	131.2	slight increase
Passenger traffic (million passenger-km)	0.26	0.26	very low level
Freight transported (thousand tonnes)	≈138	≈140	minimal variation
Freight turnover (million tonne-km)	≈0.28	≈0.28	stable level
Total passengers in public transport (all modes)	307.6 million	333.0 million	inland waterways have a negligible share
Total freight transported (all modes)	≈20 million tonnes	20.2 million tonnes	road transport dominates

***Source**: National Bureau of Statistics of the Republic of Moldova – Passenger and Freight Transport (2024–2025) https://statbank.statistica.md/*

Based on official reports issued by national institutions (such as the Agency "Apele Moldovei," the Ministry of Environment, and the National Bureau of Statistics) (Agenția

„Apele Moldovei," n.d.; Biroul Național de Statistică, n.d.), as well as field observations, the underutilization of the river network can be attributed to several key factors:

- insufficient investment in river maintenance and related infrastructure;
- sedimentation processes and inadequate depths for large vessels;
- fragmentation of agricultural land and limited access to riverbanks;
- administrative and political changes.

Table 3. SWOT Analysis – Utilization of the River Network of the Republic of Moldova

Strengths (S)	**Weaknesses (W)**
- Dense hydrographic network integrated into the basins of the Dniester River and Prut River - Multiple functional roles: drinking water supply, irrigation, biodiversity support, tourism - High landscape and ecological value (floodplains, meanders, wetlands) - Existing navigable sections for small vessels - Strong natural and cultural heritage potential of riparian areas - Potential for urban river corridor regeneration (e.g., Bâc River basin)	- Extremely low inland waterway transport share (below 1% of freight and ~0.03% of passenger transport) (Biroul Național de Statistică, n.d.) - Frequent sedimentation and shallow depths, especially in small rivers - Insufficient tourism, port, and navigation infrastructure - Pollution and environmental degradation in urban river sections - Limited access to riverbanks and fragmented land ownership - Underutilization of economic and transport functions
Opportunities (O)	**Threats (T)**
- Development of fluvial tourism corridors for regional revitalization - Increasing demand for ecotourism and recreational tourism - Integration of riverine settlements into tourism networks - Access to European funding for sustainable development projects - Low-cost potential for tourism development - Development of sustainable mobility and eco-tourism routes	- Climate change impacts (droughts, reduced river discharge) - Persistent urban and industrial pollution - Progressive loss of navigability due to sedimentation - Lack of consistent investment in water infrastructure - Depopulation of rural riverine areas - Agricultural pressure on river ecosystems

***Source**: compiled by the author*

In order to improve the economic conditions of riverine areas and facilitate their integration into broader economic circuits, a strategic reorientation toward the tourism-based valorization of the river network is required. This approach relies on the utilization of existing natural resources without necessitating major infrastructure investments. In this way, tourism capitalizes on the intrinsic attractiveness of these areas while preserving their ecological and landscape characteristics. The SWOT structure highlights a clear imbalance between the high natural potential of the river network and its current low level of economic and tourism utilization. In this context, the development of fluvial tourism corridors represents a feasible and strategically justified direction for the Republic of Moldova.

Tourism corridor concept

The concept of the cultural corridor, introduced in 1974 by the Romanian professor Răzvan Theodorescu, designates historical territorial axes in South-East Europe along which cultural values, ideas, and innovations have continuously circulated (Cultural Corridors of South East Europe, 2005, p. 2). These corridors are not simple transport routes, but rather evolutionary structures that reflect long-term interactions between communities and civilizations, encompassing both tangible and intangible dimensions. They are multifunctional and polythematic, integrating various forms of cultural, economic, and social exchange.

From the perspective of the evolution of this concept, the tourism corridor can be understood as an operational and contemporary form of valorizing a territorial axis of connectivity, in which the cultural-historical dimension is transformed into an economic and functional product.

Thus, the tourism corridor represents a system of interconnected destinations, attractions, and tourism services linked by transport infrastructure and organized along a geographical or thematic axis. In contrast to the cultural corridor, which is primarily historical, identity-based, and associated with collective memory, the tourism corridor is oriented towards the management of visitor flows, economic development, and the territorial integration of tourism resources.

It preserves the spatial logic of the cultural corridor - namely continuity, interaction, and connectivity - while adapting it to contemporary objectives such as increasing territorial attractiveness, diversifying the local economy, and reducing regional disparities. In this sense, the tourism corridor becomes a spatial planning instrument that transforms historical and geographical axes into functional networks for sustainable tourism development.

European Fluvial Corridors: Best Practices and Development Models

Fluvial corridors represent strategic spatial development axes that capitalize on waterways as natural infrastructure for connectivity between regions, cities, and ecosystems. In the contemporary European context, they have evolved from simple navigation routes into integrated systems of transport, tourism, and territorial development, where economic, cultural, and environmental functions are closely interlinked.

In particular, European fluvial corridors are designed as multimodal and multifunctional structures in which inland navigation, river tourism, riparian cultural heritage, and urban regeneration simultaneously contribute to territorial cohesion and sustainable development. Examples such as the Rhine, Danube, and Seine demonstrate how rivers can function as regional integration axes and platforms for sustainable mobility and thematic tourism.

In this regard, the analysis of best practices in European fluvial corridors provides a relevant framework for understanding the mechanisms of efficient valorisation of hydrological resources and for identifying applicable models in regions with similar potential, but currently underutilized.

Table 4. Best practices of fluvial corridors in Europe

Fluvial corridor	Countries involved	Best practice model	Main functions	Key success factors
Rhine–Danube Corridor	France, Germany, Austria, Slovakia, Hungary, Romania, etc.	Multimodal TEN-T corridor	transport, tourism, connectivity	EU integration, port infrastructure, improved navigability, developed river tourism
Rhine River Corridor	Switzerland–Germany–Netherlands	River tourism + logistics	cruises, freight transport	high urban density, cultural heritage (medieval cities), high accessibility
Danube Corridor	Germany–Austria–Romania–Bulgaria	tourism and geopolitical corridor	tourism, navigation, culture	capital cities (Vienna, Budapest, Belgrade), UNESCO heritage, cruise tourism
Seine Corridor	France	urban-tourism corridor	urban tourism, mobility	integration of Paris with rural heritage, urban river tourism, regeneration projects
Elbe Corridor	Germany–Czech Republic	cultural-natural corridor	tourism, limited transport	natural landscapes, Berlin–Prague connection, slow tourism
Douro Corridor	Portugal–Spain	wine-tourism corridor	niche tourism	viticulture integration, thematic cruises, regional development

***Source**: compiled by the author*

The analysis of European fluvial corridors highlights the existence of three main development models:

1. **The multimodal integrated model (Rhine–Danube).** This is the most complex model, combining freight transport, cross-border mobility, and tourism. It functions as a strategic European infrastructure system with a major economic role.
2. **The cultural-tourism model (Danube, Rhine, Seine).** This model capitalizes on urban and rural heritage, focusing on cruises, historic cities, and cultural experiences. It is the most developed in terms of river tourism.
3. **The specialized/natural model (Elbe, Douro).** Here, ecotourism and thematic functions (wine, landscape, nature) prevail, with a lower regional economic impact but a strong identity value.

Overall, the success of fluvial corridors depends on three key factors: consistent navigability, integration of multimodal infrastructure, and the valorisation of riparian cultural heritage. European fluvial corridors represent advanced models of integrated territorial development, in which rivers are no longer merely natural axes but become complex economic, tourism, and cultural structures. The European experience shows that their effective valorisation generates both regional economic growth and territorial cohesion. These models can be adapted to regions such as the Republic of Moldova, where fluvial potential remains insufficiently exploited.

Fluvial Tourism Corridors in the Republic of Moldova

The proposed structuring of the river network of the Republic of Moldova into functional corridors highlights a significant potential for differentiated valorisation of watercourses, depending on their hydrological characteristics and territorial context (Bețivu, 2018). From

this perspective, the Nistru and Prut rivers can be regarded as primary development axes, while the Răut and Bâc rivers play a secondary, predominantly local and ecological role.

Table 5. Fluvial Corridors Proposed for Moldova's River Network Development

River / Corridor	Length in the RM (km)	Main segment	Hydrological characteristics (discharge / average depth)	Navigability potential	Recommended activities	Constraints / limitations
Nistru	636–657	From Soroca to the Black Sea outlet	Mean discharge: 318 m³/s; average depth: 2–4 m	Light navigation possible with small vessels along most sections	Cruises, canoeing, kayaking, sport fishing, ecotourism routes	Seasonal droughts, sedimentation in lower sections, lack of port infrastructure
Prut	695	From Criva (RO–MD border) to the Danube confluence	Mean discharge: 70–90 m³/s; average depth: 1.5–3 m	Limited navigation with small vessels, mainly in central and southern sections	Canoeing, leisure boating, nature-based tourism	Land fragmentation, frequent droughts, sedimentation, small-scale ports
Răut	286	From headwaters to the confluence with the Nistru	Mean discharge: 6–8 m³/s; average depth: 0.5–1 m	Difficult navigation, suitable only for small canoes during wet seasons	Canoeing, local fishing, recreational activities along riverbanks	Severe sedimentation, navigable only seasonally
Bâc	155	From urban sources to the confluence with the Nistru	Mean discharge: 1–2 m³/s; average depth: 0.3–0.8 m	Impossible navigation	Urban riverside walks, local recreational activities	Sedimentation, pollution, unstable flow, lack of infrastructure

***Source**: compiled by the author*

The main advantage of this approach lies in transforming rivers from passive geographical elements into active structures of territorial development. In the case of the Nistru, its high discharge and considerable length allow the development of a multifunctional fluvial corridor, particularly for recreational tourism, water sports, and small-scale cruises. This can generate direct economic benefits through increased tourism attractiveness, as well as indirect benefits through the development of related services in riverside settlements.

The Prut complements this system through its potential for slow tourism and ecotourism, supporting low-impact activities such as canoeing and nature-based tourism. In this way, it contributes to diversifying the tourism offer and connecting rural communities to alternative economic circuits, thereby helping to reduce territorial disparities.

In the case of the Răut and Bâc rivers, although navigability is limited or absent, the main benefit lies in their potential for ecological regeneration and integration into local

recreational space, particularly in urban areas. These watercourses can support the development of green infrastructure, pedestrian routes, and leisure areas, contributing to an improved quality of life.

Overall, the implementation of the fluvial corridor concept in the Republic of Moldova offers three major benefits: the efficient use of existing natural resources with relatively low investment requirements, the stimulation of sustainable tourism, and the reduction of territorial disparities through the integration of riverine regions into economic and recreational networks. This differentiated approach enables each river's functions to be adapted to its actual potential, maximising both economic and environmental outcomes.

5. Conclusions

The river network of the Republic of Moldova shows a differentiated potential for structuring into tourism corridors, where the Nistru and Prut rivers function as primary axes due to their favorable hydrological characteristics and recreational navigation potential.

The Nistru corridor stands out as the most complex and valuable, offering conditions for the development of diversified fluvial tourism (cruises, kayaking, sport fishing), while the Prut plays a complementary role, mainly oriented towards slow tourism and ecotourism activities.

Secondary watercourses, such as the Răut and Bâc rivers, have limited navigational potential; however, they can be valorised through local recreational functions and ecological regeneration projects, including the development of urban green spaces.

The main constraints affecting the development of fluvial corridors include sedimentation, seasonal variations in water flow, lack of access infrastructure, and anthropogenic pressure, all of which significantly reduce their current economic and tourism utilization.

Overall, the proposed fluvial corridors can contribute to the diversification of the national tourism offer and to balanced territorial development, provided that differentiated interventions are implemented in accordance with the specific potential of each watercourse.

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