"Dubrovnik and the Cities of the Ombla Valley": A Strategic Sustainable Tourism Ecosystem

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Abstract. Tourism pressure emerges as a significant issue in mainstream tourist destinations. On one hand, the increasing tourist presence offers an opportunity for the development of the local economy driven by external agents; on the other hand, excessive sectoral specialization leads to challenges related to the sustainability of places. This paper presents a case study applying the STESY model to Dubrovnik, Croatia, a globally recognized cultural destination facing critical challenges related to overtourism, spatial imbalance, and seasonal pressure. The research focuses on identifying and rebalancing tourism aiming to reveal latent opportunities for sustainable and inclusive development. Particular attention is given to the Canal d'Ombla area, proposed as a strategic Destination area within the broader tourism ecosystem of Dubrovnik. The strategic framework was developed through a collaborative design studio with architecture students from the University of Basilicata, integrating interpretative approaches with data-driven territorial analysis. Framing tourism as a key component of spatial planning, the study advocates for a context-based decision support system aligned with the principles of the New Urban Agenda. The paper details the methodological process, the spatial taxonomy of DAj, and a development proposal titled "DUBROVNIK and the cities of CANAL D'OMBLA". The discussion outlines key findings, methodological limitations, and future directions for sustainable tourism governance in fragile cultural landscapes.

Keywords: New Urban Agenda · Sustainable development · Sustainable tourism ecosystem · STESY

1 Introduction

Tourism as a strategic driver of territorial development represents an increasingly relevant field in contemporary spatial planning and policy design. Its transversal nature intersects with key domains of sustainability, including environmental balance, sociocultural identity, and economic resilience [1–3]. In recent years, the debate on tourism development has shifted from growth-oriented paradigms to models focused on spatial justice, territorial regeneration, and systemic governance.

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The debate on sustainable development strategies for sustainable tourism enhancement under the umbrella concept of regional development become more and more pressing due to the tourism boom in the post covid era. From the global perspective [4] to the operational level of key essays discussing various aspects of sustainable urban planning, land use, transportation, and ecological design [5]. Challenges and opportunities of sustainable urban development generally are positioned in the conflicts between economic growth, social equity, and environmental preservation in urban planning [6].

Current trends, more than standard rules, in policy recommendations are at the basis of key international institutional references and academic applications [7–10].

Tourism becomes a key sector for current debate in regional sustainability [11, 12] and it represents and horizontal domain of policy making and design implementation in a multiscale [13, 14] and multistakeholder perspective [15].

The spatial dimension of tourism plays a central role in shaping the organization of destinations, especially in contexts where overtourism, territorial imbalance, and seasonal flows impact livability and resilience. In this scenario, the STESY model [16] offers a methodological framework to analyze specialized tourism ecosystems through a multi-scalar approach, integrating attractors, services, and reachability as key components in defining Destination Areas (DAj). This taxonomy enables a structured reading of tourism supply and supports the design of data-driven strategies for spatial and functional rebalancing.

In this paper, we apply the STESY model to the case study of Dubrovnik, one of the most visited cities in the Adriatic and a symbolic example of the tensions between cultural attractiveness and spatial overload. Dubrovnik has experienced a remarkable increase in international tourism, peaking before the COVID-19 crisis and returning to near pre-pandemic levels in 2023. However, the city continues to face issues of hypercentralization of tourist flows in the historic center, high seasonality, and underutilization of peripheral areas.

The research aims to develop a strategic vision for rebalancing the local tourism system, with a particular focus on the Canal d'Ombla area (DAj 4). This work is part of a studio-based educational experience at the University of Basilicata and provides a context-based framework for rethinking tourism planning through analytical rigor and design experimentation.

Beyond focusing on peculiar features of the case study area this work provide an experimentation of the STESY methodology in order to design a strategic framework for developing local tourism system on the ground of a robust analytical process oriented to identify local tourism Destination Areas. Open data and cluster analysis are applied in order to combine interpretative approach to quantitative design during studio lab developed with architectural university students at the University of Basilicata.

"Tourism as a territorial planning component" represents the disciplinary position of this paper, we aim at provide qualified decision support system in defining and support policy making territorial development process referring to the New Urban Agenda as a toolkit for better decision and better "context based" design[17–19].

The paper is structured as follows: after presenting the methodological framework and the STESY model, the case study of Dubrovnik is analyzed through statistical, spatial, and typological lenses. The subsequent section outlines a design proposal for sustainable tourism development, titled "DUBROVNIK and the cities of CANAL D'OMBLA" aimed at enhancing the territorial capacity of less-visited areas. The discussion and conclusion reflect on the outcomes of the study, its academic relevance, and future directions for operational implementation in real-world policy contexts.

2 Background and Scope of the Research

The STESY model [20] serves as a conceptual framework for analyzing and organizing knowledge related to specialized tourism phenomena, with a particular focus on spatial and territorial aspects. This taxonomy provides a structured system for classifying and managing information, supporting the analytical process from the initial phase of territorial classification to the development of strategic decision-making frameworks. The hierarchical approach of the model enables the classification of specialized tourism into three distinct levels: Specialized Tourism Ecosystem, Specialized Tourism System, and Specialized Destination Area (DAj). The latter represents the primary unit of analysis for describing the territorial tourism supply. A DAj does not necessarily correspond to traditional administrative boundaries but is instead defined by the spatial and functional organization of the local tourism system. Consequently, a DAj may encompass multiple municipalities or, conversely, multiple DAj may exist within a single municipal boundary. The conceptualization of DAj is formalized as follows:

$$\mathbf{DAj} = \mathbf{f}(\mathbf{Aj}, \mathbf{Sj}, \mathbf{R})$$

where: Aj (Attractors) refers to physical points of interest (POIs), including officially recognized national and international tourist attractions (e.g., UNESCO sites, certified historic villages, Blue Flag locations, etc.); Sj (Services) includes facilities within the tourism supply chain, such as accommodations and restaurants, each defined by specific locations and attributes; R (Reachability) represents the accessibility of the destination, encompassing the infrastructural and organizational system that allows visitors to reach the area via different modes of transportation (e.g., train stations, bus terminals, parking facilities).

A key aspect of the STESY model is the concept of tourism specialization (j), which categorizes a destination based on its predominant tourism type (e.g., cultural, gastronomic, nature-based tourism). This approach enables a detailed understanding of the relationships between functional sub-regions within a territory, facilitating the formulation of data-driven tourism development strategies. By applying this methodology to selected case studies, it is possible to construct a territorial network, enhancing the comprehension of spatial interconnections within the tourism system.

The research approach is based on the following phases (Fig. 1):

1. Analysis: Case study description through main tourism statistics, policies and analytics.
2. Application of STESY model: spatial data selection and classification, stakeholder identification, DA identification and benchmarking

3. Design: objectives identification, territorial scenario and design solutions, NUA compliance assessment.

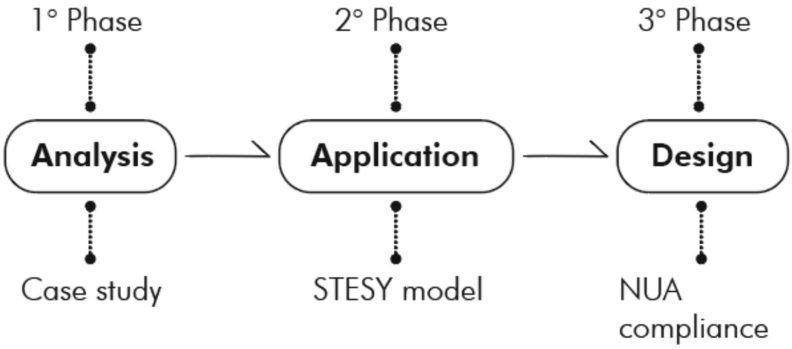

Fig. 1. Description of the methodological framework.

2.1 Case Study Analysis: Dubrovnik

Dubrovnik, one of Croatia's most popular tourist destinations, recorded a steady increase in tourist arrivals until 2019, when the peak number of visitors was reached. However, 2020 saw a high-pitched setback due to the COVID-19 pandemic, which imposed severe travel restrictions, resulting in a significant reduction in tourist flows (Fig. 2).

Since 2021, a gradual recovery of the tourism sector has been observed, with a steady increase in the number of visitors. In 2022 and 2023, arrivals have again come close to pre-pandemic levels, signaling the city's return to international attractiveness. The trend in overnight stays in accommodation facilities follows a similar trend to that of tourist arrivals. Between 2014 and 2019, there was a constant growth in the number of overnight stays in accommodation facilities, demonstrating an expanding sector. From 2021 onwards, there was a progressive recovery in bookings in hotels and other accommodation facilities, a sign of the slow but steady recovery of tourism. Dubrovnik's tourist influx is characterized by strong seasonality. The summer months, from June to September, are the busiest period, with a peak reaching 22% of annual attendance. This trend is favored by the favorable climate conditions, beautiful beaches and rich cultural and event offerings.

On the contrary, during the winter months (November-February), the number of visitors drops dramatically, with the percentage dropping to 2% in the less frequented periods (Fig. 2). This phenomenon confirms that Dubrovnik is predominantly a summer destination, with a limited tourist influx in the colder months. Most visitors arrive in Dubrovnik by plane (55%), thanks to the well-developed international connections of the city airport. They are followed by those who arrive by sea (27%), taking advantage of the city's coastal location and its connection to other Mediterranean destinations. Finally, a smaller percentage of tourists travel by land (18%), using buses or cars. Hotel accommodation is the predominant choice for visitors to Dubrovnik: 55% of tourists opt

for hotels, demonstrating a clear preference for comfort and service. Tourist apartments are also a popular choice (35%), probably due to the greater autonomy and flexibility they offer. Only 7% of visitors choose campsites or hostels, while a residual 3% prefer other forms of accommodation.

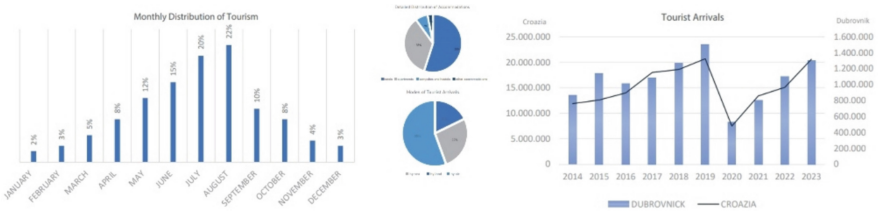

Fig. 2. Personal Elaboration of Croatia ISTAT data. Source data: https://www.htz.hr/en-GB/tourism-information/tourism-analysis/.

2.2 Application of STESY Model: Dubrovnik

The analysis of the territorial system and tourism offer of Dubrovnik was conducted by dividing the elements into three main categories according to STESY model: Attractors, Services, Reachability. Through the elaboration with GeoDa [21] software we identify DA of elements based on their proximity within the overall system. This process highlighted four DA outlining strengths and critical issues for each area (Fig. 3).

Area 1 DA stands as the heart of Dubrovnik's tourism, offering a well-rounded and extensive experience. This area boasts 178 services, making it a hub of hospitality and entertainment. The range of cultural attractions is equally impressive, with 33 panoramic viewpoints, 23 memorials, 19 works of art, museums, churches, and 16 beaches. The Old Town's dominance as a tourist center is undeniable, offering a rich historical and cultural experience, but it also faces the challenge of overcrowding, particularly during peak tourist seasons, due to the high concentration of visitors and the limited physical space. In contrast, the Area 2 DA presents a more balanced tourism model. With 95 services, including 24 cafés, 15 restaurants, and 11 bars, this area provides a more functional tourism experience, focused less on historical attractions and more on everyday conveniences. There are fewer tourist attractions in the Area 2 DA (26 in total), with 10 panoramic points and 5 memorials. However, its reachability is a key strength, with 74 infrastructure points, making it a highly accessible area for visitors. While it is less touristically rich compared to the Area 1 DA, the Area 2 plays an important supporting role, offering a more practical, less crowded alternative for tourists, though it lacks the same cultural draw. Area 3 DA offers a different dynamic, balancing between services, attractions, and accessibility. It has 76 services, including hotels and restaurants, as well as 38 attractions, with a notable concentration of panoramic points and beaches. Its reachability is supported by 41 transport points, including bus stops, ferries, and rentals for cars and bicycles. While Area 3 DA is well-equipped to host visitors, its primary appeal lies in its natural beauty, including its beaches and scenic viewpoints, making it a great destination for those seeking a more relaxed, nature-focused experience. However,

it lacks the same cultural depth as the Area 1 DA and may not attract tourists primarily interested in history and cultural immersion. Finally, the Area 4 DA represents a stark contrast to the others. It is the least developed area in terms of both infrastructure and services. With only 18 services, including one hotel, six restaurants, and three bars, and just 7 attractions, mainly limited to a few panoramic points and castles, Area 4 DA struggles to compete with the more developed areas of Dubrovnik. Despite its potential historical and scenic value, the area lacks the infrastructure and services necessary to draw significant tourist traffic. The reachability in Area 4 DA is good, with 26 infrastructure points, including 23 bus stops, but its underdevelopment makes it less attractive for visitors.

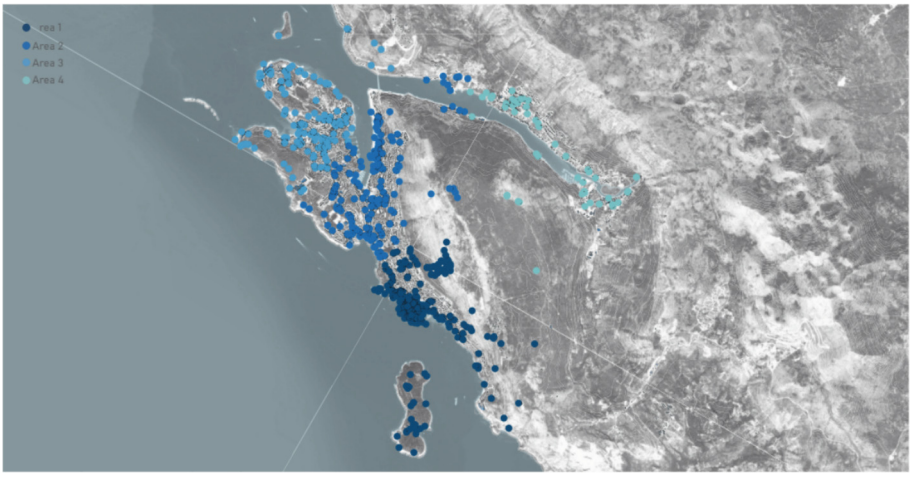

Fig. 3. Study area with Destination areas identification: Area 1, Area 2, Area 3, Area 4.

2.3 Design: DUBROVNIK and the Cities of CANAL D'OMBLA

Following an assessment and comparison of the DA, we recognize Area 4 (Canal D'Ombra) as a potential area for development and enhancement that would attract tourists and integrate into the tourism circuit of the other three DAs, balancing the current tourist pressure.

Considering Dubrovnik, one of Croatia's top tourist destinations, faces overcrowding issues, especially during the summer months, due to the high influx of visitors. The proposed project aims to establish a more balanced tourism model, enhancing visitor experiences without compromising the city's livability. The design project has as its main objective the decentralization of part of the tourism from the historic center, favoring a more distributed and sustainable experience. To do this, the focus is on the creation of eco-sustainable accommodation, the increase of services for visitors and the enhancement of the historical and cultural heritage (Fig. 3).

Actions are structured in:

- The establishment of a pedestrian and cycling path along the river offering new spaces for leisure and improving the connection between the urban center and the natural landscape.
- The recovery of historical buildings and traditional houses for the creation of a widespread hotel represents a model of sustainable hospitality that enhances the existing architectural heritage.
- The Castles of Memory: The restoration and enhancement of historic castles allows for the creation of thematic tourist itineraries that combine history, culture and immersive experiences, such as re-enactments and artisan workshops.
- Ombla Heritage Trail: The engineering and safety of natural trails promoting trekking and hiking activities.

The project follows the principles of the Urban Agenda [22] to ensure economic competitiveness, job creation, and climate change mitigation. Through synergy between the public and private sectors, Dubrovnik can develop sustainable tourism, enhancing its natural and cultural heritage while preserving residents' quality of life.

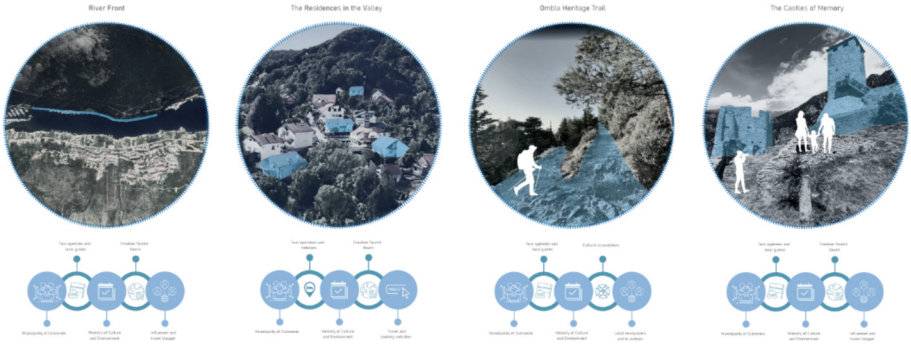

Fig. 4. Project's actions.

Dubrovnik's tourism landscape is highly concentrated in the historic center, while peripheral areas like Val d'Ombla require targeted development strategies to balance tourist flows and enhance the overall attractiveness of the city (Fig. 4). The predominance of reachability (52%) in the data highlights the importance of improving accessibility and transport solutions to develop less-visited areas. By investing in alternative tourism experiences and sustainable infrastructure, Dubrovnik can reduce pressure on its historic core and create a more balanced, long-term tourism model (Fig. 5).

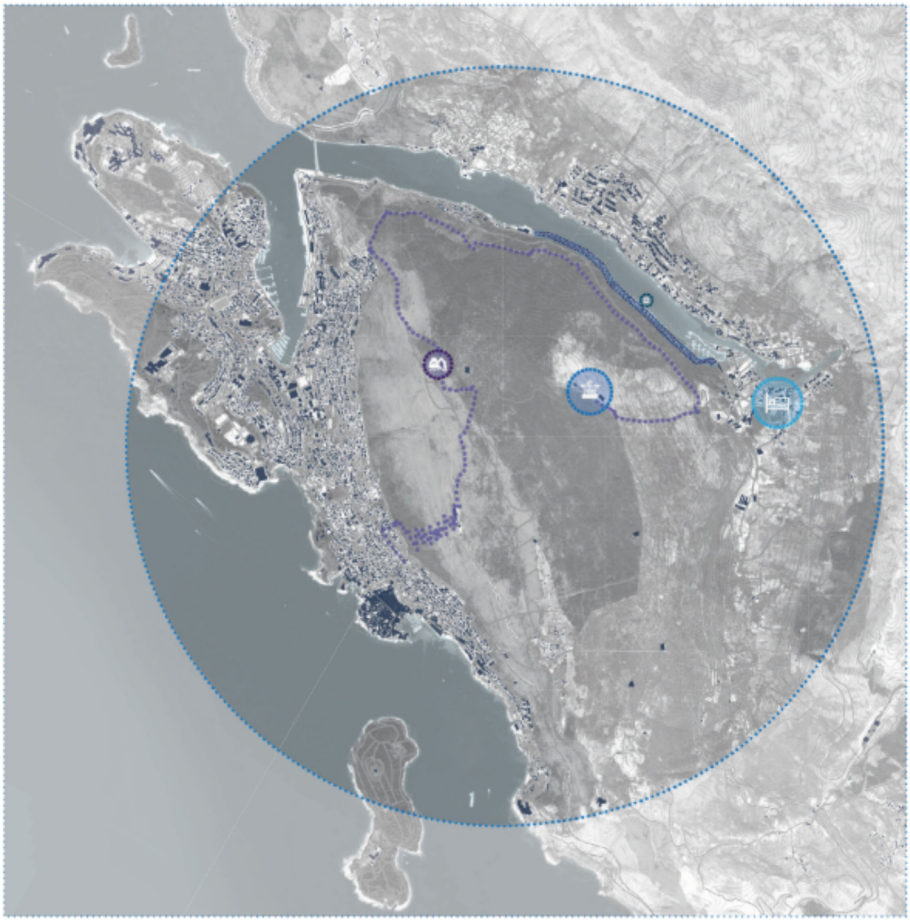

Fig. 5. Design: a journey between sky and sea.

3 Discussion E Conclusions

The analysis conducted on Dubrovnik reveals a highly concentrated and seasonally driven tourism system, with peak flows during the summer months and a sharp decline in visitor numbers during winter. After an expansion between 2014 and 2019, the city experienced a dramatic setback due to the COVID-19 pandemic, followed by a gradual recovery that, by 2022–2023, brought arrivals close to pre-pandemic levels. However, the current configuration of the tourism system remains unbalanced, both in territorial distribution and in the forms of tourist typology.

Through the application of the STESY model and spatial analysis of flows and tourism infrastructure, significant criticalities have emerged—particularly the overcrowding of DA_j 1, in contrast with the underuse of peripheral areas such as DA_j 4

[23, 24]. Although endowed with latent landscape and cultural resources, DAj 4 currently lacks the infrastructure and tourist services necessary to support significant visitor flows.

Based on these findings, a design proposal has been made that focuses on decentralizing tourism flows, through regeneration and enhancement interventions in DA_j 4. These include the promotion of slow mobility, the recovery of existing architectural heritage through models of diffuse hospitality, the creation of themed cultural itineraries, and the improvement of accessibility. These actions align with the principles of the European Urban Agenda, aiming to ensure a balance between tourist attractiveness, environmental sustainability, and residents' quality of life [25–29].

Limitation relies on data sources (mainly based on open data - Open Street Map - implemented in the STESY model) and lack of local stakeholders' participation [10, 30] in the design phases in order to enhance the local validations of the proposal.

This study is part of the output developed within a university studio course during the academic semester program of architecture students at the University of Basilicata. Therefore, the character of the application is an academic proposal more than a real case study test. It reinforces a teaching objective oriented to test downscaling of the New Urban Agenda Principles on different topics and thematic area [31–37].

Future research should explore advanced spatial analysis techniques and participatory approaches to refine the STESY model implementation [38] [38] placing results in the framework of real decisions making processes for tourism policymaking in Dubrovnik.

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