OVERVIEW OF THE VJOSA DELTA (PISHE PORO - NARTA LANDSCAPE PROTECTED AREA) - NATURAL VALUES AND THREATS

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ABSTRACT

The Vjosa Delta, spanning over 250 km^2, is one of the most significant and naturally preserved transitional areas along the Mediterranean coast. Despite human and natural changes over the past 60-70 years, it remains ecologically important. Formed by the hydrodynamic and sedimentological processes of the Vjosa River and the Adriatic Sea, it hosts 18 habitats listed in Natura 2000, including 6 EU priority habitats. The delta supports a rich biodiversity, with over 2,310 known species, including 770 vascular plants, 70 mushrooms, 248 bird species, and over 100 fish species, including many rare and threatened ones. However, the delta faces threats from the development of large-scale tourism infrastructure. Despite being part of the Pishe Poro - Narta Landscape Protected Area (IUCN Category V), unauthorized construction, such as the Vlora Airport, poses a risk to the area's ecological integrity. There are also plans for further infrastructure development, which could fragment habitats, lead to biodiversity loss, weaken ecosystem resilience, and reduce ecosystem services. To address these threats, the authors propose leaving the entire footprint of the Vjosa Delta free from large-scale infrastructure development. Instead, they advocate for the wise development of nature-based tourism (ecotourism) projects, supported by government policies to ensure effective conservation of environmental and natural resources in the area. They suggest declaring the Pishe Poro - Narta Landscape Protected Area a National Park (IUCN category II), alongside the Vjosa River National Park, to recognize their interconnected hydrodynamic and ecological significance.

***Keywords*:** Coastal ecology, Albanian transitional wetlands, environmental risks, Pishe Poro – Narta protected area.

1. INTRODUCTION

The Vjosa/Aoos River, stretching 275 km (190 km within Albania), ranks as the country's second-largest river, following the Drini. Originating from the Pindus Mountains east of Ioannina in Greece, where it is known as the Aoos River, it carries a multi-year average flow of 195 m^3/s, with fluctuations ranging from 33 to 237.6 m^3/s. Unlike other rivers in Albania, such as the Drini, the Vjosa experiences much higher peak flows due to torrential rainfall across its entire catchment area. These peak flows can reach extraordinary levels, with probabilities of up to 6,680 m^3/s (1%), 5,570 m^3/s (2%), and up to 5,040 m^3/s (5%) as reported in (Mecaj, 2015; Pano, 2015). One of the contributing factors to these high peak flows is the extensive and largely deforested watershed of the Vjosa, covering 6,706 km^2 (4,365 km^2 within Albania) (Pano, 2015). Hasenauer *et al*., (2022) said that with only 22% forest coverage in the Albanian portion of the basin, the river basin has limited water retention capacity. Consequently, the Vjosa River is prone to overflowing its banks and flooding downstream areas. Experts assert that even dams would struggle to control such flooding events along the Vjosa (Hauer *et al.*, 2019).

The Vjosa/Aoos river-system has garnered significant international attention in recent years due to its exceptional near-natural condition, largely untouched hydro-morphic dynamics, and rich and diverse biodiversity. The river corridor exhibits a high degree of hydro-morphodynamic activity, resulting in the presence of threatened habitats of European significance. Consequently, the river has been recognized as a key reference point for European environmental policy and serves as a unique natural laboratory for river science. This distinction positions the Vjosa/Aoos river-system as a valuable model for guiding management efforts in rivers throughout Europe, highlighting its importance as a focal point for scientific research and conservation initiatives. Various studies and reports have underscored the significance of the Vjosa/Aoos river-system in this regard (Schiemer *et al*., 2020; ActaZooBot Austria, 2018; Sovinc, 2021; etc.), emphasizing its potential to inform and shape environmental policies and management strategies on a broader scale.

Schiemer *et al.* (2020) identify and categorize 16 habitat types within the river floodplain of the Vjosa River, which are sustained by periodic flood conditions, particularly during low to mean flow periods. These habitats encompass various aquatic and terrestrial environments, each playing a crucial role in supporting the ecosystem dynamics of the river floodplain. The classification includes: seven aquatic habitats (A1-A7), three terrestrial

habitats within the active channel on coarse-grained sediments (B0-B2), three terrestrial habitats within the active channel on fine-grained sediments (C0-C2), two habitats at elevated islands within the active channel and on the floodplains (BC3 & BC4) and one degradation habitat (D).

The inclusion of riverine habitats 3220, 3250, 3230, 3240, 92D0, 6210, and 92C0 in Annex 1 of the European Union Habitats Directive (92/43/EEC) highlights their critical significance for conservation and environmental management. In particular, these habitats cover a substantial portion, up to 86%, of the total area of the Poçemi-Kalivaçi river corridor. Four of these habitats are designated as priority habitats according to the FFH-Annex I/Natura 2000, EUNIS habitat classification 2004/2012, and EU Red List criteria. They include: Gravel/sand bars (3220; C3.62; VU), Initial vegetation (3250; C3.553; VU), and Mediterranean riparian scrub (92D0; F9.31; LC). The combined area of these priority habitats constitutes up to 38% of the morphological floodplain of the Poçemi and Kalivaçi area, as detailed in Schiemer *et al.* (2020). The designation of these habitats as endangered (EN), vulnerable (VU), or least concern (LC) underscores their conservation status and underscores the importance of the Vjosa river corridor on a European scale. This recognition emphasizes the need for concerted efforts to protect and preserve these habitats to ensure the continued ecological integrity of the Vjosa river ecosystem.

The biodiversity of the Vjosa River network in Albania is remarkable, with a total of 1,725 known species to date. This includes 653 plant species and 1,072 animal species. The plant species comprise 354 non-vascular plants (algae) and 299 vascular plants. Among the animal species, there are 625 invertebrates, including 340 arthropods and 109 mollusks, as well as 447 vertebrates, consisting of 37 fishes, 32 reptiles, 13 amphibians, 295 birds, and 70 mammals. Of these species, 39 are classified as endangered according to the IUCN, and 119 are listed on the Albanian Red List (2013). Additionally, 148 species are included in Annexes 1–3 of the Berne Convention, 41 species in the Bird Directive, and 78 species in the Habitats Directive. These designations highlight the conservation significance of the Vjosa River and its tributaries at both national and international levels. The data is primarily sourced from various studies, including those by Meulenbroek *et al.* (2020), Miho *et al.* (2023; 2024), Bino *et al.* (2023), Shumka *et al.* (2018), and others, reflecting ongoing efforts to update and expand our understanding of the biodiversity within the Vjosa River ecosystem.

The Albanian Government's decision to conserve the riverine landscape of the Vjosa and its major tributaries, including the Drino, Bença, and Shushica rivers, as a Wild River National Park is a significant recognition of

its natural heritage value. This designation places the area under Category II according to the IUCN classification (DCM 155/2023). Encompassing approximately 12,727 hectares, the park includes the entire aquatic, riverscape, and terrestrial area along these rivers, totaling over 400 kilometers of riverine flow.

The establishment of the Wild River National Park represents the culmination of nearly a decade of efforts from the environmental and academic community. Both international and national experts in river ecology and conservation biology have played crucial roles in advocating for and contributing to this initiative. Their expertise and dedication have been instrumental in highlighting the ecological importance of the Vjosa riverine landscape and advocating for its protection and preservation. Various sources, including ActaZooBot Austria (2018), McVeigh (2023), Miho (2023), and the official website of the Vjosa National Park (https://www.vjosanationalpark.al/), have documented and contributed to raising awareness about the significance of this conservation effort.

2. THE VJOSA/AOOS WILD RIVER AND ITS DELTA – AN INSEPARABLE HYDRODYNAMIC AND ECOLOGICAL ENTITY

The Vjosa River has given rise to a vast and dynamic delta that extends into the Adriatic Sea, representing a vital ecological feature along the Albanian coast. This delta, the largest and most significant on the entire Albanian coast and beyond, encompasses approximately 250 square kilometers. Stretching from the Hoxhara Channel, with its Darzeza and Pishe Poro wetlands and coastal dunes in the northwest (Fieri), to the Vjosa River estuary, the Kallenga and Narta Lagoons, coastal dunes, Saline, and beyond to Vlora city in the southwest, the delta forms a vital nexus of hydrodynamic and sedimentological processes shaped by the interactions between the Vjosa River and the Adriatic Sea over centuries. The northern boundary of the delta nearly merges with the Semani Delta, while in the northeast, it extends to the Mifoli Bridge. This expansive delta landscape, shaped by the dynamic interplay of riverine and marine forces, includes notable features such as dead arms of the river in Zhuka (Vlora) and Darzeza (Fieri), known as the 'dead river.' A significant portion, approximately 160 square kilometers, of the Vjosa Delta falls within the Pishe Poro - Narta Landscape Protected area, designated as Category V (DCM 694/2022) (Fig. 2).

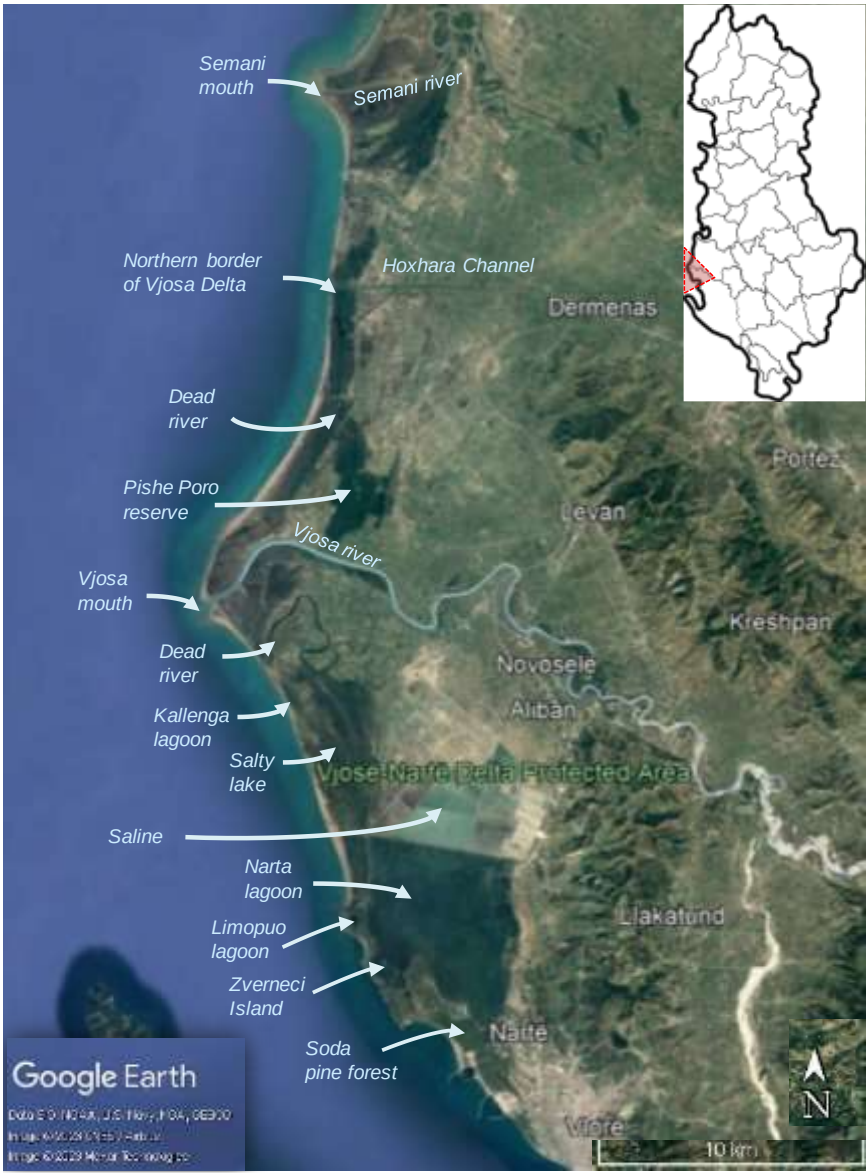

Fig.1: Map of the transitional wetlands of the Vjosa Delta (elaborated from Google Earth 2023).

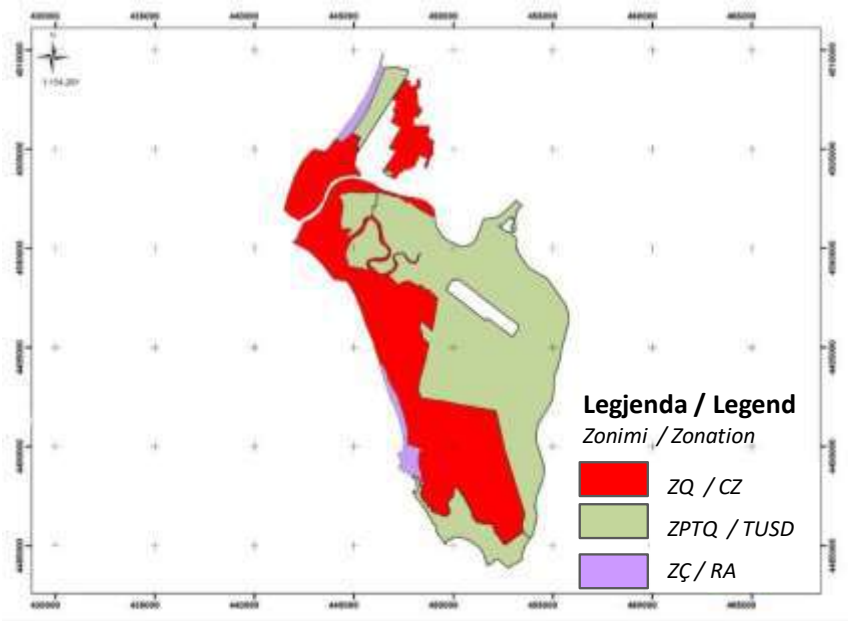

Fig.2: The zoning map of the Landscape Protected Pishe Poro – Narta (Vth Category); ZQ/CZ, Core zone; ZPTQ/TUSD, Traditional use and sustainable development area; ZÇ/RA, Recreation area. The white rectangle inside the PA is where Vlora Airport has started to be built. (elaborated after DCM 694/2022)

Research by Durmishi *et al*. (2018) indicates that two-thirds of the delta's formation occurred over the last 500 years, with notable shifts in the river mouth's location. Historically, the river mouth migrated from the Vlora Bay to the foot of Frakulla (Fieri), altering the landscape and contributing to the formation of the Narta Lagoon. The Vlora town itself is situated atop early sediments deposited by the Vjosa River over time. Changes in the river mouth's position have been documented over recent centuries, with significant shifts occurring between 1870 and 2001, resulting in a movement of approximately 10 kilometers northward. Coastal erosion near the Kallenga lagoon highlights the ongoing dynamic nature of the delta landscape, influenced by sediment discharge, anthropogenic activities, wave energy, and tidal effects.

The wave-dominated area of the Vjosa Delta is a mosaic of diverse habitats, including temporary wetlands, reed beds, lagoons, saline and salt flats, sandy dunes, dead riverbeds, drainage channels, and agricultural lands. This rich variety of habitats supports a wide range of species and contributes to the overall biodiversity of the region (Fig. 1 and Figs. 4-7). According to

Schwarz (2024), the Vjosa, Semani, and Shkumbini deltas constitute a relatively intact set of adjoining deltas, forming what is termed as 'triple-deltas'. These deltas are assessed to be relatively intact based on hydromorphological characteristics and limited land use obstruction. This underscores the importance of the Vjosa/Aoos Wild River and its Delta as an inseparable hydrodynamic and ecological entity. The wilderness of the Vjosa/Aoos Wild River and its outstanding natural values play a crucial role in preserving the wild nature and unique characteristics of its delta. The mutual protection and sustainable management of both the river and its delta are essential for safeguarding their natural values and ecosystem services for human well-being.

3. BRIEFLY ON NATURAL VALUES OF THE VJOSA DELTA

The Vjosa Delta encompasses a diverse range of natural habitats, including the Narta lagoon, the Vjosa estuary, freshwater wetlands, marshes, reedbeds, woodlands, islands, and sandy beaches (Fig. 3). These habitats collectively contribute to the rich biodiversity and ecological significance of the delta region. According to NAPA (2022a), the delta area is home to 18 habitats identified under the Natura 2000 framework, with 6 of these habitats classified as EU priority habitats, indicating the need for special protection measures. Fortunately, these habitats, which span across the delta, marshes, coastal dunes, lagoons, and saline areas, are currently in good natural condition and exhibit high ecological integrity. Among these habitats, the Narta lagoon stands out as one of the largest and most important ecosystems not only along the Albanian coast but also within the entire Adriatic region. Its vast expanse of 41.5 km^2 provides critical habitat for numerous species of flora and fauna, making it a key focal point for conservation efforts within the Vjosa Delta. The habitats within the Delta area provide essential resources such as shelter, food, and breeding grounds for a wide variety of animal species, including insects, fish, amphibians, reptiles, mammals, and particularly birds. These habitats are characterized by their tranquility and abundance of food, making them crucial stopover points for many species during migration.

Fig. 3: Aerial views of the Vjosa Delta, part of the Pishe Poro – Narta Landscape Protected area (Category V). (©https://www.balkanrivers.net/)

To date, approximately 2,310 species have been documented within the various habitats of the Delta area (Fig. 4). This includes 1,350 plant species, 70 fungi species, and 890 animal species. The data is compiled from sources such as NAPA (2022b), Miho *et al*. (2013), PPNEA/EURONATUR (2021), and Topi *et al*. (2013), with updates provided by various authors in Miho *et al*. (2024).

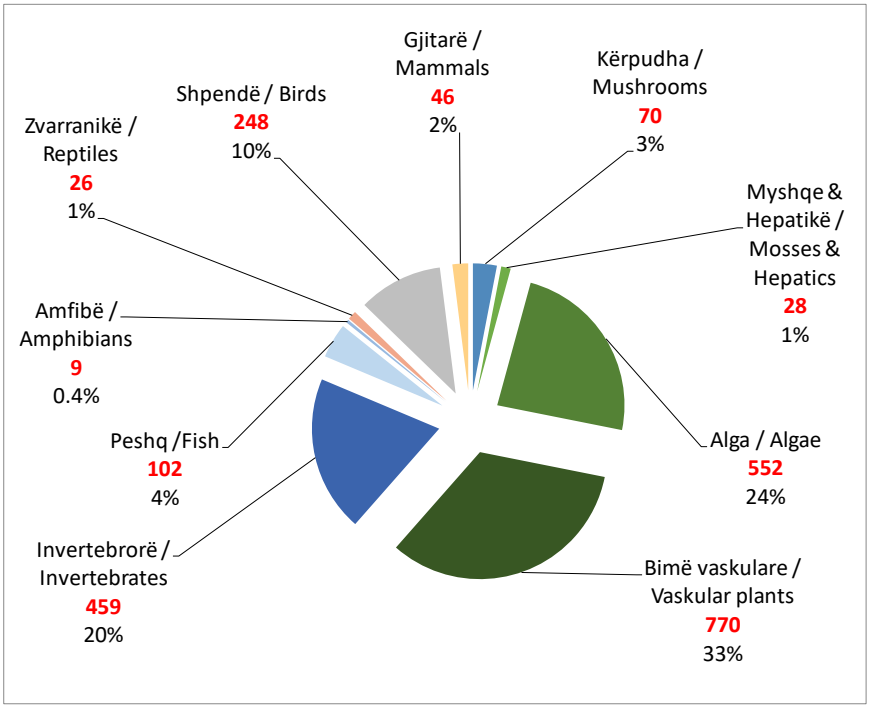

Fig. 4: The species number after major living groups found to date in the area of the Vjosa Delta, according to various sources given in text.

Fig. 5. a) Dalmatian pelican (*Pelecanus crispus*) in one of the drainage channels between Narta lagoon and Saline; **b)** colony of the glossy igis (*Plegadis falcinellus*) in a swampy area of Zverneci; **c)** flamingo colony (*Phoenicopterus roseus*) in the Narta lagoon (April 2023).

From the photosynthetic plants found within the Delta area, approximately 550 species are algae inhabiting aquatic habitats, while 28 species are mosses predominantly found in terrestrial environments. Additionally, there are over 770 higher plants, primarily located in terrestrial habitats. In terms of animal species, there are approximately 460 invertebrate species, as documented by Beqiraj *et al*., (2024). Among these invertebrates, there are 287 insect species, including members of the lepidoptera and coleoptera orders. Additionally, there are 92 mollusk species, comprising 49 gastropods, 34 bivalves, and 4 cephalopods. Furthermore, the invertebrate

population includes 61 crustaceans, 18 nematodes, and 6 echinoderms. Among the vertebrate species in the Delta area, there are approximately 431 species, including 102 fish species, 26 reptile species, 9 amphibian species, 248 bird species, and 46 mammal species. Remarkably, about 198 of these species are classified as endangered, representing approximately 47% of the endangered animal species found across the entire Albanian territory. This information is based on studies conducted by Miho *et al*. (2013), Topi *et al*. (2013), the Ministry of Environment (MoE) in 2013, and our most recent findigs.

The Delta area has been designated as Important for Birds (IBA) by BirdLife International in 2023, meeting several criteria related to bird conservation. However, it is also categorized as facing very high threats, highlighting the urgent need for conservation efforts to protect avian populations. The Narta Lagoon, within the Delta area, is identified as the second most important site in the country for waterfowl, hosting over 20,780 wintering birds and more than 40 species. These findings are based on reports from NAPA (2022a) and Bino *et al*. (2024). Moreover, the area encompassing Pishe Poro – Vjosa Estuary (Vlora) has been recognized as an Important Plant Area (IPA) by Radford *et al.* (2011) and is considered a candidate site for inclusion in the NATURA 2000 network, according to PPNEA & EURONATUR (2021). Several specific locations within the Delta area, including **Limopuo Lagoon, Narta Dunes, Zverneci Forest, and Zverneci Molasse Hills (Fig. 6), have been designated as Natural Monuments** (III^{d} IUCN Category) by the Albanian government, as per DCM 303/2019. These designations underscore the ecological significance and conservation value of these sites within the Delta area.

Fig. 6: a, Sandy dunes and with dune grass (*Ammophila arenaria*) (**b**) in the belt that separates the Saline from the Sea; **c,** Zverneci Forest; **d,** Zverneci Molasse Hills. These habitats are part of the list of Natural Monuments (DCM 303/2019) (IIIrd category).

Transitional ecosystems, such as lagoons, river estuaries, and coastal marshes with brackish water, serve as vital interfaces between the sea and the land. These ecosystems are partially influenced by coastal waters, resulting in a mixture of saltwater and freshwater flows. The well-preserved Vjosa Delta exemplifies such habitats and is characterized by its productivity and ecological importance.Transitional ecosystems are renowned for their high productivity, often serving as the origin of life itself. Their net plant production ranks among the highest on the planet, contributing significantly to carbon dioxide assimilation and nutrient circulation. These ecosystems play a crucial role in mitigating climate change and global warming, particularly through the reduction of nitrogen levels. Studies by Salisbury & Ross (1991) and Whittaker (1975) have highlighted the significance of transitional ecosystems in supporting biodiversity and ecological functions. In the context of the Vjosa Delta, the preservation of these habitats is essential not only for their ecological value but also for their contribution to global climate regulation and nutrient cycling. Protecting and conserving these transitional ecosystems is paramount for maintaining the health and resilience of coastal environments and supporting the myriad of species that depend on them for survival.

Transitional wetlands serve as breeding grounds for many species of fish and molluscs, making them important for fisheries and aquaculture. They

play a crucial role in preventing loss of life and property by mitigating extreme floods and protecting land from storms. Additionally, they naturally form basins and contribute to maintaining desirable water quality (Newton *et al*., 2023; USGS, 2023; etc.). Therefore, their understanding, proper utilization, conservation, and protection are prioritized by national and international acts, including the Water Framework Directive (WFD, 2000), the Ramsar Convention, the Bern Convention, the Barcelona Convention, IUCN, WWF, etc.

On the other hand, the Vjosa Delta's transitional ecosystems are currently facing significant impacts from tourism, fishing, aquaculture, salt-mining, industry, shipping and harbor activities, urbanization, and agriculture. These activities often lead to alterations in the physical environment, such as changes in geomorphology or salinity levels, as well as fluctuations in dissolved oxygen values, among others. Individually or in combination, these pressures contribute to biodiversity loss and the decline of ecosystem services, ranging from coastal protection to seafood production. Understanding the causes and consequences of anthropogenic pressures is crucial for identifying effective management strategies that can minimize negative impacts and promote the sustainable utilization of valuable resources (Lacoste *et al*., 2023; Miho *et al*., 2013; Newton *et al*., 2023; etc.).

Albania boasts more than 1000 km² of transitional ecosystems, encompassing areas such as Velipoja, Kune-Vaini, Patoku-Fushe Kuqe, Rrushkulli-Hamallaj, Divjake-Karavasta, Semani wetlands, Pishe Poro-Narta, Orikumi wetland, and Butrinti (*see* Table 1). Miho *et al*. (2013) provide a comprehensive summary of their natural values, habitats, and biodiversity. Among these ecosystems, the Vjosa Delta stands out with approximately 240 km² (24%), despite facing anthropogenic and natural transformations over the past 60-70 years. Despite these challenges, the Vjosa Delta is notable for its largely undisturbed habitats and rich biodiversity. It's worth noting that other deltas in Albania, such as Buna, Drini of Lezha, Mati, and Semani, have undergone significant transformations due to human impact, both in their catchments and corresponding coastal areas.

Table 1. Data on transitional areas of Albania, their surface, protection category (national and international).

Name (Region in Albania)	Surface (ha)	Category	Albanian decision	International value (codes)
Buna River-Velipoja (Shkodra)	21,678.85	V		RAMSAR site (1598); IBA (Al013); IPA (01&02)

Name (Region in Albania)	Surface (ha)	Category	Albanian decision	International value (codes)
Vaini–Tale-Patoku–Fushekuqe–Ishmi (Lezha & Kurbini)	8,092.30	IV	VKM/DCM 60/2022	IBA (AL007; Drini Delta; AL014; Patoku Lagoon); IPA (21&26)
Rrushkulli (Durresi)	579.5	V	VKM/DCM 60/2022	IBA (AL015; Lalzi Bay)
Shkumbini Delta (Lushnja & Rrogozhina)	16,628	II	VKM/DCM 59/2022	Divjaka-Karavasta NP; RAMSAR site (781); IBA (AL006); IPA (33)
Semani Delta (Lushnja& Fieri)	20,413	-	-	Schwarz, 2024
Vjosa Delta (Vlora & Fieri	23,690	V	VKM/DCM 694/2022	Pishe Poro-Narta LPA; IBA (AL005; Narta Lagoon); IPA (35)
Orikumi wetlands (partly in Karburuni Nature Rezerve; Vlora)	800	IV (1.5 km^2)	VKM/DCM 60/2022	IBA (013; Vlora Bay, Karaburuni peninsula, Orikumi lagoon, Sazani island and Cika mountain); IPA (36)
Butrinti (Saranda)	8,622.20	II	VKM/DCM 59/2022	RAMSAR site (1290); IBA (AL012); IPA (45)
Total	**100,503.85**			

In the Pishe Poro - Narta Landscape Protected area (*see* Fig. 2), aquatic habitats cover over 6,130 hectares, accounting for 38% of the area. These habitats encompass salty, brackish, or freshwater bodies, with the majority comprising lagoons (approximately 3,470 hectares) and swamps (around 2,540 hectares) (DCM 694/2022). Many of these habitats are considered priority habitats under the EU Habitats Directive. Notably, the Narta Lagoon stands out as one of the largest and most important ecosystems not only along the Albanian coast but also across the entire Adriatic region. It ranks as the second most important area in Albania for waterfowl and holds significant importance as an Important Bird Area (IBA).

4. HUMAN PRESSURE ON THE DELTA

Since the 1960s, the Delta area has undergone profound transformations due to human activities, ranging from extensive reclamation to exploitation as a salt pan (*refer to* Fig. 1), and subsequent water pollution stemming from urban, agricultural, and industrial activities. In recent decades, particularly during the transition period, the area has faced mounting pressures from uncontrolled urbanization, unchecked fishing and hunting practices,

sediment exploitation, and other factors. The Narta Lagoon, in particular, suffers from limited water exchange, influenced by various factors such as excessive evaporation, the impact of sea waves, heavy sedimentation from the Vjosa River, inadequate water inflows from the basin, and the diversion of lagoon water to feed saline pans, among others. These factors collectively significantly affect the ecosystem of the lagoon, leading to eutrophication and a decline in productivity. Furthermore, pollution from organic matter and other pollutants of urban, agricultural, or industrial origin exacerbates these challenges.

In addition to historical pressures, the delta area faces a new threat in recent years from the development of large-scale tourism infrastructure. Despite a significant portion of the area holding the status of a Protected Landscape (IUCN Category V; DCM 694/2022), this designation has not deterred the initiation of construction for the Vlora Airport within the protected zone, as of April 2022. Documents from the Ministry of Infrastructure and Energy (MIE, 2019b,c) and other recent news (*i.e.* Pearce, 2024) indicate infrastructure development plans for the delta area (*see* Figs. 2 & 7), suggesting further challenges to its conservation and protection.

Fig. 7: Map showing the eventual plans for tourist infrastructure development in the future within the Landscape Protected Pishe Poro - Narta (*after* MIE 2019b).

The Vjosa Delta was not included in the zoning process of the Vjosa National Park (MTE, 2022; DCM 155/2023). However, the Vjosa Wild River has garnered attention from important international institutions such as

the Berne Convention, IUCN, and the European Commission. These institutions have specifically mentioned the habitats and rare species of the Delta area, which could face threats, reduction, or even disappearance in the long term due to the construction of hydropower plants (HPPs) on the Vjosa River. In a recent review process of the entire system of Protected Areas (PAs) in Albania, led by the National Agency of Protected Areas (NAPA, 2022a), approximately half of the Vjosa Delta area was designated as a Protected Landscape (V^{th} IUCN Category) (DCM 694/2022) (Table 1; Fig. 2). However, this designation represents a reduction from the former protected area, and the status of the Pishe Poro Protected Area, Fieri part, was downgraded from Category IV to Category V (Fig. 8). This decision does not fully reflect the exceptional natural and biodiversity values of the entire Delta area, which are recognized both nationally and internationally.

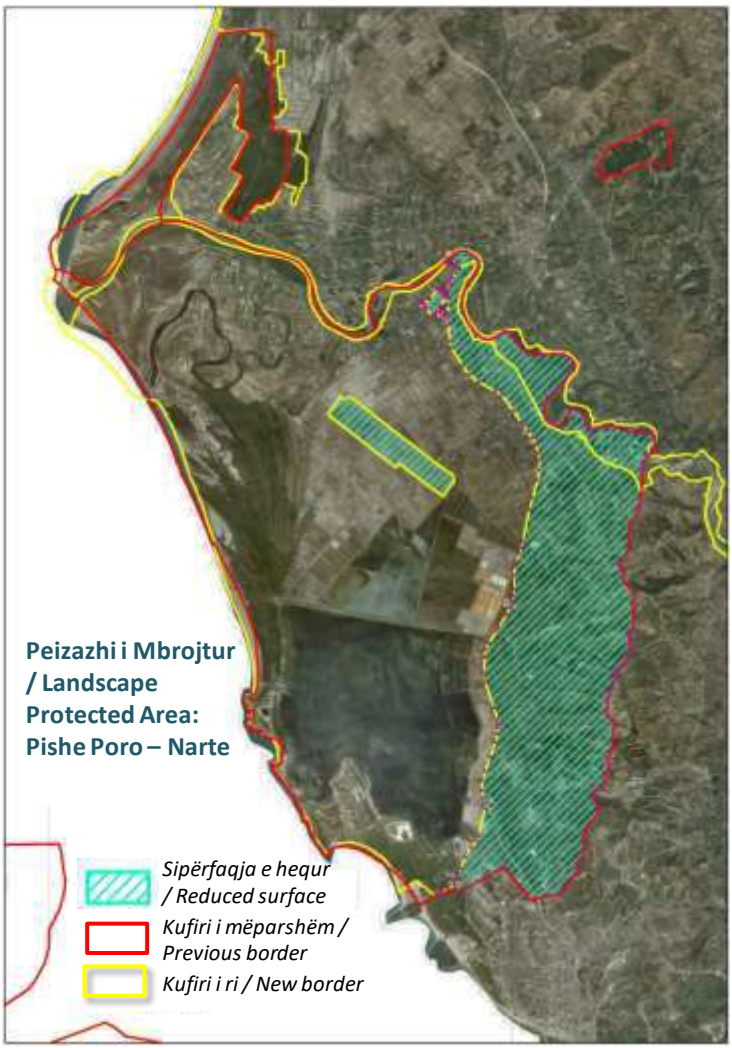

Fig. 8: The previous (in red) and new (*in yellow*) borders of the Protected Landscape Pishe Poro – Narte (Vth IUCN Category) (elaborated after VKM/DCM 694/2022: Shtojca/Annex 3).

According to INSTAT, Albania welcomed approximately 5.2 million tourists during January-July 2023, with expectations of reaching up to 10 million by the end of the year. This surge in tourism is projected to generate an income of up to 4 billion Euros, double that of 2022 (Latifi, 2023), accounting for up to 8.3% of the estimated GDP (PPP) (51.8 $USD; WEO, 2022). A significant portion of these tourist flocks to the coastal areas for

summer holidays, with the Vlora region being among the most frequented. The World Tourism Organization (UNWTO) highlights tourism as one of the fastest-growing industries, contributing more than 10% to the global GDP (Baloch et al., 2023). However, this rapid growth in tourism has been accompanied by environmental pollution witnessed in various regions around the globe.

A substantial, large-scale tourism industry inevitably brings both positive economic benefits, such as employment opportunities and increased wealth, as well as environmental impacts. These impacts can manifest as air emissions, noise pollution, solid waste, littering, sewage discharge, oil and chemical pollution, architectural and visual degradation, increased energy consumption, and heightened vehicle use, among others. Tourism is recognized as a threat to deforestation, air and water pollution, and poses risks to biodiversity and ecosystem resilience (Azam *et al*., 2018; Baloch *et al*., 2023; Sun *et al*., 2021; etc.). Therefore, there is an urgent need for heightened awareness regarding the environmental consequences of tourism development in the Vjosa Delta. Striking a balance between business interests and environmental conservation is imperative for maintaining the integrity of the ecological system.

5. THE VJOSA DELTA UNDER THE SCIENCE FOCUS

The Vjosa Delta has attracted considerable attention and concern from environmentalists, academics, and experts both locally and internationally, as well as from important international institutions (*see* Fig. 9). The recent recommendation of the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) for the Albanian Government underscores the need to 'suspend the construction of Vlora International Airport until a new and thorough Environmental Impact Assessment (EIA) procedure is conducted, along with a Proper/Appropriate Assessment' (https://rm.coe.int/2023-rec-219e-vlora-airport/1680ac7963).

In response to concerns regarding the conservation of the Vjosa Delta area, academia from our institutions has collaborated with national and international environmental organizations in several initiatives. **Two Scientific Weeks in Vjosa Delta, held in April 2023 and April 2024**, brought together national and international experts (from Austria, Italy, Greece, Bulgaria) to update knowledge and data on biodiversity, hydrogeology, geography, and related fields. Additionally, the **International Vjosa Delta Symposium** - An Ecosystem in Transition was convened in Vlora in October 2023. These efforts culminated in the publication of a **special volume on the Vjosa Delta**, available in Albanian and English

(Miho *et al*., 2024). The Volume not only highlights the natural values and benefits (ecosystem services) of the area but also addresses the sensitivity of habitats and species to various threats. Foreign experts shared international best practices for the conservation and sustainable management of transitional coastal ecosystems. The overarching aim of these endeavors is to inform decision- and policy-making, guide investors, and engage other stakeholders in the responsible development of the area while protecting and preserving its natural values.

Figure 9. The Vjosa Delta has been a field lab for each of us for years, for diploma or doctorate work. Field working moments in the Dead River and Kallange, Zhuka/Poro, Vlora, on May, 2022.

6. CONCLUDING REMARKS

The construction of the airport within the Vjosa Delta area, alongside large-scale urbanization, poses a significant threat to the region's natural values. These developments are likely to result in further reduction of habitat integrity, fragmentation, and biodiversity loss, ultimately weakening ecosystem resilience and diminishing ecosystem services. Such actions are contrary to the principles outlined in the declaration of the Vjosa Wild River

National Park and run counter to its true values. Moreover, the plans proposed by the Ministry of Infrastructure and Energy (MIE) are in direct conflict with the implementation of EU standards, including the Birds and Habitats Directives, the Water Framework Directive (WFD, 2000), and the EU's strategy to halt biodiversity loss. Additionally, they disregard the concerns raised by international organizations dedicated to the protection of coastal areas, such as the Ramsar, Berne, and Barcelona Conventions, as well as entities like the IUCN and WWF.

We propose an interdisciplinary study of the Vjosa Delta aimed at its conservation and sustainable management, grounded in scientific evidence. It is our collective belief that the Delta of Vjosa (from Darzeza, Fieri, to Narta Lagoon, Vlora) should remain untouched by large-scale construction projects. Instead, we advocate for the development of sustainable ecotourism, coupled with supportive government policies to ensure effective environmental conservation of natural resources while safeguarding the economic viability and social well-being of local communities, as suggested by Baloch *et al*. (2023). Furthermore, we believe that the time is ripe for the Landscape Protected Pishe Poro - Narta to be declared a National Park, recognizing it as an indivisible hydrodynamic and ecological entity alongside the Vjosa Wild River National Park.

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