Reimagining the Future of the Lake Prespa Region
A Cross-Border Perspective

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Abstract - *This report is a result of the workshop held by the PhD students, and provides a report of the Lake Prespa region, a distinctive transboundary area encompassing Albania, North Macedonia, and Greece. The project seeks to transform Lake Prespa into an abstract infrastructure network creating connections among places, utilizing its natural and cultural resources to generate sustainable tourism, improve cross-border connection, and strengthen socio-economic resilience. The study used a landscape-focused methodology, to analyse Lake Prespa and its surrounding landscape as an interconnected common. This approach proved essential in establishing a comprehensive, state-of-the-art assessment of the area, enabling a clearer understanding of the spatial relationships among key features distributed around the lake. The research underscores the significance of digital infrastructure and real-time data systems in improving tourist experience and facilitating long-term regional planning. Proposed interventions encompass the establishment of cross-lake corridors, nature-inspired mobility solutions, and multipurpose public spaces that embody the region's cultural legacy and ecological importance.*
This proposal envisions Lake Prespa as an interconnected ecosystem that serves as a cultural and traditional commons, disregarding political boundary divides and positioning the lake as a pivotal node within the broader network of the Western Balkans. This vision aligns with regional objectives for sustainable development and cross-border collaboration, establishing a framework for integrating conservation with economic advancement in transboundary areas.

Keywords - Cross-Border Connectivity, Landscape Segmentation, Sustainable Tourism, Infrastructure networks, Cultural and Natural Heritage

Introduction

The municipality of Pustec occupies a distinctive cross-border region at the intersection of Albania, North Macedonia, and Greece, centered around the transnational water body of Lake Prespa. This area forms part of a broader transboundary hydrological and ecological system, recognized for its exceptional natural and cultural heritage [1]. Encompassing mountain ranges, the interconnected basins of Lake Ohrid and the Prespa Lakes, as well as ancient and medieval settlements, the region is designated as a UNESCO World Heritage site due to its unique biodiversity and historical significance [2]. Lake Prespa today represents a unique geographic and ecological entity, simultaneously serving as a traditional common and a politically segmented water body, shared administratively by North Macedonia, Albania, and Greece [3]. Despite the inherent challenges of tripartite governance, small lakeside settlements have persisted, primarily sustaining themselves through agriculture [4]. However, their peripheral location,distant from major urban centers and economic hubs, has led to pronounced challenges, including youth outmigration, limited mobility, and a shortage of professional opportunities [5]. Regions of natural interest typically encompass less populated and economically disadvantaged areas, particularly those that are mountainous [6]. Local communities encounter a dilemma: they are deeply committed to traditional land uses, which are typically sustainable regarding the regeneration capacity of natural resources and have enabled survival in challenging conditions. Conversely, they anticipate new forms of development. The heritage associated with their traditions constitutes a significant aspect of local identity, intertwining collective memory of the past with contemporary elements, including innovative applications of natural resources and emerging opportunities such as leisure and tourism in various forms and intensities [7]. The values of a protected area encompass various components, including natural

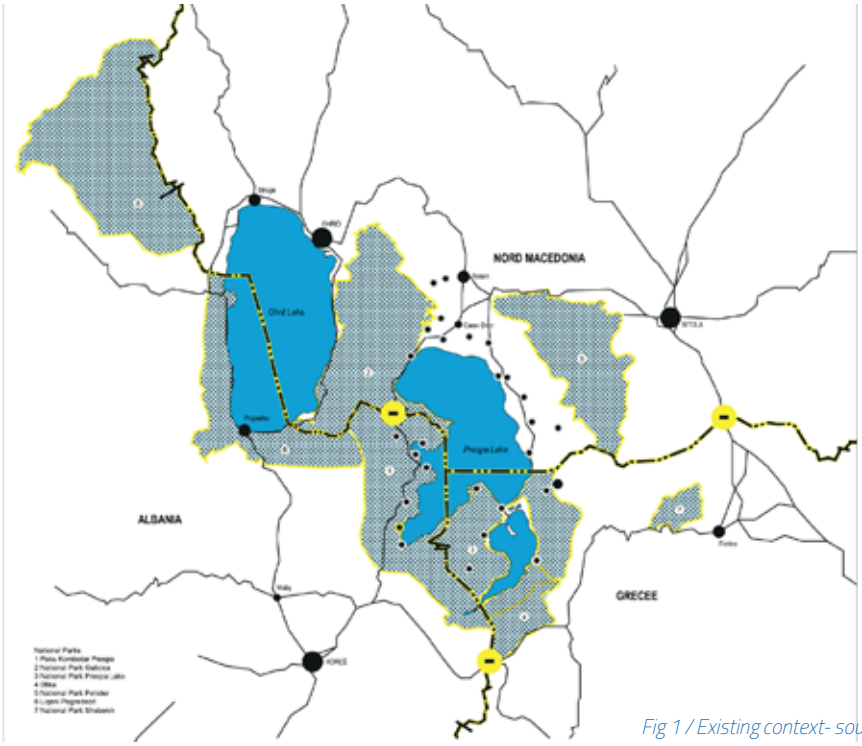


Fig 1 / Existing context- source/ Catrina Rondina

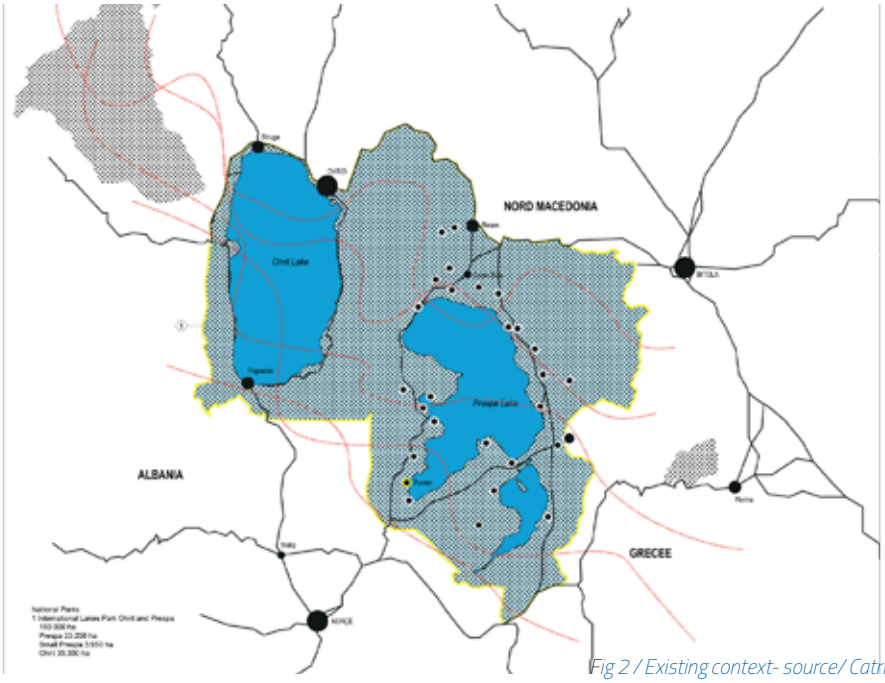


Fig 2 / Existing context- source/ Catrina Rondina

features and human modifications, biodiversity and aesthetic qualities, traditional and contemporary resource uses, local perspectives and external expectations, as well as preservation and transformation proposals [8].

The vision

The territorial realignment following the 1913 The territorial realignment after the 1913 border demarcation disrupted long-established, interdependent communities that had coexisted until that time [9]. During the 20th century, this partitioning led to considerable depopulation and the decline of traditional transboundary networks. Political upheavals, such as the Balkan Wars and World War II, exacerbated these divides, undermining infrastructural and social cohesion throughout the region [10]. In response to these persistent cross-border issues, a group of PhD students conducted a collaborative workshop aimed at crafting a forward-looking development framework for the region. This initiative sought to leverage the untapped touristic potential of the Prespa basin's natural parks while enhancing infrastructural and social connectivity across national boundaries [11]. Central to this approach was the recognition that, despite their separate cultural identities, the three bordering nations share significant environmental assets—traditional commons—whose ecological integrity inherently transcends administrative and political boundaries [12]. The project thus reframed the notion of cross-border interaction, moving beyond the conventional

lens of geopolitical coordination to embrace a more fluid, place-based approach that acknowledges shared geographies and everyday practices [13]. Tourism, within this framework, was identified as a catalytic sector, capable of generating new economic flows, stimulating inter-community exchange, and reversing the region's demographic decline by encouraging the return of former residents and attracting new populations [14].

Objectives:

This research aims to develop a hypothetical scenario for enhancing cross-border interactions by leveraging Lake Prespa as a central infrastructural asset, while assessing its potential socio-spatial impact on nearby villages and the surrounding hinterland [15]. Special focus was placed on developing a comprehensive strategy aimed at fostering sustainable and integrated mobility in the Lake Prespa region, including: Enhancing low-mobility services by promoting transport solutions tailored to both residents and tourists, in order to reduce vehicular traffic and discourage mass tourism [16]; Promoting green and nature-based mobility, leveraging natural paths and ecological corridors to connect key cultural and ecological sites [17]; Encouraging tourism-oriented activities by envisioning the lake as multifunctional infrastructure, supporting uses such as water sports, adventure tourism, floating promenades, and flexible transport systems [18]; Reconceptualizing connectivity beyond physical infrastructure, by including visual and perceptual connections across the lake, emphasizing panoramic landscape continuity [19]; Developing a smart digital layer, including a mobile application designed to provide real-time service information and enhance the visual and experiential engagement with the lake, thus supporting exploration and interaction [1]. The central hypothesis of this project explores the potential of reimagining the lake as a form of infrastructure—physical, digital, and perceptual—serving as a connective element across territorial, cultural, and experiential dimensions [2].

Methodology

A deeper analysis of Lake Prespa and its surrounding landscape as an interconnected common proved essential in establishing a comprehensive, state-of-the-art assessment of the area [3]. This approach enabled a clearer understanding of the spatial relationships among key features distributed around the lake. The study first focused on identifying cultural and heritage

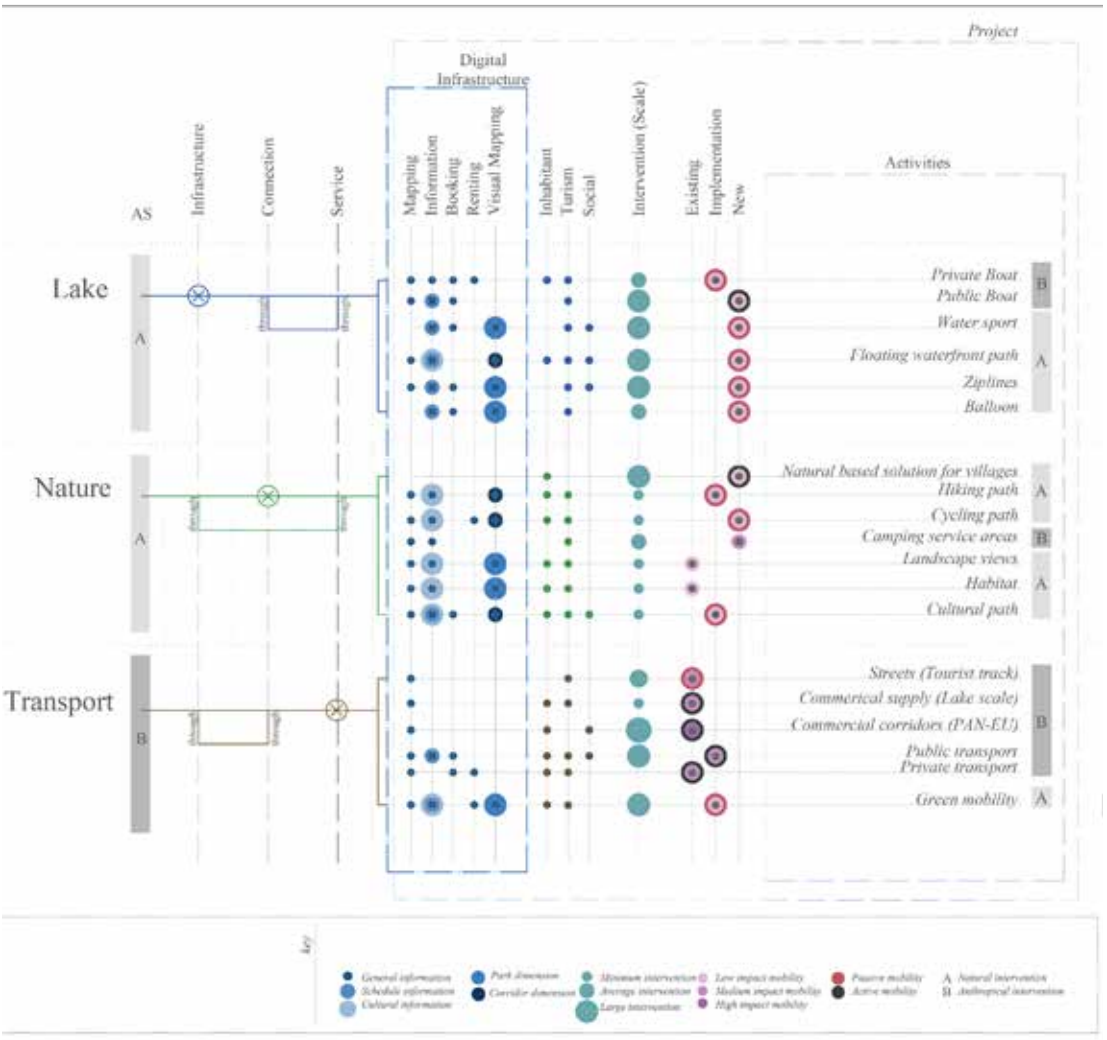


Fig 3 / Matrix concept *source/ Lisa Mensi, Sadmira Malaj Catrina Rondina, Gregor Andoni*

landmarks, natural sites, and ecologically significant areas, effectively mapping the region into distinct elevation zones, including higher (mountains and hills) and lower (fields and lake) terrains [4]. To capture the complexity of these spatial dynamics, the concept of the "segment" was employed as an analytical tool, facilitating the identification of connective pathways and interactions among various landmarks, fluxes, and critical sites within the Prespa basin [5]. This conceptual framework generated a "net" of connections, which was then systematically compared to the existing infrastructure, including primary road networks, agricultural tracks, hiking trails, and informal natural paths [6]. This comparison allowed for a detailed typological analysis, revealing gaps and opportunities for enhancing connectivity while preserving the unique ecological and cultural character of the region [7]. As a foundational component, the project emphasized the primacy of nature and its organic, rather than political, borders [8]. This led to the proposal of an "International Prespa Park"—a unified, transnational conservation area encompassing all three lakes—as a central node within the broader Western Balkans network. Such a park would strategically bridge two critical Pan-European transport corridors: Corridor VIII (linking the Adriatic Sea via Durrës, Albania to the Black Sea ports) and Corridor X (connecting Austria, via North Macedonia to the Greek port of Thessaloniki) [9]. With Albania's internal infrastructure now extending from the Adriatic port of Durrës to the city of Korçë, the Prespa region stands well-positioned to capitalize on these emerging regional linkages [10]. However, a significant challenge remains in establishing integrated infrastructural corridors that connect key cities around the lake—such as Korçë (Albania), Bitola (North Macedonia), and Florina (Greece)—to support economic diversification, sustainable tourism, and long-term regional stability [11]. Addressing these infrastructural gaps is a central objective of this project, reflecting a commitment to fostering resilient, interconnected communities within the broader Western Balkans context [12]. Moreover, the existing patterns of low mobility within the Prespa region present a unique opportunity for the development of sustainable tourism models [13]. Such approaches prioritize the preservation of the natural environment while promoting cross-border collaboration based on ecological continuity, rather than rigid political boundaries [14]. This strategy aims to foster the growth of slow tourism, nature-based experiences, and innovative transboundary partnerships, reinforcing the region's long-term socio-economic stability and ecological resilience [15]. By focusing on sustainability, these models can help mitigate the environmental impact of tourism, support local livelihoods, and enhance the cultural and natural heritage that defines the Prespa landscape [16]. The approach taken in the Prespa study draws on established landscape assessment methodologies, integrating both spatial analysis and cultural landscape mapping [17]. This combination enables a comprehensive understanding of landscape structure, function, and connectivity. For instance, the use of segments as analytical units is reminiscent of the methodology applied in the assessment of the Alpine Arc and the Dolomites in Italy, where landscape segmentation is used to map ecological corridors, cultural routes, and heritage sites in complex mountainous terrains [18]. Practically, this means stacking geographical data to distinguish between distinct functional zones and terrain kinds [19]. For instance, in the Dolomites, researchers charted ancient towns, agricultural valleys, and mountain passes to grasp the spatial logic of human-nature interactions across millennia [1]. In the Prespa setting, this strategy enabled the identification of important corridors and nodes enabling human mobility as well as natural flows, hence stressing possible synergies between conservation activities and economic growth [2]. The next phase was finding the interaction points between the existing infrastructure and the lake, and evaluating how these nodes are, or may possibly be, interconnected [3]. After mapping these contact points, it became feasible to visually associate the principal locations around the lake, facilitating a clearer comprehension of which areas are already interconnected, which necessitate additional infrastructural development, and which may remain linked primarily through visual or perceptual continuity [4]. The design process adopted a conceptual framework that regarded the lake as a connected space rather than a barrier, envisioning it as "absent" and concentrating exclusively on the linear logic of the links [5]. This abstraction facilitated the creation of a theoretical infrastructure network focused on functional links, rather than being limited by the lake's physical existence [6].

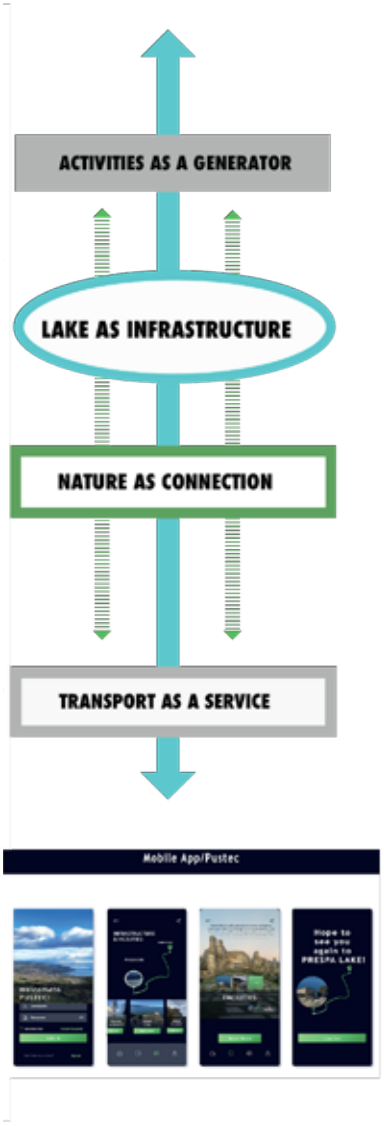


Fig 4 / Framework structure

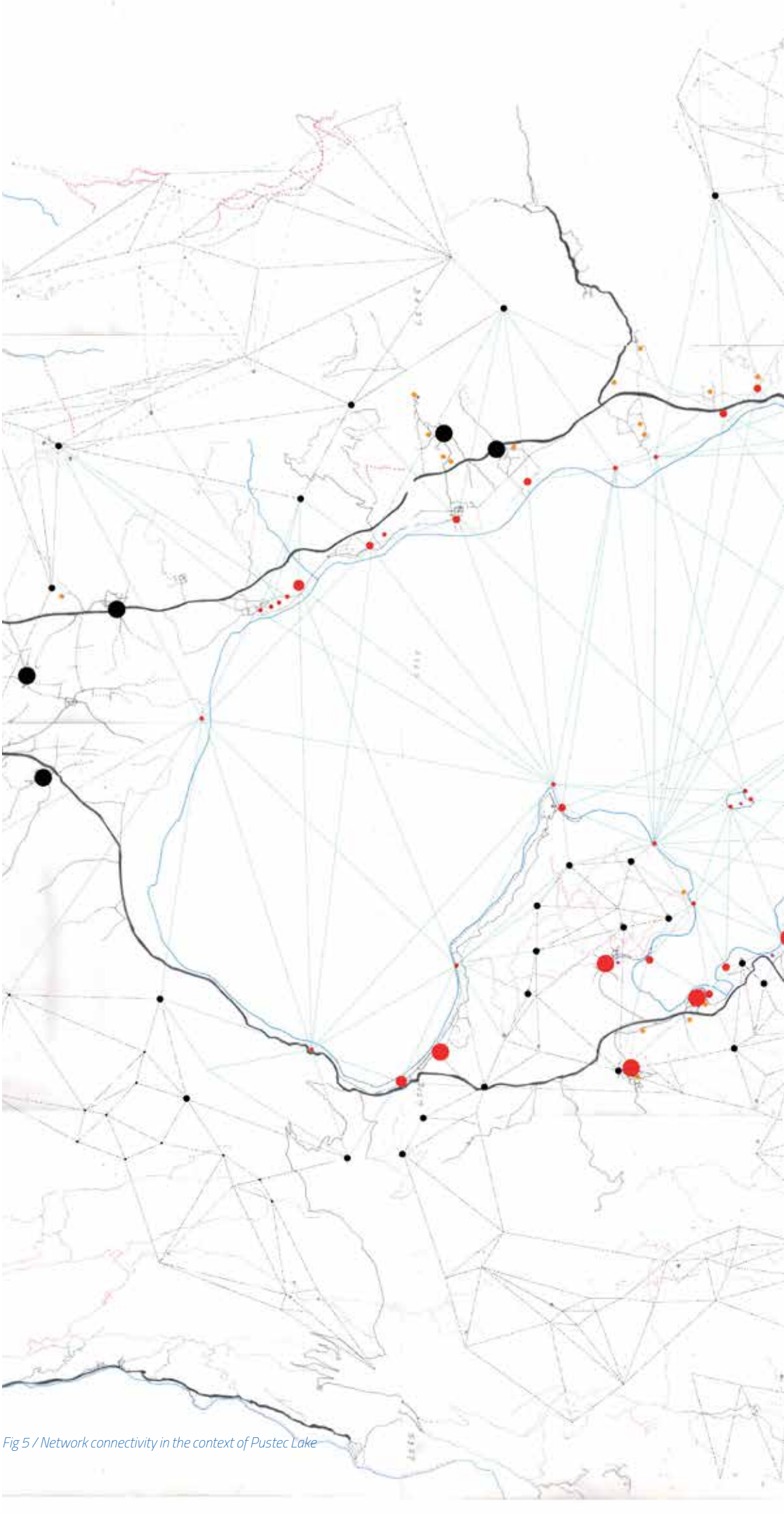
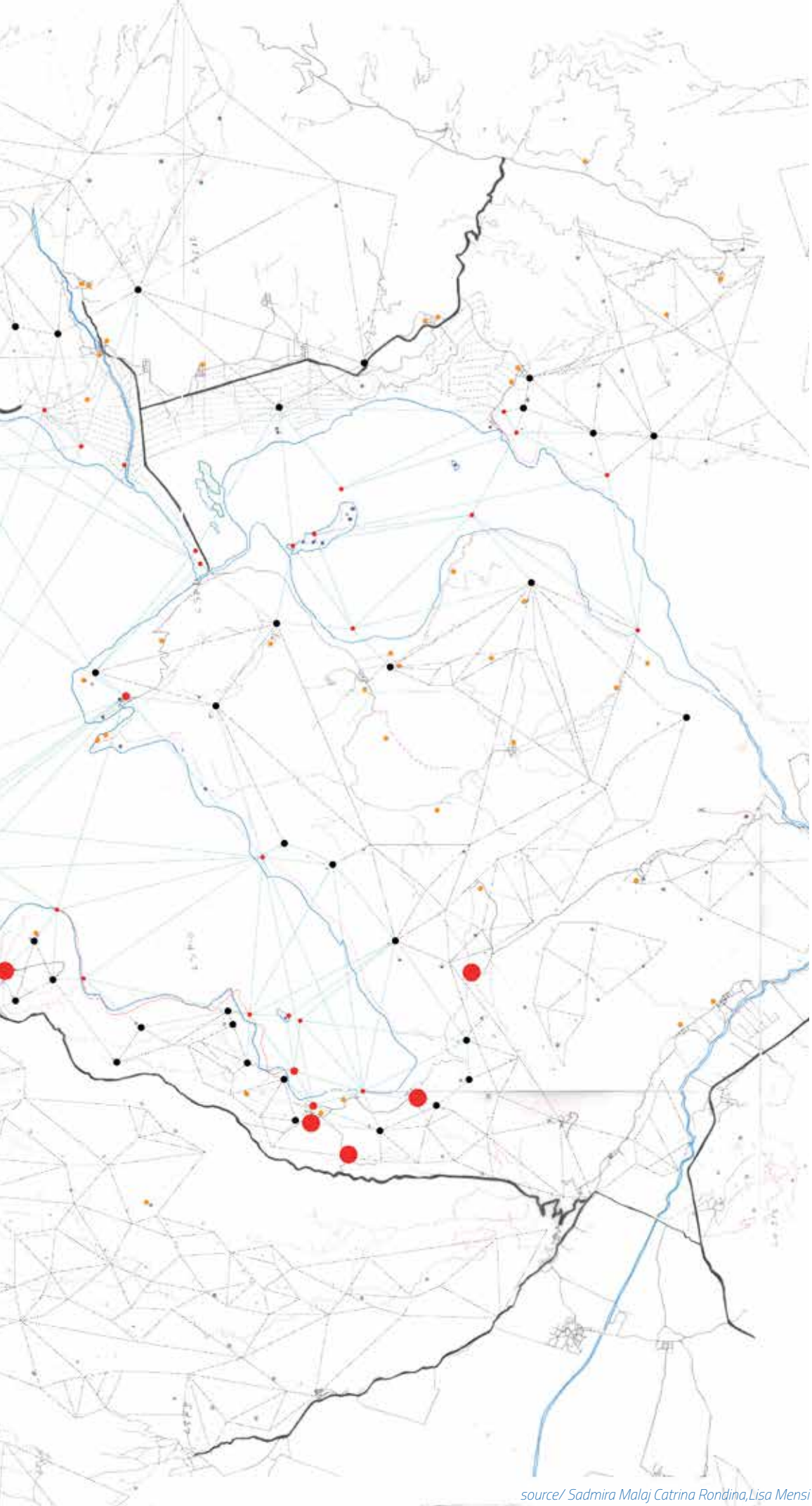


Fig 5 / Network connectivity in the context of Pustec Lake



source/ Sadmira Malaj Catrina Rondina,Lisa Mensi

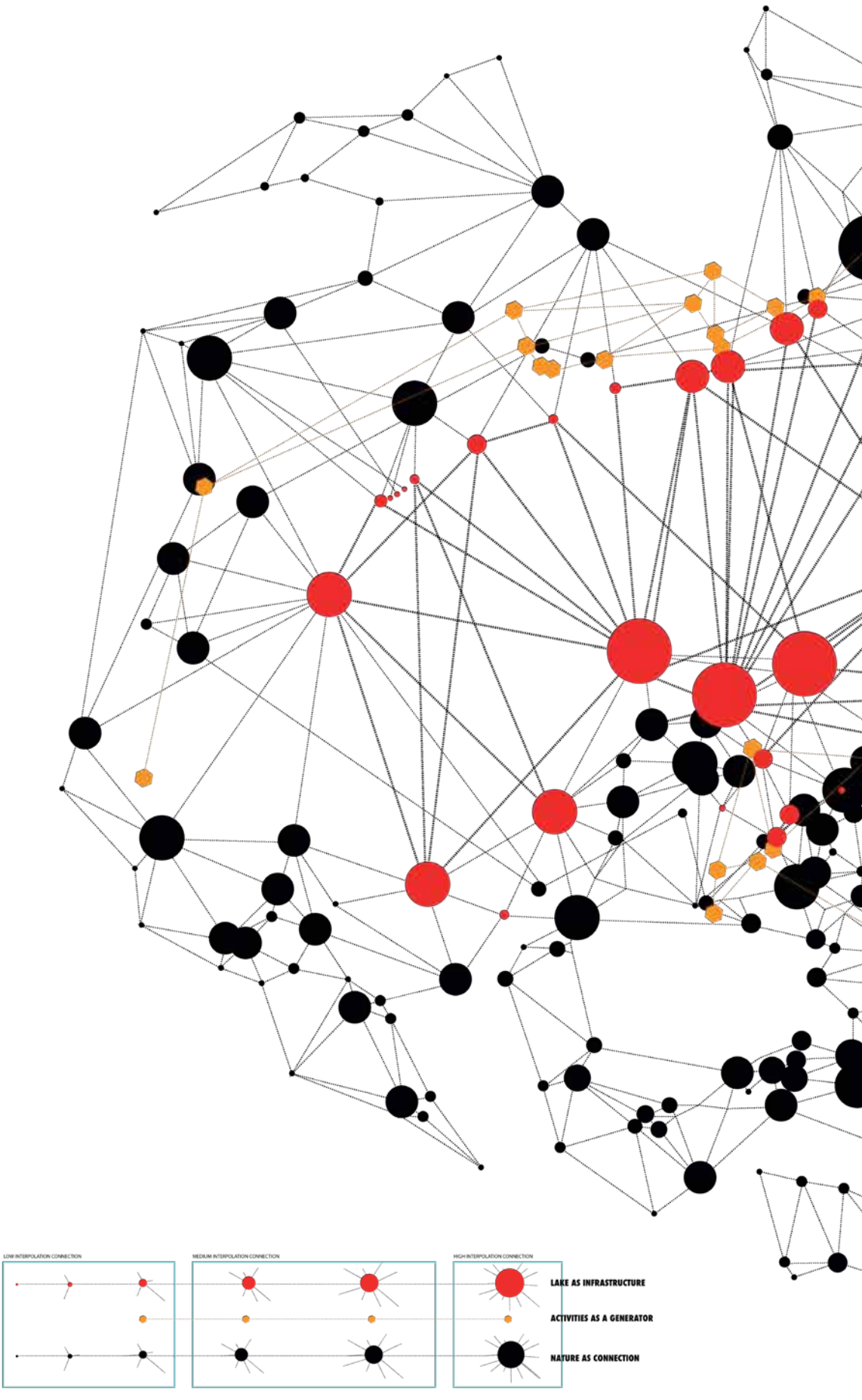


Fig 6 / Network of interpolation in the context of Pustec Lake

source/ Sadmira Malaj Catrina Rondina,Lisa Mensi

Results

This mapping exercise revealed significant discontinuities in the border areas, currently manifested as infrastructural gaps—both in terms of terrestrial connectivity and lake-based infrastructure [7]. To address this, a series of visualizations were developed to explore potential cross-border connections via natural corridors and existing low-impact road networks [8]. The objective was to identify opportunities for integration that do not rely on large-scale infrastructural interventions, thereby preserving the distinctive rural character and ecological integrity of the region. This approach prioritizes minimal intrusion while fostering accessibility and cross-border interaction through existing landscape assets [9].

Ultimately, this process highlighted the potential of natural infrastructure as a more flexible and accessible medium for connectivity compared to conventional forms of infrastructure [10]. As a result, four distinct cross-lake corridors were identified, originating from the national shorelines and extending toward points of higher spatial significance—these being areas with a greater concentration of intersections and thus higher potential for attractivity. These intersections emerged from a combination of factors: visual alignments between surrounding mountain peaks, junctions where the lake meets the mainland, and the spatial distribution of cultural heritage sites. Together, these layers inform a network that aims to integrate natural, cultural, and built infrastructures [11]. Each corridor follows a distinct directional logic, as the connections between key nodes were not the result of artificially imposed design, but rather emerged from the organic extension of existing natural and infrastructural paths [12]. These axes were not conceived through a conventional top-down planning approach, but instead stemmed from an interpretative reading of the territory—uncovering latent continuities and spatial potentials inherently present within the landscape [13]. With the network of connections clarified, the next phase of the process involved identifying potential interventions at the masterplan scale. This stage particularly emphasized the implications of such connections for the mainland, considering what it would mean for these links to function as "infrastructure" in the broader, more abstract sense of the term—that is, as systems enabling flows of people, knowledge, culture, and ecology across borders and landscapes [14]. To address this question, four interrelated keywords were defined to guide the development of intervention scenarios: Lake as infrastructure; Nature as connection; Activities as generator; Transport as service.
Building upon the principles and analyses developed throughout the research, these keywords were used to structure a matrix of potential interventions. This matrix served as a tool for envisioning future scenarios and assessing their possible impacts on the mainland territory [16].

Conclusions and Recommendations

The intervention matrix outlines the specific actions proposed under each of the four guiding categories, establishing connections between tourism-generating activities and the supporting infrastructure systems [17]. Particular emphasis was placed on identifying how sustainable tourism initiatives could be integrated with both physical and digital infrastructures [18]. A detailed analysis was conducted on the digital infrastructure, categorizing the types of services

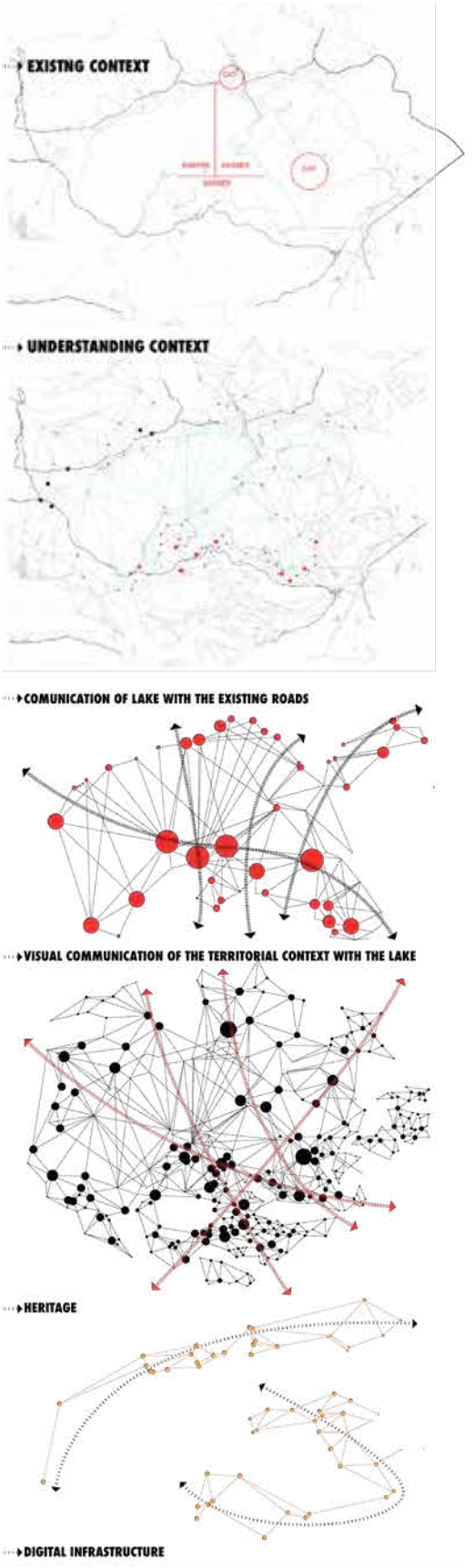
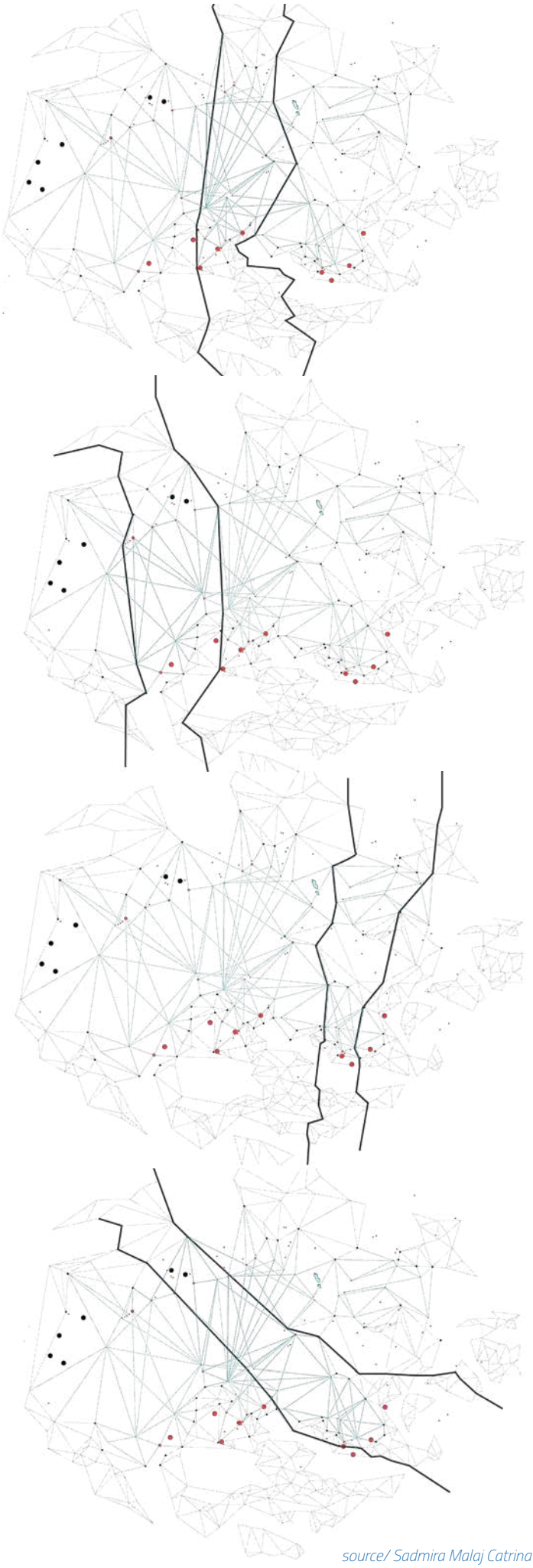


Fig 7 / Analysis of defining the main corridors



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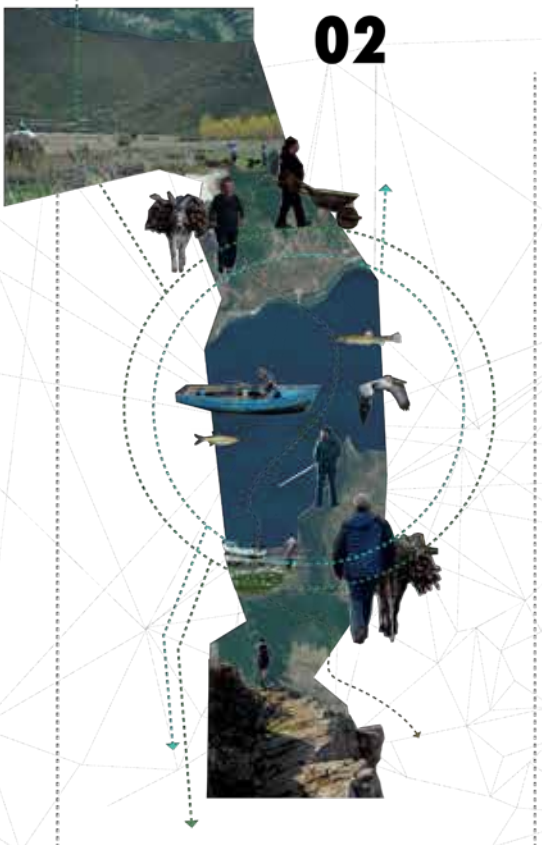
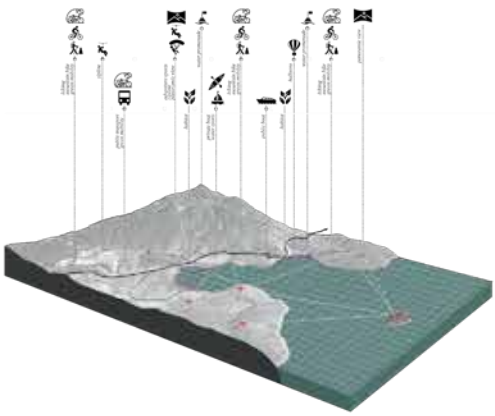
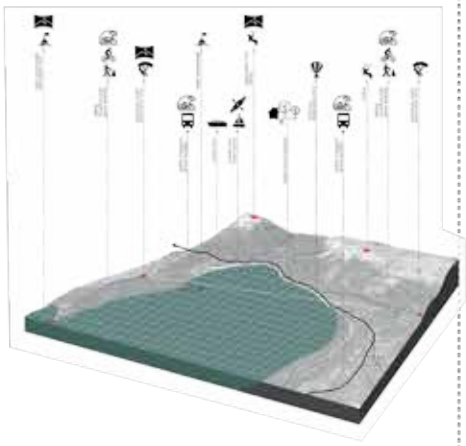
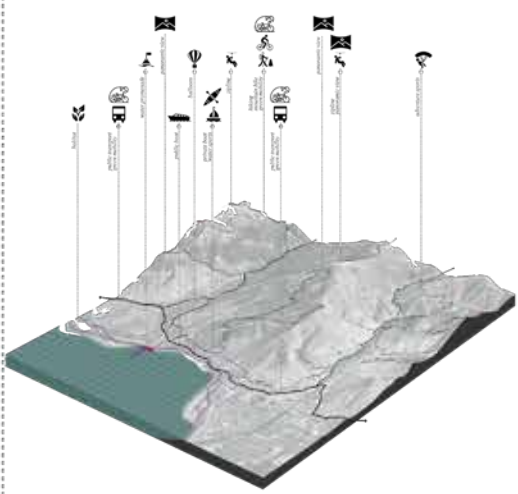




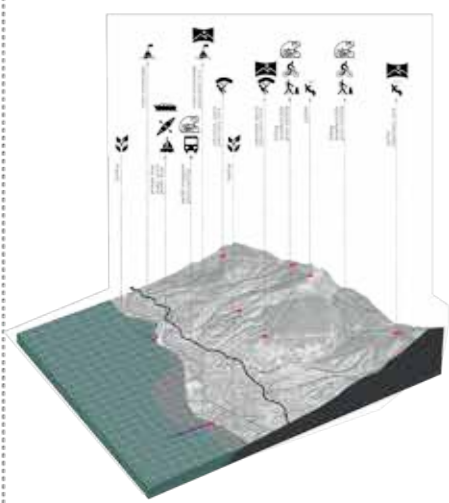
CORRIDOR 01 / ACTIVATION IMPACT



CORRIDOR 02 / ACTIVATION IMPACT

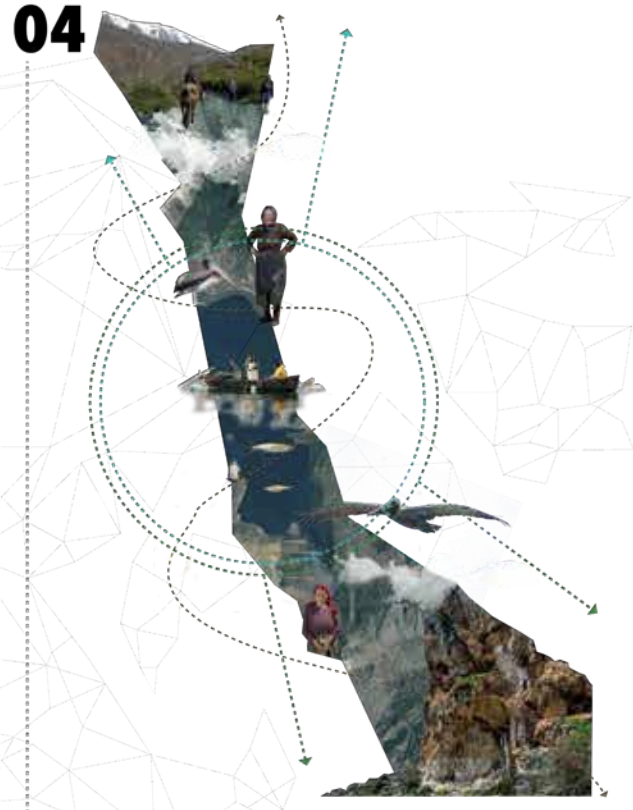


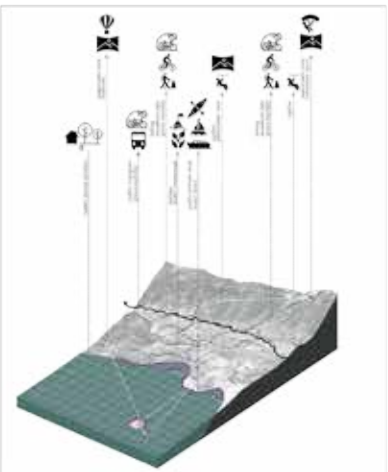
CORRIDOR 01 / ACTIVATION IMPACT



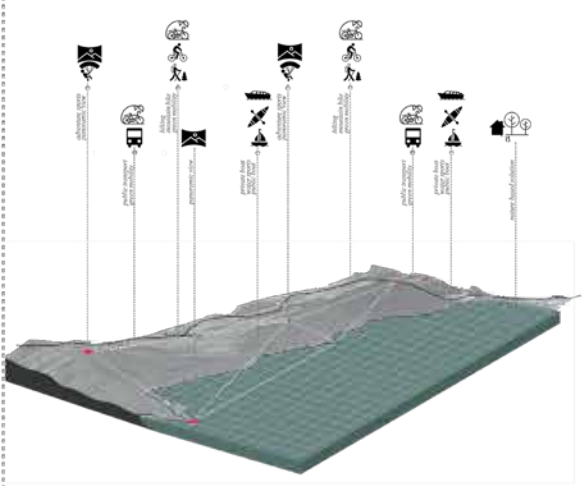
CORRIDOR 02 / ACTIVATION IMPACT

Fig 8 / Implementation of the matrix - accordingly to the corridors

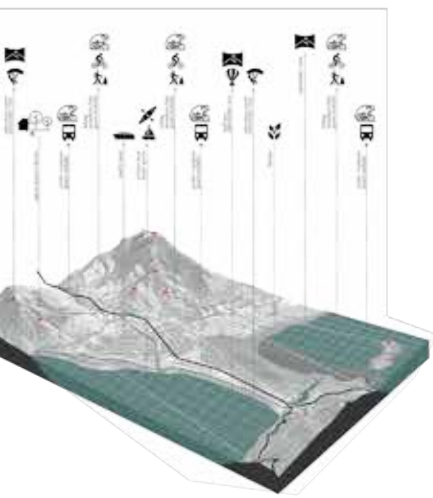




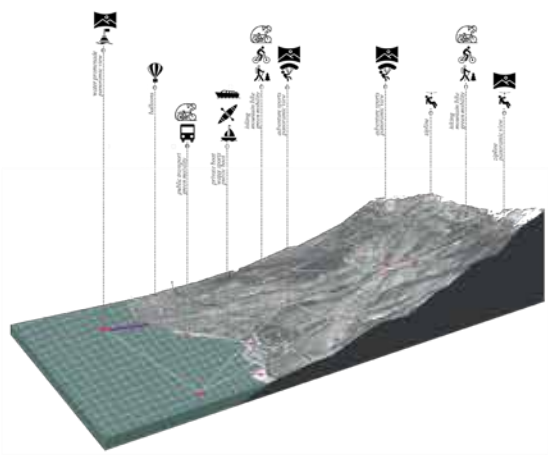
ORRIDOR 03 / **ACTIVATION IMPACT**



CORRIDOR 04 / **ACTIVATION IMPACT**



ORRIDOR 03 / **ACTIVATION IMPACT**



CORRIDOR 04 / **ACTIVATION IMPACT**

source/ Sadmira Malaj Catrina Rondina,Lisa Mensi

and the corresponding informational scales they would operate on. This included the development of visual mapping tools designed to inform tourists about available activities at both the Park and Corridor scales. For each activity featured in the digital application, it was also necessary to determine the physical interventions required to enable or enhance the visitor experience [19]. As such, a graduated scale of intervention was established, based on varying degrees of mobility—ranging from low, medium, to high impact—and distinguishing between passive and active impacts. These classifications were then aligned with the typologies of infrastructure that either require implementation or could function without new construction, allowing for a more context-sensitive and sustainable approach to territorial development [1]. Once the strategic framework was established, the final phase focused on activating the mainland by designing targeted interventions along the identified corridors—serving as the case study for the research [2]. This phase aimed to spatialize the impact of proposed activities, translating them into tangible design actions that support sustainable tourism development around Lake Prespa [3]. Each national shoreline was analyzed individually to determine the most appropriate services and interventions for enhancing sustainable tourism potential. The following pages present the masterplans for the four corridors, each integrating the proposed activities as defined in the intervention matrix [4]. The first corridor, identified as the most dynamic, features the highest concentration of tourism-related activities. It offers a comprehensive range of services and programs, making it a key area for testing the multifunctional role of infrastructure in the Prespa region [5]. This project investigated a prospective scenario in which Lake Prespa is reimagined and utilized as a form of infrastructure—both physical and conceptual—with the aim of fostering sustainable cross-border tourism through the creation of an international park [6]. At the regional scale, the proposal envisions a unified transboundary park, recognized by UNESCO and strategically situated between two major PAN-EU corridors, thus emphasizing its geopolitical and infrastructural relevance [7].

At the lake scale, the project outlines a framework for implementing tourism-supportive infrastructure through services and activities, while also introducing a digital infrastructure designed to enhance transnational connectivity and visitor experience across all three countries [8]. Special attention was given to the four identified corridors—recognized as the most attractive areas—where targeted interventions were proposed [9]. The intervention matrix serves as both a planning tool and a strategic roadmap, enabling adaptable implementation based on future scenarios, evolving demands, and policy developments [10]. Ultimately, positioning the lake as an infrastructural backbone—guided by the principles and analyses developed throughout the project—offers a powerful strategy to promote regional tourism, strengthen cross-border collaboration, and dissolve the invisible barriers that continue to divide this shared landscape [11].

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