Classification of Croatian Maritime Regions as a Prerequisite for Applying Regional Development Theories

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Abstract

Croatia's maritime and coastal area has economic, demographic, and cultural characteristics that differ from those of the continental part of the country. The existing administrative and statistical regionalisation does not adequately reflect actual territorial specificities or the complex functional processes that shape the area. This mismatch reduces the effectiveness of development policies targeting coastal and island areas and hinders the application of regional development theories. This paper analyses the limitations of Croatia's current NUTS division and explains the importance of establishing functional maritime regions as a prerequisite for improved research, planning, and management of the Adriatic area. Particular attention is given to the limitations of applying regional development principles to Croatia's coastal area. The methodological approach comprises an analysis of relevant academic literature, a comparison of European models for dividing coastal regions, and the application of regional development theories. The results show that the Adriatic Croatia region does not reflect the actual functional structure of Croatia's maritime and coastal area and that the current administrative division is inadequate for monitoring development processes. The paper proposes a division into NUTS 3 regions based on the nodal urban centres of Pula, Rijeka, Zadar, and Split as a more suitable framework for regional policy than the existing model. The paper concludes that functional maritime regions could contribute to more effective regional planning, governance, and sustainable development of Croatia's maritime and coastal area.

Keywords: maritime regions; functional regionalisation; NUTS classification; Adriatic Croatia; regional development

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Introduction

As a coastal country with a highly indented coastline and numerous islands, Croatia has developed a complex system of land-sea interactions throughout its history. Its distinctive geographical features have shaped economic, demographic, and cultural structures that differ substantially from those found in the continental part of the national territory. Within the European Union, Member States' statistical and developmental territorial organisation is based on the NUTS classification (Nomenclature of Territorial Units for Statistics), which supports the collection of comparable data and the implementation of regional and cohesion policy. However, numerous studies indicate that administrative and statistical divisions do not fully reflect actual functional processes, particularly in coastal and island areas (Magaš, 2003; OECD, 2013; Puljiz, 2006). The official statistical and administrative regionalisation defined by the European Union's NUTS classification therefore does not sufficiently recognise the specific characteristics of coastal and island areas, making them more difficult to understand analytically, study scientifically, and manage strategically.

The latest revision of the NUTS 2 division, which divided Croatia into four statistical regions, represents a step towards greater differentiation of the national territory. Nevertheless, the literature stresses that such divisions often remain primarily administrative and do not include criteria for recognising functional regions shaped by the specific geographical, economic, and social characteristics of maritime areas (Magaš, 2003, 2014; Puljiz, 2006). The internal heterogeneity of Adriatic Croatia is particularly problematic because the region encompasses markedly different types of areas. This mismatch between administrative boundaries and actual functional processes has direct methodological and practical shortcomings.

Regional development theories, which are based on the concept of coherent and spatially connected units, are difficult to apply to areas whose internal differences are too pronounced to be captured within a single analytical framework. This reduces research precision, limits the identification of development needs, and diminishes the effectiveness of public policies for coastal and island areas. The suitability of the existing regionalisation model must therefore be reconsidered, together with the need to define separate maritime regions that would more accurately reflect the spatial, social, and economic processes characteristic of Croatia's coastal and island system. This mismatch between administrative boundaries and actual functional processes is the central research problem addressed in this paper.

The aim of this paper is to analyse the limitations of Croatia's current NUTS division and to explain the importance of establishing functional maritime regions as a prerequisite for improved research, planning, and management of the Adriatic area. Particular emphasis is placed on identifying the limitations of applying regional development principles to Croatia's coastal area.

Review of Previous Research

Previous studies of Croatia's regionalisation show that the country has faced difficulties in defining functional statistical units for decades. Administrative boundaries do not adequately follow regional development flows. Many researchers identify structural problems in Croatia's administrative regionalisation, particularly in relation to the European NUTS classification. As a European Union standard, the NUTS system was designed primarily to collect comparable data and implement cohesion policy, while the boundaries of territorial units in Croatia were largely adopted from existing administrative levels.

Academic studies emphasise that Croatia's statistical regions often result from political and administrative compromises, with functional criteria playing a secondary role. Puljiz (2006) argues that the NUTS 2 classification is overly aggregated and may obscure substantial regional differences, making it an unsuitable basis for national regional policy. He therefore proposes a uniform methodology based on socioeconomic indicators. Cziraky et al. (2002) emphasise the complexity of regional development and note that it encompasses several dimensions, meaning that criteria such as GDP per capita cannot adequately represent actual development disparities. They propose a multivariate methodology that includes economic, structural, and demographic dimensions. Puljiz and Rukavina (2022) show that regional differences in Croatia remain substantial despite formal adjustments to the territorial classification. Differences in GDP per capita are particularly apparent at the county level, while income convergence is more pronounced at the local level.

Magaš repeatedly questions the territorial division of Croatia. In an earlier study, he argues that Croatia's territorial organisation is shaped mainly by political and administrative criteria, while geographical and functional criteria receive insufficient consideration. He highlights the mismatch between official units and actual functional areas and advocates scientifically grounded regionalisation (Magaš, 2003). In later analyses, he further argues that Croatia's territorial organisation results from political and administrative decisions and that administrative boundaries therefore often fail to follow actual functional areas. Using Adriatic Croatia as an example, he shows that centres such as Rijeka, Zadar, and Split shape regional areas extending beyond existing county boundaries. He proposes redefining the regional division and establishing three Adriatic regions centred on Rijeka, Zadar, and Split that would better reflect the functional units of Adriatic Croatia within the EU NUTS system (Magaš, 2014). He further contributes to the discussion of Croatia's functional regionalisation by analysing the connections among Lika, Zadar, and Šibenik as a functional unit of central Adriatic Croatia. He notes that these areas have often been studied as administratively separate and concludes that their actual gravitational and economic relationships indicate unified functioning, calling the quality of existing administrative divisions into question (Magaš, 2016).

The Organisation for Economic Co-operation and Development (OECD) developed the concept of functional regions and urban areas, which holds that territorial units should follow actual functional links and flows rather than administrative boundaries (OECD, 2013). The European Commission takes a similar approach in the Directive on Maritime Spatial Planning, which defines the management of the coast and sea as an integrated process extending beyond traditional administrative divisions (Directive 2014/89/EU, 2014). According to ESPON studies, planning and governance approaches for coastal and island areas must be tailored to their particular characteristics because these areas function as coherent regional units shaped by economic links, constrained transport accessibility, and similar environmental characteristics (ESPON, 2012a, 2012b, 2013). The ESPON programme develops methodologies for identifying coastal areas using criteria such as economic clusters, maritime transport, ecosystems, and urbanisation.

France, Italy, and Spain have developed their own territorial divisions of coastal regions through territorial and sectoral policies. The French zones littorales are coastal areas treated as coherent geographical units that require dedicated spatial planning, protection, and valorisation policies. Management policy for the zones littorales supports research and innovation related to their specific characteristics, environmental protection, and the preservation of landscapes and heritage. It also seeks to preserve and develop economic activities connected with the sea and coast (Légifrance, 2016). The Italian aree marittime are three official maritime areas established under the Maritime Spatial Planning Directive. Each maritime area has separate strategic guidelines for spatial governance and use, tailored to its specific characteristics (Consiglio Nazionale delle Ricerche [CNR], 2024). The Spanish demarcaciones marinas comprise five official marine demarcations into which Spain's maritime area is divided for the implementation of marine strategies. Each demarcation has separate strategies for governance and marine environmental protection, which also serve as a spatial framework for coordinating different maritime activities (Ministerio para la Transición Ecológica y el Reto Demográfico, n.d.). These European examples demonstrate the need to establish regions based on functional rather than administrative criteria to improve planning, governance, and policy implementation. For Croatia, with its highly indented coastline and numerous islands, such an approach would accord with both theory and European Union practice.

The review of previous research provides a scientific basis for redefining the regional classification of Croatia's maritime regions. Croatian authors argue that regions established according to administrative criteria do not correspond to functional processes in coastal areas. European examples show that countries with developed maritime sectors organise coastal and maritime areas as separate functional units with dedicated development and governance instruments. Effective planning, governance, and implementation of development policy therefore require regions based on functional criteria. For Croatia, with its indented coastline and numerous islands, such an approach would be consistent with theoretical insights and European practice. However, existing Croatian studies offer only partial proposals for functional models of maritime regions. They do not provide a comprehensive classification or recognise the importance of

establishing such regions for applying existing regional development theories. This study addresses this research gap.

Methodology

This study uses a conceptual and theoretical approach to analyse the functional regionalisation of Croatia's maritime area. The methodological framework comprises an analysis of relevant academic literature, a comparison of European models for regionalising coastal areas, and an interpretation of the Adriatic area through contemporary regional development theories.

Several interrelated criteria were considered when identifying functional regions in Croatia: (1) the nodal role of transport centres, (2) gravitational relationships between centres and their hinterlands, (3) transport connectivity and accessibility, (4) economic links, and (5) the spatial and geographical characteristics of the coastal and island system. These criteria were used to identify the urban nodes of Adriatic Croatia and analyse their influence on the surrounding area. The boundaries of the proposed regions were determined by interpreting spatial, economic, and transport links with reference to theoretical models of functional regions. This approach provides a coherent framework for understanding regional processes in the Adriatic area. Although the criteria and their application are not strictly formalised, the proposed division follows recognised patterns of spatial organisation and functional relationships between centres and their hinterlands and is consistent with relevant theoretical approaches to functional regionalisation.

Regional Development Theories and the Spatial Functionality of Maritime Regions

Maritime, coastal, and island areas constitute a distinctive form of regional system in which environmental, economic, transport, and social processes overlap. Unlike continental regions, maritime areas are characterised by natural barriers, fragmented island communities, and distinct spatial dynamics shaped by the sea and coast. Applying regional development theories to maritime areas therefore requires adaptation to the functional characteristics of the territory.

Endogenous growth theory describes long-term growth as the result of internal factors and emphasises innovation and human capital as drivers of sustainable development. It highlights the importance of investment in research and development as a source of technological progress, as well as investment in human capital. The theory also stresses the importance of public investment in innovation, education, and infrastructure, which may contribute positively to economic growth (Aghion & Howitt, 1992; Romer, 1990, 1994). In maritime regions, endogenous growth can be understood through the use of a region's internal resources and capacities. Maritime regions should draw on their natural resources, maritime traditions, local entrepreneurship, and the knowledge and skills of residents in fisheries, aquaculture, shipbuilding, tourism, and maritime transport.

Investment in research and development, education, and local infrastructure is particularly important because it strengthens regional innovation capacity and competitiveness. Public policies should create an environment that encourages the use of local resources, knowledge, and innovation rather than dependence on external development opportunities.

Porter's cluster theory argues that clusters, defined as a critical mass of related industries and institutions, influence competition by raising the productivity of enterprises in the area, encouraging innovation, and supporting the formation of new enterprises within the cluster (Porter, 1998). In maritime regions, cluster theory can be applied to coastal and port systems in which ports, shipping companies, logistics firms, shipyards, tourism agencies, and maritime education and research institutions are spatially concentrated. Such maritime clusters facilitate information and knowledge exchange and the faster diffusion of new technologies and innovations, increasing the productivity and competitiveness of the wider area. In coastal and island areas, clusters may develop around major ports as well as around segments of the blue economy such as fisheries, aquaculture, and nautical tourism. Maritime regions therefore function as integrated areas that connect enterprises, institutions, and local communities.

New economic geography (NEG) explains why economic activities concentrate spatially in particular regions or cities rather than being distributed evenly. The theory assumes that the spatial distribution of production and population is not predetermined but develops through the interaction of increasing returns, transport costs, and factor mobility. Small initial advantages attract firms and workers to a location, and this concentration further increases productivity. A developed core gradually emerges while peripheral areas fall behind (Krugman, 1991). In maritime regional development, NEG helps explain why the most important maritime functions concentrate in a small number of centres. Large ports benefit from economies of scale and clustering; lower unit costs and better connectivity then attract further traffic and investment. At the same time, smaller coastal and island systems may remain peripheral because their level of activity is insufficient to initiate a growth cycle, producing substantial development disparities. NEG therefore supports the functional definition of maritime regions around port cores and their gravitational zones and the adaptation of development policy to these areas.

Functional region theory defines regions as groups of spatial units whose internal interactions are more intensive and frequent than their external interactions. A region is usually organised around one or more central nodes and their gravitational zones (Brown & Holmes, 1971; Karlsson & Olsson, 2006). The concept is important for maritime areas because their economic, transport, and social processes frequently cross administrative boundaries. The central components of maritime regions are usually ports and coastal cities around which gravitational zones develop. Maritime areas are characterised by links between the coast and hinterland, the movement of people and goods, and fishing zones that cross administrative boundaries. Coastal and island regions should therefore not be defined solely by administrative borders.

These theories are applied in European countries with developed maritime sectors. The French zones littorales treat coastal space as a single geographical and development unit, allowing governance policies to be adapted accordingly. This reflects the concept of functional region theory. The Italian aree marittime provide an example of strategic maritime governance based on functional processes. The Spanish demarcaciones marinas confirm the importance of a dedicated spatial framework for planning and implementing maritime strategies. These examples show that countries which recognise the distinctive features of coastal areas and maritime transport apply regional development theories in practice.

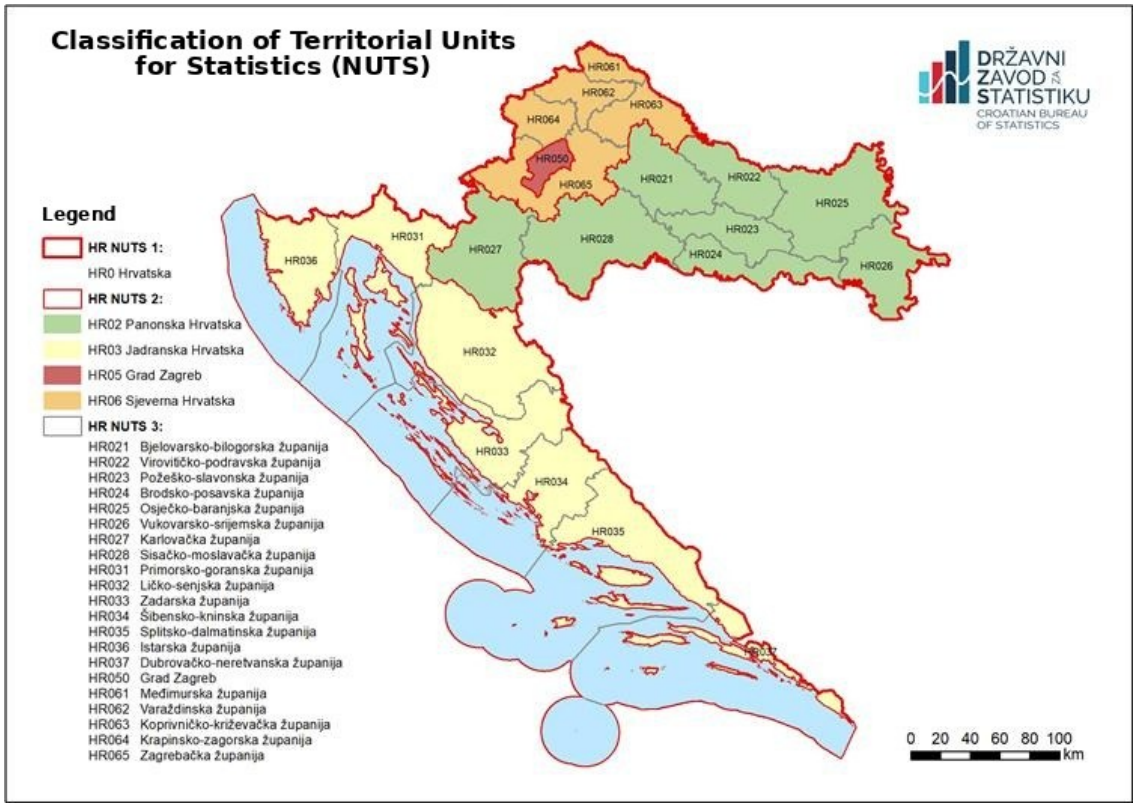
Unlike these European examples, Croatia's maritime area has not yet been defined through functional maritime regions and is instead viewed through administrative statistical units such as NUTS regions and counties. This approach does not facilitate identifying actual development trends or monitoring specific indicators. Applying endogenous growth theory in Croatia would enable policies to focus on strengthening the internal development potential of coastal and island areas. Porter's cluster theory provides a framework for viewing Croatian ports and coastal cities as the cores of maritime clusters connecting ports, maritime enterprises, and research and education institutions. NEG helps explain why key functions are concentrated in several large port centres while many island and coastal areas remain peripheral. The concept of functional regions offers a basis for redefining Croatia's coastal and island area. Maritime regions should be organised around port cores and their gravitational zones rather than solely along administrative boundaries. This would support more effective governance, planning, and use of public investment and European funds aligned with actual development processes.

Spatial Definition and Classification of Maritime Regions in Croatia

When considering the spatial organisation of Croatia's maritime area, the NUTS 2 and NUTS 3 levels are essential but conceptually problematic reference points. Although the NUTS classification primarily supports statistical harmonisation and the implementation of European Union regional policy programmes, in Croatian practice it often serves as an implicit framework for interpreting development processes in coastal and maritime areas. Figure 1 presents the NUTS division of Croatia.

At the NUTS 2 level, Adriatic Croatia treats the coastal area as a single development macroregion characterised by a strong concentration of ports, tourism, and logistics activities. Its boundaries, however, result from an administrative reshaping of the territory rather than actual functional flows. Although the NUTS 2 region provides a statistically coherent area, as an aggregate unit it cannot fully represent the complex interregional connections characterising the Adriatic maritime system, including the integration of port functions, the urban coast, and tourism and transport networks.

Figure 1
NUTS Division of Croatia



Source: Croatian Bureau of Statistics (n.d.-a)

Similar issues arise at the NUTS 3 level, where Adriatic counties play a central role in implementing regional development instruments. County boundaries, however, rarely reflect actual spatial development units, creating a gap between administrative units and functional development systems. This mismatch demonstrates the limitations of the NUTS structure for identifying maritime regions in development terms because regional development in maritime areas arises from flows, networks, and clusters rather than rigid territorial boundaries. The contemporary approaches to regional development examined above indicate the need for a conceptual shift toward functional maritime regions that overcome administrative fragmentation and are defined by economic, social, transport, and spatial criteria.

Academic research also occasionally divides Croatia's maritime area into the northern, central, and southern Adriatic according to geographical, hydrological, and biological characteristics. Although this division is analytically valuable because it more precisely reflects actual development processes and functional links in the Adriatic, its application in regional development studies is very limited because Croatia does not collect official statistical data according to this regionalisation. Figure 2 shows a map dividing the Adriatic into northern, central, and southern areas.

Figure 2
Map of the Adriatic Division



Source: Croatian Meteorological and Hydrological Service (n.d.)

Further consideration of the spatial organisation of the Adriatic area shows that Croatia's administrative division into seven Adriatic counties (NUTS 3 units) creates several development constraints. It fragments the coastal area into smaller territorial units that do not correspond to actual functional flows. This approach disrupts the continuity of processes that occur at the level of the recognised northern, central, and southern Adriatic macroregions, preventing systematic statistical monitoring and comparative analysis. Consequently, strategic planning and development policy remain confined to individual counties even though the principal development directions extend across county boundaries.

A comparison of the Croatian model with European arrangements reveals several substantive shortcomings. Other coastal countries, including Italy, France, and Spain, have developed functional coastal regions, coastal area statistics, and integrated development strategies that link maritime spatial planning with regional development. Croatia, by contrast, has neither a unified coastal development strategy nor systematic coastal statistics. This complicates integrated governance and reduces access to European development instruments targeting the maritime economy. These shortcomings strengthen the case for establishing Croatian maritime or coastal functional regions aligned with theoretical regionalisation criteria and with the practice of other European coastal countries.

Proposal for Territorial Reorganisation and Functional Regions of Adriatic Croatia

Nodal functional regions are based on the premise that spatial integration develops around an urban centre that generates services, employment, and infrastructure. Unlike administrative units, functional regions are dynamic and are defined by the spatial reach of daily commuting, transport flows, economic links, and access to public services. Under Eurostat criteria, functional NUTS 3 regions usually contain between 150,000 and 800,000 inhabitants, an optimal range for maintaining a polycentric settlement network (Eurostat, 2022). Such regions can be defined in Croatia by analysing the gravitational zones of urban centres and identifying the hierarchical structure of metropolitan areas, regional nodes, and medium-sized polycentric systems.

Adriatic Croatia is a highly dynamic and polycentric spatial system in which regional functions develop through continuous interaction with the coastal and island geography. As one of Croatia's four NUTS 2 regions, it is characterised by the linear spatial pattern of urban development and strong dependence on transport and tourism flows. This accords with theoretical arguments concerning the influence of physiographic barriers on the spatial organisation of functional systems (Haggett, 2001). Nodal functional regions within this macrostructure are shaped by the intensity of migration and economic movement, access to public services, and the degree of integration between centres and their peripheral areas. These features correspond to contemporary concepts of functional urban areas defined in European analytical studies (ESPON, 2013).

Considering these assumptions, the findings of previous studies, and theoretical insights into regional development, four nodal functional complexes are most clearly distinguishable in Adriatic Croatia: the Rijeka, Zadar, Split, and Pula regions. Each has distinctive spatial and functional characteristics and reflects the multidimensional nature of regional centrality.

This study selected relevant indicators that enable a comprehensive analysis of the demographic, spatial, and economic characteristics of the regions; their values are presented in Table 1. Population and area provide insight into regional size and population density, which is important for understanding spatial organisation and population distribution (Nejašmić, 2005). The number of cities, municipalities, and settlements reflects the degree of urbanisation and territorial structure, including the development of the network of central settlements (Vresk, 2002). Economic indicators such as GDP per capita and the unemployment rate assess economic development, while the development index, as a composite indicator, enables comparison among regions across several criteria (Centre for Local Economic Development, 2017).

Table 1
Proposed Functional Regions of Adriatic Croatia

County	Proposed NUTS 3	Population	Area	Cities	Municip.	Settlem.	GDP pc	Unempl. rate	Develop. index
Istria	**Pula**	**195.237**	**2.813**	**10**	**31**	**655**	**20.848**	**3,96%**	107,250
Primorje-Gorski Kotar	**Rijeka**	**265.419**	**3.588**	**14**	**22**	**509**	**20.883**	**5,78%**	103,860
	Zadar	**299.469**	**11.983**	**15**	**51**	**683**	**14.412**	**7,84%**	
Lika-Senj		42.748	5.353	4	8	255	15.213	8,24%	95,575
Zadar		160.340	3.646	6	28	229	14.650	5,52%	104,439
Šibenik-Knin		96.381	2.984	5	15	199	13.653	9,75%	95,396
	Split	**538.971**	**6.321**	**21**	**56**	**598**	**14.863**	**10,11%**	
Split-Dalmatia		423.407	4.540	16	39	368	14.003	11,43%	102,102
Dubrovnik-Neretva		115.564	1.781	5	17	230	17.916	8,79%	105,303

Source: Authors' calculations based on data from the Croatian Bureau of Statistics (n.d.-a, n.d.-b, 2011, 2024) and the Ministry of Regional Development and European Union Funds (2024)

The indicators presented in Table 1 confirm that Croatia's Adriatic area is not a homogeneous development unit. The existing NUTS 3 division comprises seven counties with markedly different development characteristics. The proposed NUTS 3 division, organised around the functional urban centres of Pula, Rijeka, Zadar, and Split, provides a considerably more suitable framework for regional policy than the current county model. Unlike the present administrative units, which do not reflect spatial, economic, social, and migration trends, the new regions capture actual gravitational systems and structural relationships more clearly.

The Pula region is a distinctive example of a polycentric functional system within the Istrian peninsula. Pula's central role coexists with the pronounced development potential of Rovinj, Poreč, and Pazin. The region is characterised by a dispersed distribution of urban functions and strong internal connections based on agriculture, tourism, cultural activities, and numerous other economic sectors. Istria's peripheral position relative to Croatia's main transport corridors creates a distinctive pattern of functional reach but does not diminish Pula's regional importance as the peninsula's administrative and cultural centre.

The Rijeka region functions as the most important gravitational centre in the northern Adriatic, with influence based on a distinctive combination of maritime, industrial, and service functions. In recent years, the Port of Rijeka has become increasingly important as a major transport node in Central Europe. Rijeka therefore generates a complex network of logistics and economic interactions linking Kvarner and Gorski Kotar into a coherent functional area. Beyond its transport and economic functions, Rijeka provides specialised tertiary and quaternary services, confirming its role as a higher-order regional node.

Over recent decades, the Zadar region has undergone accelerated functional consolidation driven by infrastructure development and population growth. Modern transport infrastructure and stronger air and maritime connections define Zadar as a medium-level node in the Adriatic system. Its gravitational zone includes a spatially diverse mix of island and mainland areas, with island systems strongly dependent on Zadar's urban centre. Tourism dynamics contribute to seasonal fluctuations, a prominent feature of Mediterranean functional regions.

The Split region is the most complex nodal system in Adriatic Croatia and the only one displaying the characteristics of a metropolitan area according to functional urban development criteria (OECD, 2013). Split is often identified as the principal city in Croatia's Adriatic area, with prominent tertiary and quaternary activities, including universities, healthcare institutions, and cultural institutions of regional importance. Its role as a transport node, particularly in connecting islands with the mainland, creates a broad gravitational reach across Split-Dalmatia County and numerous island areas. The Split region also demonstrates clearly polycentric development and a growing role for secondary urban nodes, consistent with theoretical models of diffuse metropolitan development (Brezzi & Veneri, 2014).

Taken as a whole, the nodal functional organisation of Adriatic Croatia reflects a hierarchically structured system in which regional centres of different orders shape a complex network of spatial interactions. The system confirms the polycentric character of the Adriatic area, which is influenced by geomorphological fragmentation, the historical continuity of urban centres, and seasonal mobility patterns. Understanding this structure is essential for regional development policy, particularly for optimising transport systems, governing island areas, and aligning policy with European principles of territorial cohesion. Regional policy actors can also intervene more effectively because measures become aligned with functional geography rather than only with formal boundaries. This makes the proposed model methodologically and operationally more suitable than the existing NUTS 3 structure. These differences have important implications for regional policy and the allocation of European Union cohesion funds.

Application of Regional Development Theories to the Functional Regions of Adriatic Croatia

The functional classification of Adriatic regions is particularly useful for applying regional development theories because it clarifies how development potential, spatial interactions, and economic functions are distributed along the Adriatic coast. Traditional administrative divisions often fail to follow actual functional flows among cities, islands, and hinterlands. A functional approach instead reveals patterns that correspond closely to theoretical models such as functional region theory, new economic geography, and endogenous growth.

Consistent with functional region theory, development in the Adriatic area is uneven, concentrated in several strong urban and economic centres. Split and Rijeka, and to some extent Zadar and Pula, are dominant centres whose influence extends beyond administrative boundaries. Functional classification shows, for example, that Split does not operate solely within Split-Dalmatia County; it creates a broad functional region that includes Solin, Trogir, Omiš, and parts of the Dalmatian hinterland. Intensive daily commuting, seasonal labour inflows, and the concentration of tertiary activities make Split a centre that generates development effects throughout the surrounding area. Rijeka similarly functions as an industrial and logistics centre whose functional region exceeds county boundaries and extends towards the hinterland of Gorski Kotar, Opatija, and smaller Kvarner towns. Functional classification therefore confirms the theoretical proposition that urban centres extend their influence through networks of economic interaction rather than administrative structures.

New economic geography further deepens understanding of the functional regions of the Adriatic, particularly through the role of transport accessibility and the concentration of services. The Adriatic area is strongly affected by seasonality, which creates temporary "agglomeration shocks" in places such as Dubrovnik, Hvar, and Poreč, where the population doubles or triples during the summer. Functional classification can quantify these seasonal flows and identify cities with dual functions: one outside the tourist season and a substantially different one during the season. NEG explains why activities such as accommodation, hospitality, and nautical tourism concentrate spatially in particular nodes. Their functional regions are defined by accessibility, service density, and infrastructure capacity. Zadar, for example, develops functional zones encompassing Nin, Biograd, and part of Ravni Kotari because of its airport and road connections, which closely correspond to the spatial concentration models described by new economic geography.

Endogenous growth models confirm that many Adriatic regions develop through local resources and specialised knowledge. Functional classification helps identify areas with strong endogenous potential, such as wine-growing zones, island fishing communities, and local clusters of small tourism enterprises. Although these areas are relatively small in institutional terms, they form clear functional microregions in which development draws on available local capacities. Istria, for example, is a functional region with pronounced endogenous elements. Its recognised gastronomy, branded olive oil and wine production, and cultural tourism create a development model based on territorial identity and local entrepreneurship, fully consistent with endogenous growth theory.

Linking these theoretical propositions with functional classification shows that Adriatic Croatia should not be treated as a single region or organised solely through administrative boundaries. It should be understood as a network of connected but developmentally distinct functional areas. This approach supports more precise public policy measures, including stronger transport corridors in functional urban areas, specialised measures for peripheral islands, management of seasonal pressure in tourism nodes, and support for local clusters in areas with pronounced endogenous potential. Functional classification

thus becomes an important instrument for applying contemporary regional development theories to the Adriatic area.

Discussion and Conclusion

The analysis confirms that the existing NUTS system, which is based on administrative boundaries, does not adequately capture the functional structure of Croatia's maritime and coastal area. Despite the recent revision of NUTS 2 regionalisation, which divided Croatia into four statistical regions, the current territorial structure still does not reflect the specific functionality of maritime and coastal areas. The new division provides greater differentiation than the previous two-region scheme, but the central problem remains. The statistical regions were not designed to reflect the socioeconomic, logistics, and environmental processes characteristic of maritime systems. Adriatic Croatia includes urban agglomerations with strong international functions, such as Rijeka and Split, as well as uninhabited islands, rural hinterlands, and areas heavily oriented towards tourism or maritime industries. This internal heterogeneity complicates applying regional development theories based on coherent functional units. When a statistical region contains structures with divergent development patterns, the ability to identify causal relationships accurately and formulate clear development recommendations is substantially reduced. The NUTS 3 level in Croatia also retains the characteristics of administrative rather than functional regionalisation. County boundaries often cut across natural maritime units and disregard island systems that function as coherent spatial and social areas, as well as maritime zones and economic areas connected through relationships that do not follow mainland administrative boundaries.

The lack of precisely defined maritime regions directly affects the quality of academic research and the validity of strategic documents. Research on regional competitiveness, socioeconomic development, demographic change, island governance, and sustainable economic planning remains partly fragmented because the coastal system has not been adequately conceptualised as a coherent functional area.

These findings demonstrate the need to redefine the regional framework by introducing specifically designed maritime regions based on the principles of functional geography and integrated coastal management. Such regions would support a more detailed understanding of development potential, identify structural constraints, and inform empirically grounded recommendations, thereby increasing the relevance and precision of territorial analyses. Only regionalisation that recognises the distinctive characteristics of maritime areas can provide an adequate basis for applying contemporary regional development theories and drawing sound, context-sensitive conclusions.

The analysis indicates that the proposed model of NUTS 3 regionalisation, based on functional urban centres and their gravitational zones, provides a considerably more suitable framework for regional policy than the existing county structure. The Pula, Rijeka,

Zadar, and Split regions demonstrate greater internal coherence, clearer development patterns, and stronger internal functional relationships than the administrative boundaries of individual counties allow. Recognising actual demographic, economic, spatial, and functional processes enables more precise identification of development needs and differentiated targeting of interventions, especially those financed through European structural and investment funds. The proposed regionalisation increases the analytical reliability of the statistical system and strengthens the effectiveness of public policy, creating conditions to reduce regional disparities and encourage more balanced territorial development. It would also improve the validity of academic research and enable more targeted, spatially sensitive national policies, thereby contributing to territorial cohesion and the sustainable development of Croatia's Adriatic area.

The proposed NUTS 3 regionalisation is conceptually aligned with the dominant theoretical frameworks of contemporary regional development, particularly new economic geography, functional region theory, and the endogenous growth paradigm. These theories treat development as a process rooted in the functional organisation of space, network interactions, and the concentration of activities within urban nodes.

Establishing regions according to actual gravitational systems increases the analytical relevance of territorial units and enables more effective identification of development discontinuities. This aligns with the concept of territorial cohesion, which requires development policies to adapt to actual spatial and functional dynamics.

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