ENVPRO

Centre for Econics and Ecosystem Management

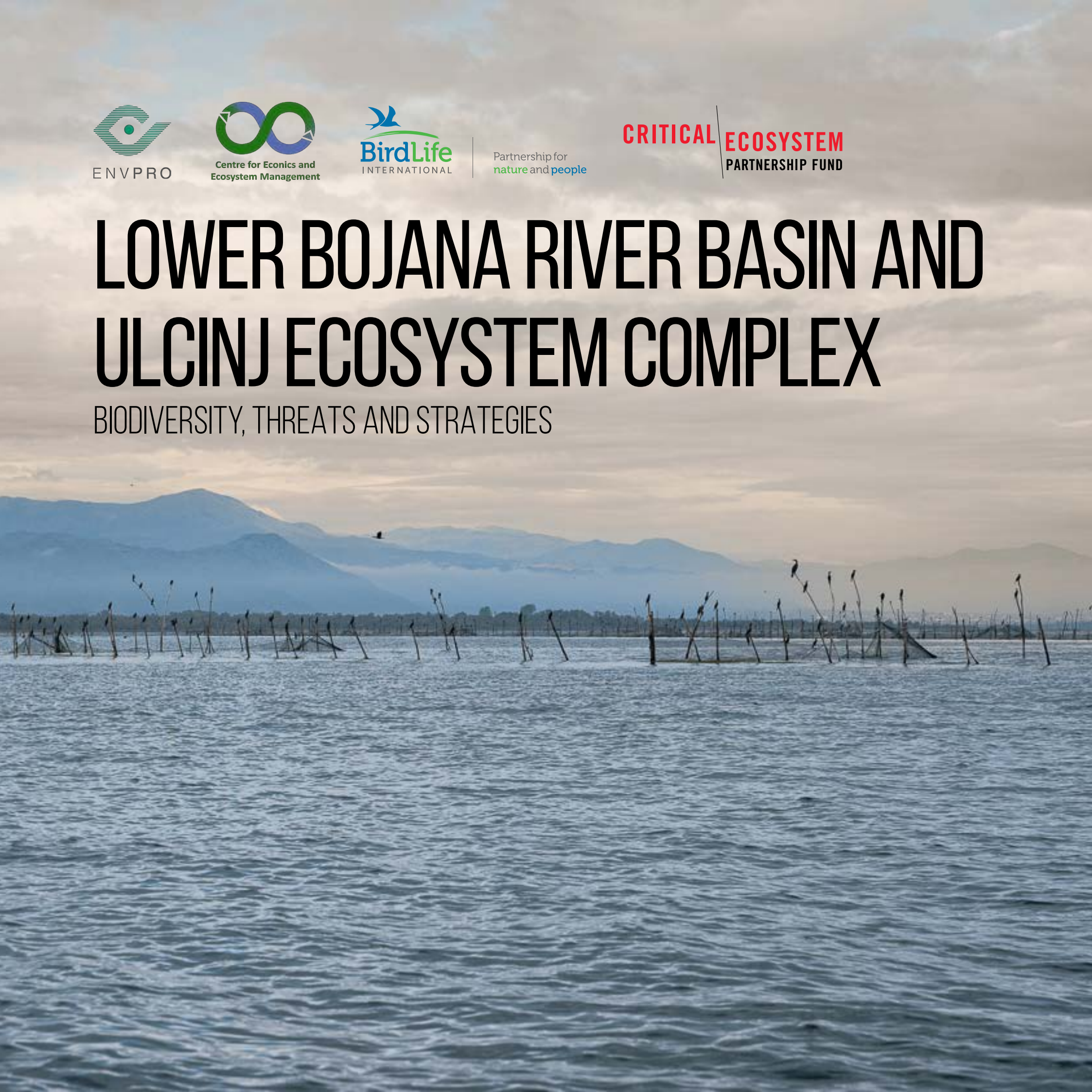
BirdLife INTERNATIONAL

Partnership for nature and people

CRITICAL ECOSYSTEM PARTNERSHIP FUND

# LOWER BOJANA RIVER BASIN AND ULCINJ ECOSYSTEM COMPLEX

## BIODIVERSITY, THREATS AND STRATEGIES



*Rubus ulmifolius cf. © Nina Lončarević*

**Publisher:**
NGO Environment Programme (EnvPro)[1]

**Authors:**
Lončarević Nina[2], Katnić Ana[3] & Šundić Danijela[4]

**Methodological Coaching and Supervision, Database Structure Development Support, Study and Database Review:**
Ibisch Pierre[5]

**Project Title:**
"Enabling Environment for Joint Bottom-up Protection and Sustainable Development Planning of the Bojana River Basin"

**Project Duration:**
06/2020–04/2022

**Key Partner:**
Center for Econics and Ecosystem Management[6]

**Suggested Citation:**
Lončarević N., Katnić A. & Šundić D. (2022). "Lower Bojana River Basin and Ulcinj Ecosystem Complex: Biodiversity, Threats and Strategies". *NGO Environment Programme.*

**Supported by:**
Critical Ecosystem Partnership Fund (CEPF)[7]

The Critical Ecosystem Partnership Fund is a joint initiative of l'Agence Française de Développement, Conservation International, the European Union, the Global Environment Facility, the Government of Japan and the World Bank. The fundamental goal is to ensure that the civil society is engaged in biodiversity conservation. The Small Grants Program in the Balkans is additionally supported by the MAVA Foundation.

[1] *https://envpro.me/*
[2] *Project Coordinator at NGO Environment Programme, email: ninaloncarevic7@gmail.com*
[3] *Executive Director at NGO Environment Programme, email: ana.katnic@envpro.me*
[4] *Short-term Freshwater Specialist at NGO Environment Programme, email: danijelasun@yahoo.com*
[5] *Director at Centre for Econics and Ecosystem Management and Professor at Hochschule für nachhaltige Entwicklung Eberswalde, email: pierre.ibisch@hnee.de*
[6] *https://www.centreforeconics.org/*
[7] *https://www.cepf.net/*

*Flamingo (Phoenicopterus roseus) © Robert Janković*

**Project Team:**

Katnić Ana (NGO EnvPro, Executive Director, Project Management and Methodology Support)
Lončarević Nina (NGO EnvPro, Project Coordinator, Data Management and Cartography)
Šundić Danijela (NGO EnvPro, Freshwater Ecology Specialist)
Jovićević Mirko (NGO EnvPro, IT, Database and Software Application)
Crvenica Aleksandra (NGO EnvPro, Organizational Development Specialist)
Lika Zenepa, NGO Dr. Martin Schneider-Jacoby Association (MSJA)[8] (Project Partner, Cultural Objects Survey)
Gligorović Bogić[9] (Independent Expert, Macro Invertebrates and Freshwater Habitats Research)
NGO Montenegrin Ecologist Society (MES)[10] (Herpetological Research and Habitat Classification)
NGO Center for Research and Protection of Birds (CZIP)[11] (Avifauna Research)
NGO Marine Mammal Research Organization (DMAD)[12] (Dolphin Research)

**Language Editing and Translation (English to Montenegrin):**
Kusovac Danilo[13], Specialized Translator for English and French

**Study design:**
Maja Kostić[14]

**Cover Photo:**
Bojana/Buna river © Mediterranean Wetland Secretariat, A. Camaro

[8] *https://ulcinjsalina.me*
[9] *Independent expert, email: bogicg@gmail.com*
[10] *https://drustvoekologa.me, email: drustvoekologa@gmail.com*
[11] *https://czip.me/, email: bojan.zekovic@czip.me*
[12] *https://www.dmad.org.tr/, email: aakkaya@dmad.org.tr*
[13] *kusovacdanilo7@gmail.com*
[14] *majakosticartwork@gmail.com*

# ACKNOWLEDGMENTS:

We owe immense thankfulness to Prof. Dr. Pierre L. Ibisch, who, although prevented from visiting us due to the global CoVid-19 pandemic, methodologically and practically guided the work, genuinely provided for the knowledge sharing, contributed to the creation of the study and greatly to the strategic formulation within.

We are very thankful to our local partner and other supporters from Ulcinj municipality for their active participation, enthusiasm and commitment that went beyond the project, under which this study is produced, and its requirements. Namely, they are Zenepa Lika from NGO Martin-Schneider Jacoby association who collaborated with us as an important partner, providing essential technical knowledge, institutional and civil society experience, local leadership and collaboration assistance; Rina Kovači and Artan Lika from the company Reborn by Adventures, inspiring young people who bring fresh ideas, social cohesion and local activism to nature protection and sustainable development, exceeding project-based cooperation; Xhemal Perović from NGO Mogul who contributed with his knowledge and experience acquired through many years of activism and generously and kindly offered logistic support; Valentina Bogojević from the NGO Association of Ada Bojana Restaurants who enthusiastically contributed with her knowledge and experience; and Sanja and Saša Čapunović from NGO Association Ada Bojana, who have devoted years to fighting for the conservation of Ada Bojana.

Besides them, we also want to thank other local stakeholders who joined the workshops, interviews and meetings organized under the project. Their insights contributed to the project results, the creation of this study and to the continuation of EnvPro work in Ulcinj. Some of them are Ivo Knežević from Ulcinj Fishermen's Association, who expressed great passion towards the protection the Bojana River, Adrian Perović from Salty village with a desire to protect the cultural heritage and the spirit of the city, and support sustainable tourism development, Ulcinj Municipality representatives, numerous local NGO representatives, activists, as well as volunteers and local organization members who participated in the renewal of the hiking trail Mide–Ostros and others.

Besides the local community, we owe gratitude to organizations and institutions who shared their raw data or whose data were freely available and included either in this study or software application (*https://broud.envpro.me*). They are NGO CZIP in partnership with NGO EuroNatur, which have contributed immensely with their bird monitoring database for the Ulcinj Salina for years 2003–2020 (Center for Research and Protection of Birds & EuroNatur, 2021); NGO Wetlands International and Montenegro National Coordinator, Andrej Vizi, for the data provided through the International Waterbird Census and the many volunteers who undertake the IWC (Wetlands International, 2021); NGO DMAD for valuable dolphin presence and abundance of data for years 2016–2020 (Marine Mammal Research Organization, 2021); Birdlife International for kindly sharing their Important Bird Areas (IBAs) and Key Biodiversity Areas (KBAs) data for Bojana/Buna basin for Montenegro and Albania (BirdLife International, 2021); Plantlife International for kindly sharing their data on Important Plant Areas (IPAs) for the Bojana/Buna basin in Montenegro and Albania (Plantlife International, 2021); NGO Riverwatch and Ulrich Schwarz from Fluvius Vienna for providing detailed hydropower plant data for the Drin basin (Schwarz, 2021); Ministry of Ecology and Spatial Planning, namely Ivana Stojanović and Željka Čurović, for providing the entire database from the Ministry's GEF Adriatic project including valuable data on habitats of the Ulcinj area, ecological attributes, threats etc. (Ministry of Ecology and Spatial Planning, 2022); Ouellet Dallaire et al., 2019 for the Global River Classification data available here *http://www.hydrosheds.org/page/gloric* and WWF for their basins, lakes and hydrosheds data (Lehner et al., 2008; Lehner & Grill G., 2013); Global Biodiversity Information Facility (GBIF) for open species data (Global Biodiversity Information Facility, 2021); UNEP-WCMC and IUCN (2021) for protected areas data (UNEP-WCMC & IUCN,

2021) and the European Environment Agency (EEA) for EMERALD site boundaries (European Environment Agency, 2022b).

In addition, we owe great appreciation to the people who comprised the research team of this project and contributed to the project and the creation of this study. They are Bogić Gligorović, who provided a detailed overview of macro invertebrates of Ulcinj area and valuable species presence data and supported field visits (Gligorović B., 2021); Jelena Popović, Andrijana Mićanović, Vuk Iković and Irma Muhović, from NGO MES, who produced the habitat classification and conducted herpetological overview and research of Ulcinj area, contributing with valuable new field data (Popović J. et al., 2021); Bojan Zeković, from NGO CZIP, who provided an overview of bird diversity and threats in Ulcinj and contributed with the field data for an important bird species (Zeković B., 2021); and Aylin Akkaya from NGO DMAD, who provided a detailed report on cetaceans of the study area and very valuable dolphin presence data (Aylin Akkaya, 2021).

We also owe thankfulness to our intern Ivana Dragović who supported the implementation of our 2nd workshop and contributed to desktop data collection during the period May–October 2021.

DEVOTED TO THE PERSISTENT AND PASSIONATE LOCAL COMMUNITY,
TO SUPPORT YOUR VISION TO CREATE A SUSTAINABLE FUTURE
FOR BOJANA BASIN AND ULCINJ.

# TABLE OF CONTENTS

# INDEX OF TABLES



# INDEX OF FIGURES

# INDEX OF ANNEXES

# LIST OF PHOTOS

# ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| Bern Convention | Convention on the Conservation of European Wildlife and Natural Habitats |
| BOD | Biological Oxygen Demand |
| Bonn Convention | Convention on the Conservation of Migratory Species of Wild Animals |
| BRUOD | Bojana River and Ulcinj Ecosystem Open Database |
| CEPF | Critical Ecosystem Partnership Fund |
| CETI | Center for Eco-Toxicological Research |
| CICES | Common International Classification of Ecosystem Services |
| CITES | Convention on International Trade in Endangered Species of Wild Fauna and Flora |
| CMP | Conservation Measures Partnership |
| CMZ | Catchment Management Zone |
| $CO_2$ | Carbon Dioxide |
| CZIP | Center for Research and Protection of Birds |
| DMAD | Marine Mammal Research Organization |
| DSL | Detailed Location Study |
| EcAP | Ecosystem Approach |
| EEA | European Environment Agency |
| EnvPro | Environment Programme |
| EPA | Environment Protection Agency |
| ES | Ecosystem Service/s |

| | |
|---|---|
| EU | European Union |
| GBIF | Global Biodiversity Information Facility |
| GEF | Global Environment Facility |
| GWP-Med | Global Water Partnership Mediterranean |
| HPK | Chemical Oxygen Demand |
| HPP | Hydropower Plant |
| IBA | Important Bird Area |
| IPA | Important Plant Area |
| IUCN | International Union for Conservation of Nature |
| IWC | International Waterbird Census |
| KBA | Key Biodiversity Area |
| KEA | Key Ecological Attribute |
| LBBUEC | Lower Bojana Basin and Ulcinj Ecosystem Complex |
| MABR | Man and Biosphere Reserve |
| MARD | Ministry of Agricultural and Rural Development |
| MARISCO | Adaptive MAnagement of vulnerability and RISk at COnservation sites |
| MES | Montenegrin Ecologist Society |
| MORT | Ministry of Sustainable Development and Tourism (former, until 2020) |
| MPA | Marine Protected Area |
| MSJA | Martin-Schneider Jacoby Association |
| NAP | National Action Plan for the Implementation of the (LPS) Land Pollution Protocol |
| NGO | Non-Governmental Organization |
| $NH_4$ | Ammonium |

| | |
|---|---|
| NO2 | Nitrogen Dioxide |
| NSIMCZ | National Strategy for Integrated Management of Coastal Zone until 2030 (2015) |
| NSSD | National Strategy for Sustainable Development until 2030 |
| OS | Open Standards (for the practice of conservation) |
| PA | Protected Area |
| Pb | Lead |
| PEHD | Polyethylene High-Density |
| QGIS | Quantum Geographic Information System |
| Ramsar | Convention on Wetlands of International Importance |
| SAP-MED | Regional Plans under the Strategic Mediterranean Action Plan |
| SARD | Strategy of Agricultural and Rural Development 2015–2020 |
| SDPU | Strategic Development Plan for Ulcinj 2016–2020 |
| SEIA | Strategic Environmental Impact Assessment |
| SHs | Stakeholders |
| SPA/RAC | Specially Protected Areas Regional Activity Centre |
| SPM | Spatial Plan of Montenegro until 2020 |
| SPSPCZ | Special Purpose Spatial Plan for Coastal Zone from 2018 |
| SPSPMZ | Special Purpose Spatial Plan for Marine Zone, 2007 until 2020 |
| SUPU | Spatial and Urbanistic Plan of Ulcinj until 2020 |
| TB | Transboundary |
| UNEP/MAP | Mediterranean Action Plan of the United Nations Environment Programme |
| UNESCO | United Nations Educational, Scientific and Cultural Organization |
| VIIRS | Visible Infrared Imaging Radiometer Suite |

*Birds above Ulcinj Long beach © Isidora Ćalović*

# EXECUTIVE SUMMARY

The study in hand is produced as a result of a small project led by NGO Environment Programme (EnvPro), "Enabling Environment for Joint Bottom-up Protection and Sustainable Development Planning of the Bojana River Basin". The scope of the project encompasses an ecologically and socio-economically connected system, entitled in this study as "Lower Bojana Basin and Ulcinj Ecosystem Complex" (LBBUEC). The **study's goal** is the creation of an assessment of ecological values and drivers of stress (i.e. threats) in the LBBUEC. As a result, the study provides the necessary foundation for strategic development directed towards the enhancement of **human well-being** and the **functioning of ecosystems.** The project and the study used the adjusted MARISCO methodology, created by the Center for Econics and Ecosystem Management at Eberswalde University. The MARISCO methodology is a tool that enables a systematic and participatory co-production of knowledge (scientific, local and traditional), designed to guide conservationists and managers to treat areas of high conservation value in a comprehensive way.
The assessment work was performed through desktop research including data sharing from institutions and organizations, field research by the engaged research team, local knowledge gathering through local SHs participation, and joint review and systematization of knowledge by the project team, research team and local SHs.

As a result, we identified the scope of the project area, Lower Bojana Basin and Ulcinj Ecosystem Complex (LBBUEC), its ecological values, threats, as well as the policy framework. The LBBUEC is situated in Southeast Europe in Montenegro, Ulcinj municipality. The River Bojana is shared with Albania (Alb. Buna), and the whole Bojana/Buna basin and its connection with Lake Skadar/Shkodra makes the basin transboundary, while belonging to the Drin River Basin brings the regional dimension. The LBBUEC, being in the focus of the work, consists of 6 landscape-scale ecosystems: marine, coastal, running waters and stagnant waters (freshwater and brackish), low hinterland (with grasslands and populated area) and high hinterland (with forests and rocky grasslands). Bojana River basin encompasses the Bojana River with tributaries, lakes (Šas and Žaka) and wetlands. Besides this, the LBBUEC includes Ada Bojana Island, Long Beach with its hinterland, Port Milena, coastal cliffs, maquis and marine waters, lower hinterland with grasslands, populated area and olive plantations, Ulcinj Salina and other wetlands, and high hinterland forests and rocky grasslands. Owing to specific hydrological, climatological, pedological, terrain and other factors, the LBBUEC is an area characterized by large habitat diversity, including sand dunes, dune grasslands, pseudo steppe, oak forests and maquis, alluvial forests, pristine freshwater, lakes and a complex of small wetlands, freshwater and brackish, etc., all of which provide important habitat to a very high diversity and abundance of species.

The richness of species, habitats and landscapes is already, and to some respect aimed to be, safeguarded through various protection mechanisms. Some protected areas are designated, although they are primarily de jure established, while some are recognized as important and proposed for designation within national and local strategic and policy documents.

Guided by the MARISCO methodology, after the identifying the ecosystems of the LBBUEC, we identified the related k**ey ecological attributes, ecological stresses, drivers of stress, underlying causes and factors, ecosystem services and human well being objects**. As the **key ecological attributes** important for all six ecosystems, we identified stable and developed biodiversity, stable hydrological regime, native species and stable climate. The main **ecological stresses** are habitat fragmentation, community composition disorder, population isolation, and erosion. Most strategically important **drivers of stress** (i.e. threats) are climate change, intensive tourism and invasive species. Most strategically relevant **underlying factors and causes** are: interest of capital, unconscientious actions, lack of finance, lack of political will, ad-hoc performance and short-term profit, institutional immaturity and

lack of prevention. The main **human well-being objects** important to the local SHs are physical health, economic well-being, values and community, social systems maturity and knowledge. Within these we identified the specific **ecosystem services** (divided to provisioning, cultural and regulation) that are or may be provided by the LBBUEC, according to the Common International Classification of Ecosystem Services (CICES).

**Drivers of stress that locals identified they can tackle** with regard to their knowledge and manageability of the threats are: noise and other similar disturbances, pollution from agriculture, uncontrolled urbanization (legal and illegal), fires, poaching, overhunting of species, invasive species, intensive agriculture and intensive and commercial tourism.

The **strategic path** towards tackling identified problems that is proposed in this study deliberately starts at the institutional level. The dynamically changing and presumably intensifying ecological problems, insufficient knowledge, the uncertainty regarding future developments and also the immaturity and weakness of institutions suggest that an appropriately continuous and open-ended learning process is needed for the LBBUEC. The nature of the project and the geographical area, as well as the identified challenges themselves, make it clear that isolated conservation measures are likely to have only a very limited chance of success in the long term (as is ultimately true worldwide). Many of the underlying causes and factors (lack of prevention, lack of law enforcement etc.), identified by the local SHs at conducted workshops, reinforce the need to improve governance, at both the state and the local level. Additionally, institutional action must include strong participation of local people, since in such a biologically and ecologically valuable and complex space, it is out of the question to plan or implement conservation single-mindedly. As plausible **next steps** identified within the broad strategic approach is the creation of a UNESCO biosphere reserve feasibility analysis with the emphasis on the creation of governance structures that empower the civil society and institutions, building of the concept for mobilizing the potential of ecosystem-based climate change adaptation and all nature-based solutions for climate change miti-gation, which integrates ecosystem-based sectoral change opportunities, enriched by the presenta-tion of transnational cooperation and development opportunities. An important strategic step com-plementary to the previous three is the establishment of a purpose-oriented and regional association for the promotion of a sustainable, ecosystem-based and climate change robust development of the Bojana/Buna River basin, which would allow both the state and municipal actors to become mem-bers as well as, of course, the civil society organizations and enterprises.

# 1

# INTRODUCTION

*Fishing near Ada Bojana island © Isidora Ćalović*

# 1.1. PROJECT OVERVIEW

***Catchment Management Zone of Bojana River in Montenegro***

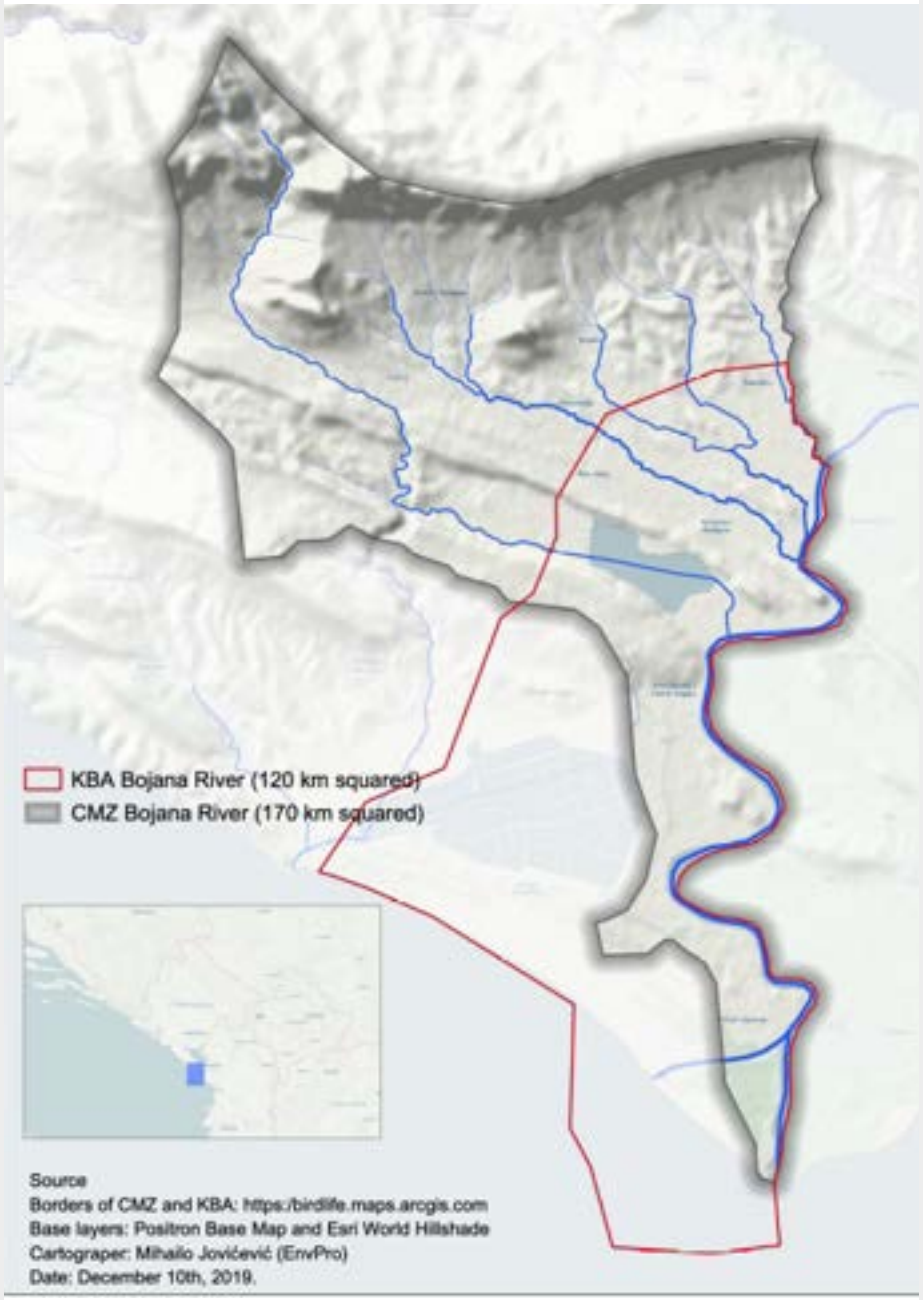



*Figure 1: Bojana River CMZ as the initial project scope and Bojana delta Key Biodiversity Area*

The study in hand is produced as a result of a small project led by the NGO Environment Programme (EnvPro), "Enabling Environment for Joint Bottom-up Protection and Sustainable Development Planning of the Bojana River Basin". This is EnvPro's first project in this geographical area and it is focused on the Montenegrin side of the Bojana/Buna River basin and its wider surrounding area, leaving out the Albanian side of the river basin. Aspirations exist to enlarge the scope in the future due to the high ecological, cultural, social, economic and other connectivity of the transboundary area. EnvPro strategically chose this area because it is considered of particular importance in Montenegro and on the Adriatic, due to high bird diversity, remnants of endangered ecosystems and habitats which are also of EU importance, lack of continuous research and conservation effort (excluding birds) and due to more or less preserved biodiversity which is under the increasing threat of degradation (Dömpke Stephan, 2008; European Commission et al., 2016; Janssen et al., 2016; Rubinić et al., 2019; Schneider-Jacoby et al., 2006; Sovinc A. et al., 2017)

The project was supported by the Critical Ecosystem Partnership Fund (CEPF), under their Strategic Direction 2: "Sustainable Management of Water Catchments" and sub direction "Support to Sustainable Management through Integrated Approaches of Freshwater Biodiversity Conservation". These directions are in line with EnvPro's mission to apply modern scientific knowledge, build partnerships and networks, raise capacities and awareness, apply participative bottom-up approaches and empower stakeholders to use the benefits of nature conservation in Montenegro and the Balkan region.

Based on the donor's strategic ecosystem profile, the project was to focus primarily on the Bojana Catchment Management Zone (CMZ) and, with it, the connected Key Biodiversity Area (KBA) of the lower Bojana basin (Figure 1), which belongs to the wider Lake Skadar basin. The donor's logic behind it is that the most effective method for setting priorities for freshwater ecosystems is to prioritize the CMZs, based on available information on biological importance,

threat and feasibility, and then to focus the conservation action on the KBAs within them, while giving attention to catchment or river basin wide issues, where this is relevant.

However, the scope of the project was extended, encompassing a larger ecologically and socio-economically connected system and is titled "Lower Bojana Basin and Ulcinj Ecosystem Complex" (LBBUEC), encompassing the entire Ulcinj municipality. The geographical scope is defined in detail in Chapter 3. Geographical Scope of the Project and Motivation.

The project greatly relied on the MARISCO methodology, created by the Center for Econics and Ecosystem Management at Eberswalde University for Sustainable Development to design the project and approach to our work. MARISCO stands for Adaptive MAnagement of vulnerability and RISk at COnservation sites. It is a tool that enables a systematic and participatory co-production of knowledge (scientific, local and traditional) through adaptive learning and management. It is designed to guide conservationists and managers to treat areas of high conservation value, taking into account the ecological and social, static and dynamic factors, with the end purpose being sustainable use of natural resources.

The project set out to achieve two main results, i) Assessment of vulnerability status, risk and resilience of biodiversity and ecosystems with adjoined services presented in database and map forms and ii) Local stakeholders, their values and interests reinforced, raised awareness and understanding and designed strategic directions for protection and sustainable use of Bojana River basin.

The first result involved creating of two outputs, the study given in hand and the database web-application for presenting relevant knowledge and data collected in the project. To create these outputs, we applied the adjusted the MARISCO method – the structure it provides and its phases and steps described under 2.1. MARISCO Method and Timeline of Implementation. For robust data collection we used a variety of methods: desktop review, field research, exchange of data with organizations and researchers as well as gathering knowledge from relevant local stakeholders through participatory approach – continuous meetings, interviews and workshops. The data collection process is described in detail under section 2.6. Data Collection: Desktop, Field and Open Data.

The MARISCO knowledge base set in this study is reflected in the second output, a software application, digital extension of the study, named "Bojana River and Ulcinj Ecosystem Open Database" (BRUOD[15]. Many organizations possess various scattered data in different shapes and forms, so far collected in a temporally and geographically fragmented way and often not consistently presented to the decision making, data and/or scientific bodies and general public. The purpose of this application is to offer data access for using information and data outputs such as maps, to inform decisions, actions, conservation planning and research efforts, and to ease the identification of data and research gaps. The software application contains all georeferenced and relevant non-georeferenced data collected from many sources throughout the project and is meant to be maintained and expanded in future.

In parallel and synergy to the above, and to achieve the second result, we met with international, national and local stakeholders (SHs) relevant for the project area, to secure information sharing, explore possibilities for cooperation and support. Out of numerous local stakeholders we identified and many with whom we met, the most engaged and passionate individuals and organizations, interested in collaborating to solve drivers of threats, assembled a non-formal Local Action Group (LAG). To steer their collaboration and joint acting, EnvPro assisted them in implementing one small action in the LBBUEC identified as the priority; created three project concept notes based on the local group's choice of most relevant solutions for which they have capacities (measured by knowledge and management potential).

The cross-cutting element of the work was also raising capacities of young researchers, NGOs and locals involved in the project to systematically analyze ecosystem-based values and threats and develop strategic approaches for joint actions.

[15]*access here: https://broud.envpro.me*

# 1.2. BACKGROUND AND JUSTIFICATION

Lower Bojana Basin and Ulcinj Ecosystem Complex (LBBUEC) is situated in Southeast Europe and is shared by two countries, Montenegro and Albania. In Montenegro it is situated in the territory of Ulcinj municipality, while in Albania it is situated in Shkodra municipality. It covers an area of 1052 km2 (Lehner & Grill G., 2013). It drains the entire Drin basin, which also belongs to Kosovo*[16] , North Macedonia and Greece, into the Adriatic Sea (Figure 2).

The LBBUEC (detailed explanation of the scope area is given in Chapter 3. Geographical Scope of The Project and Motivation), consists of 5 bio geographic units: marine, coastal, freshwater and brackish, grasslands and forest and maquis. This entire region has a Mediterranean climate, with dry summers and mild, rainy winters. The average temperature during the entire year is above 5°C, and average monthly temperatures above 10°C begin in early March, and last until December. The region is characterized by a semiarid, a Mediterranean type of climate with long, hot and dry summers and uneven amounts of precipitation during the year. The highest precipitation is during spring, late autumn and winter (Dömpke Stephan, 2008; Petković & Sekulić, 2019).

The Bojana River is a floodplain river, and although fairly short, 40km, it has a complex hydrology. The main natural factors defining its hydrological regime are its tributaries (the Drin in particular), Lake Skadar and Bojana River estuary. Most important anthropogenic factors determining its hydrology are three large reservoirs on the Drin, as well as protective embankments along Bojana used as flood protection. These embankments protect the area of 600 ha between Bojana and the old dam of the salt-works, as well as the Ulcinj field during seasonal flooding (Dömpke Stephan, 2008; Petković & Sekulić, 2019).

The Bojana River has a slow flow, due to the small slope of 1.2 m/km. The average depth of the river is about 3 to 5 m, and in some parts it exceeds 8 m. At the mouth of the river, the sea waves created a reef, which is visible when the water level is low. There are two river branches: the West one (west of Ada Bojana Island) is smaller, about of 0.9 m depth in winter, and 1.2 m in summer, in comparison to the East one which forms the border with Albania, and has 1.2 m depth during the winter, and 1.6 m during the summer (Petković & Sekulić, 2019).

In general, the Montenegrin coast is an area of intense seismic activity, due to the movements of tectonic plates in the border zone towards the Dinarides massive. Some parts of the terrain show average and stable soil conditions, like sandy terrains near the sea with high levels of groundwater, or wetlands. Alluvial sediments are characteristic for the lower stream of Bojana River, consisting of gravel, sand, mud, and mud clay. Alluvial soils are located in Donji and Gornji Štoj, the Bojana Island and along the Bojana River. These soils are composed of mostly sandy and muddy components, often in contact with salt. The Bojana River soil is also salty due to the influence of sea water. The sediments of the Long Beach belong to the Quaternary period, consisting of alluvial and sandy sediments. Sea sand and gravel, created by the sea waves, are deposited along the lower parts of the shore of Long Beach and Ada Bojana beaches. The terrains of Donji and Gornji Štoj are located 2.2–2.9 m above the sea level. These soils in slightly elevated terrains are of better quality than those in the lower areas. This area is cultivated with vegetables and fruit, and smaller amounts of grains (Dömpke Stephan, 2008).

Owing to specific hydrological, climatological, pedological, terrain and other factors, the LBBUEC is an area characterized by a large habitat diversity, including sand dunes, dune grasslands, pseudo steppe, oak forests and maquis, alluvial forests, pristine freshwater, lakes and a complex of wetlands, freshwater and brackish, all of which provide important habitat to a very high diversity of species (Dömpke Stephan, 2008). The Balkan Peninsula is widely considered as a biodiversity hotspot of Europe (Griffiths H. I. et al., 2004; Kryštufek & Reed, 2004). Namely, there are 230 bird species (Puzović, 2002; Stumberger et al., 2005) out of a total of 348 in Montenegro (Saveljić & Jovićević, 2015) with Ulcinj Salina being "the most important wintering, nesting and feeding site for birds on the eastern coast of Adriatic Sea and a key stop-over site for bird migration on the Adriatic Flyway[17]" (Rubinić et al., 2019). Out of a total of 13 amphibians in the Montenegro, 11 are

present in the LBBUEC, while out of 35 species of reptiles, there are 21 (Ajtić et al., 2004; Popović J. et al., 2021). Plant species richness is unknown for the entire area, but assessed as very high (Caković D. & Milošević D., 2013; Stešević et al., 2020) in the Long Beach and Bojana Island alone there are 962 species registered out of which 37 are nationally protected (Bubanja N., 2016). Many organism groups, such as macroinvertebrates, mosses, lichens, fungi, are extremely under-represented in biological research, also in comparison to the research in the region, but the assumptions of leading Montenegrin experts are that their diversity in the LBBUEC is very high, which is to be confirmed (Caković D. & Milošević D., 2013). The existing species diversity of the area is indicated by the first and the only integrated research of species for the area, produced by EuroNatur and published in the Rapid Assessment of the Ecological Value of the Bojana-Buna Delta (Albania/Montenegro) (Schneider-Jacoby et al., 2006) which presented many species from the area as threatened and endangered.

The richness in biodiversity is aimed to be safeguarded through various protection mechanisms, and some protected areas have already been established while some are recognized as important within strategic and policy documents.

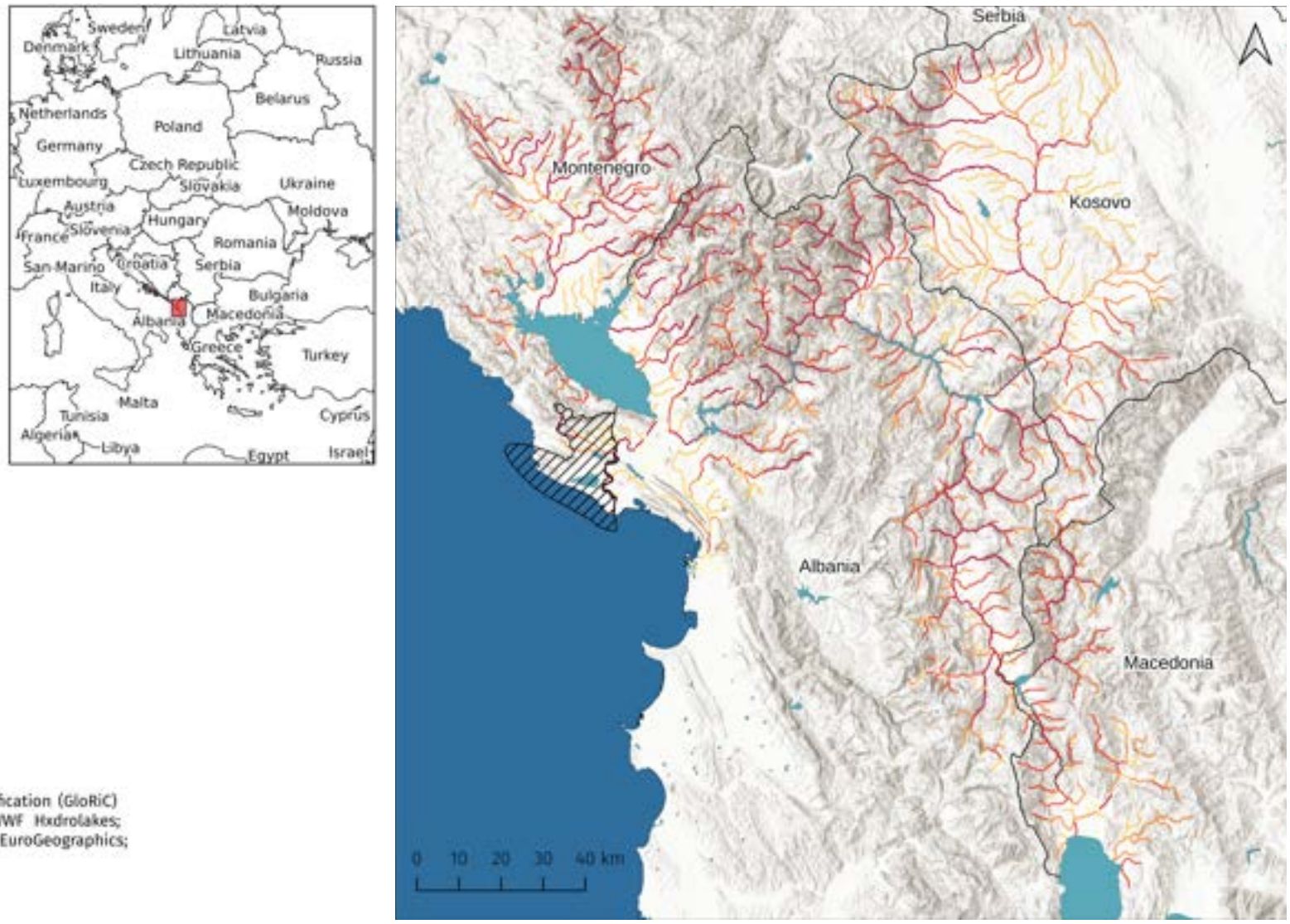



*Figure 2: Map of the project scope area of the LBBUEC situated in south-east Europe and Drin river basinaa*

The Montenegrin side of the Bojana basin has scattered protected areas and no efficient management of the wider and designated site/s yet. On the sea coast there are a number of areas protected as Monuments of nature: Long Beach, Small Beach, Valdanos Beach, Stari Ulcinj Island with its beach and six oak trees of three different species (locations of tree species unknown), designated under the Law on Nature Protection in Montenegro and under protection since 1968. Ulcinj Salina has recently (2019) been designated as a Nature Park.

The most recently protected area (December 2021) is the Stari Ulcinj Island and the surrounding marine and terrestrial areas, under the category Nature park, being the third Montenegrin Marine Protected Area (MPA) (Environment Protection Agency, 2021).

Bojana River, Ada Bojana Island, Knete (wetlands), Lake Šas and Long Beach with Ulcinj Salina are designated as EMERALD candidate sites (Directorate of Democratic Participation EU, 2021). Ulcinj Salina and Lake Šas are Important Bird Areas (IBAs). The Ada Bojana Island with a small adjacent part of the Long Beach is recognized as an Important Plant Area (IPA) (Plantlife International, 2021)Most recently, in 2019, Ulcinj Salina, an area of saltpans, was designated as the third Montenegrin Wetland of International Importance (Ramsar Convention On Wetlands, 2022b).

As far as protection in the interconnected broader area of goes, National Park Lake Skadar in Montenegro was also listed as a Wetland of International Importance in 1995; while the area "Shkodra Lake and River Buna" was listed as Wetland of International Importance in February 2006 (Ramsar Convention On Wetlands, 2022b, 2022a).

On the Albanian side, Lake Shkodra is protected under the category Nature Park. The entire Albanian part of the Bojana/Buna River basin is nationally protected, including Velipoje area, under the protection status of "Protected Landscape" and is a part of the European Green Belt (GWP-Med et al., 2015). At the same time, this area, including the Montenegrin part of Bojana/Buna basin, is a Key Biodiversity Area (KBA) and an Important Bird Area (IBA) (BirdLife International, 2021). The Albanian part of the Bojana/Buna basin part is an Important Plant Area (IPA) (Plantlife International, 2021). "Protected Landscape of Buna River – Velipoja" is designated as an EMERALD candidate site (Directorate of Democratic Participation EU, 2021).

Despite its high natural values, the area is significantly threatened by unsustainable, unplanned and illegal activities, as well as a lack of integrated management and shared values for joint planning. Stakeholders are many and from different fields and levels (tourism, fisheries, agriculture, infrastructure, pollution, nature protection, water management, disaster risk reduction), often independently and individually developing sectors and realizing interests. Practices of opportunism in planning of protected areas as well as proclaiming protected areas with no substantial de facto outcome are common for the region and here. It is evident that the processes of effective protection and integrated management are not yet in place and that synergies need to be enhanced and mainstreamed.

EnvPro's intention for Lower Bojana Basin and Ulcinj Ecosystem Complex follows its strategic direction "Expand sustainable development programs and create areas of excellence in multiple locations", recently formalized in its Strategic plan of organization development 2022–2025 (NGO Environment Programme, 2021). Given the enormous ecological values of biodiversity and natural resources, mostly over-used and threatened by unsustainable practices, EnvPro aims to facilitate the creation of a case-example for efficient nature protection and sustainable development of the LBBUEC area. Due to its comprehensiveness and holistic approach, EnvPro has an affinity to rely on UNESCO's Man and Biosphere Reserve (MABR) programme, which assumes the integration of 3 main principles, (1) Conservation – of natural and bio-cultural diversity; (2) Sustainable economic, social and cultural development and (3) Logistic support – to model projects, training and education for sustainable development and research and monitoring. The given approach, when applied properly, with equal regard to all principles, creates true sites of excellence and facilitates shared benefits on multiple scales (UNESCO, 2017). The programme has also been recognized earlier by NGO EuroNatur, and during the work on the project by a local partner organisation and other local stakeholders.

In line with the EnvPro's strategic direction, this **study's goal** is creating an assessment of ecological values and drivers of stress in the Lower Bojana Basin and Ulcinj Ecosystem Complex, which will provide the necessary foundation towards the enhancement of **human well-being** and the **functioning of ecosystems.**

*[16]All references to Kosovo, whether the territory, institutions or population, in this text shall be understood in full compliance with United Nations Security Council Resolution 1244 and without prejudice to the status of Kosovo.*

*[17] It is an important migratory corridor that runs along the East coast of the Adriatic Sea for waterbirds migrating between the eastern half of Europe and North and sub-Saharan Africa.*

# METHODOLOGY

*Ada Bojana © Zenepa Lika*

# 2.1. MARISCO METHOD

Biodiversity assessment of the Bojana basin was performed following an ecosystem-based, adaptive and participatory approach. The specific method applied during the process was MARISCO, developed by the Centre for Econics and Ecosystem Management at Eberswalde University for Sustainable Development and published in a guidebook (Ibisch & Hobson, 2014).

EnvPro was first introduced to the MARISCO methodology in 2015, when it was applied for an ecosystem-based assessment of the Buljarica cove (Katnić A. et al., 2016), in partnership and with the guidance and support from the Centre for Econics and Ecosystem Management. The MARISCO method is a toolbox that allows for systematically guiding a process of adaptive learning and management, an acronym of: adaptive MAnagement of Vulnerability and RISk at COnservation Sites. Although the approach is called ecosystem-based, it is also people-centered. The ecosystem is analyzed separately from the people (social systems), but this procedure is conceptually grounded in the ecosystem approach where people and all social systems are interdependent components of a wider system; this is also conceptualized by linking ecological and social systems through ecosystem services. The method is developed based on the Open Standards for the Practice of Conservation (OS; now Conservation Standards) by the Conservation Measures Partnership (CMP) (Conservation Measures Partnership, 2020). It was utilized for a number of years by the team that developed MARISCO and evolved into a system that puts a greater emphasis on ecosystem dynamics and change and on the effects and problems related to climate change[18].

Since the publication of the guide, the method has been updated (Figure 3), and more focus is placed on a comprehensive analysis of social systems, including social stresses and drivers of stress. However, the MARISCO structure remained adaptive and it is possible to adjust the number and sequence of the steps, according to the needs and the goal of the method's application.

The MARISCO cycle includes seven major phases of management, which are subdivided into 30 methodological steps. The phases are:

- Phase I (motivation and scope) addresses the question of what is to be accomplished. It defines the motivation and expectation of the participants of the MARISCO process, defines the management vision and the scope of the management and study.
- Phase II (people-centered phase) examines what the social framework looks like. This involves compiling information on what people need for a good life and what services contribute to their well-being. In addition, in this phase it is determined which ecosystems produce these services and what conditions they need to provide them.
- Phase III (ecosystem-based phase) focuses on the ecological setting. It compiles data on what types of ecosystems are present. It is also examines which key ecological properties ecosystems need to be functional.
- Phase IV (problem analysis) is devoted to the question of which problems (drivers of stress) occur. For this purpose, the current state of the objects of protection is assessed. Furthermore, the criticality of stresses, stress drivers and underlying factors and causes are described and analyzed.
- Phase V (strategy evaluation and development) examines which problem-solving strategies are necessary. For this purpose, existing strategies are evaluated and prioritized. An impact analysis and a strategic gap analysis are conducted. Based on this, complementary strategies are developed.
- In Phase VI (plausibility and effectiveness check), the question of whether the theory of change is plausible is explored. For this purpose, outcome networks are developed to analyze the effects of the strategies.
- Phase VII (operational planning and implementation) focuses on how to implement the strategies, through monitoring and operational planning. In addition to this, the measures identified are implemented and knowledge management applied.


*Figure 3: MARISCO method phases and steps (version December 2021)*

Results and discussion section reflects MARISCO phases as follows:

- Phase I (motivation and scope) – Chapter "Geographical Scope of The Project and Motivation"
- Phase II (people-centered phase) – Chapters "Policy and Stakeholders" and "Ecosystem Services and Human Well-being"
- Phase III (ecosystem-based phase) – Chapter "Ecosystems, Biodiversity Objects and Key Ecological Attributes"
- Phase IV (problem analysis) – Chapter "Ecological Stresses, Drivers of Stress and Underlying Factors"
- Phase V (strategy evaluation and development) – Chapter "Strategy Formulation"
- Phases VI and VII were not covered by the project

[18] *For additional literature on the MARISCO method development see Schick et al. (2017), (2018) and (2019) and see a short video explaining the MARISCO method process.*

# 2.2. ASSESSMENT TIMELINE AND STEPS

EnvPro's implementation of the method did not include all MARISCO phases and steps, and it was adjusted to suit project needs and situation. The initial pace of the project implementation was slowed down, but we successfully overcame most obstacles. The main challenges that persisted were the project's limited resources and time, and constraints caused by the CoVid-19 pandemic, such as in-person collaboration with the Center for Econics and Ecosystem Management and facilitation of some steps/phases.

The project was of total 22.5-month duration and the creation of this study and complementary database in this period developed through 9 phases (Figure 4):

- **July–September (2020),** research team gathering and stakeholder meetings. As a first step in project implementation, EnvPro set out to gather a broader research team which would contribute to the ecological assessment of the project scope. Parallel to this, EnvPro mapped the local, national and international stakeholders (institutions, organizations and individuals) of relevance to the project area. In this period, EnvPro conducted meetings with national and international-level stakeholders to present the project, explore possibilities for cooperation and exchange any available raw data. Details on this process are given in the section 2.5. Stakeholders Engagement. In September, a methodological guidance document was prepared by Prof. Dr. Pierre L. Ibisch and shared with the EnvPro and research team.

- **2nd and 3rd October (2020),** 1st workshop, "Assessment of the Bojana Basin for Developing Adaptive, Ecosystem-Based Risk Management, Based on MARISCO Methodology". EnvPro hosted a workshop, led by Prof. Dr. Pierre L. Ibisch, to present the MARISCO methodology to participants, which were the preliminary broader research team. In the workshop, the group conducted the 1st phase - determining the geographical scope of the project and team's motivation and vision for the area –

- **October–November (2020),** furthering preparation of data collection. After the workshop, EnvPro worked on preparing a detailed data collection approach, for creating a broad overview of ecological and other knowledge, and facilitating work of the research groups by providing templates to be used for data reporting. The work also included the preparation of questionnaires for interviewing local SHs. Both were created following the MARISCO structure and phases, i.e. Methodological guidance developed for the assessment.

- **November–January (2020 & 2021),** local SHs meetings and interviews. In this period, EnvPro conducted meetings and non-formal interviews with identified local SHs. The purpose of the meetings was presentation of the project and the organization, gathering of locals' knowledge on ecology, drivers of stress, causes etc., and also identification of any local SHs who are potential "champions" of area protection and sustainable development.

- **January–June (2021),** desktop data collection and field research. In this period, the EnvPro team worked intensely on desktop data collection, as well as the broader research team, which also conducted field research, in preparation for the creation of this study and also the upcoming workshop with local SHs.

- **4th–6th June (2021),** 2nd workshop, "Ecosystem Based Assessment of Values and Threats to the Bojana Basin". In this workshop, EnvPro gathered the broader research team and local SHs, both the potential champions and the representatives of decision-makers.

EnvPro and the research team presented the research area and results of data collection and project progress thus far.Together with local SHs, the EnvPro team and research group identified MARISCO elements: ecosystems, ecosystem services and human well-being, ecological attributes, ecological stresses, drivers of stress and underlying causes, as well as the causal connections between them.

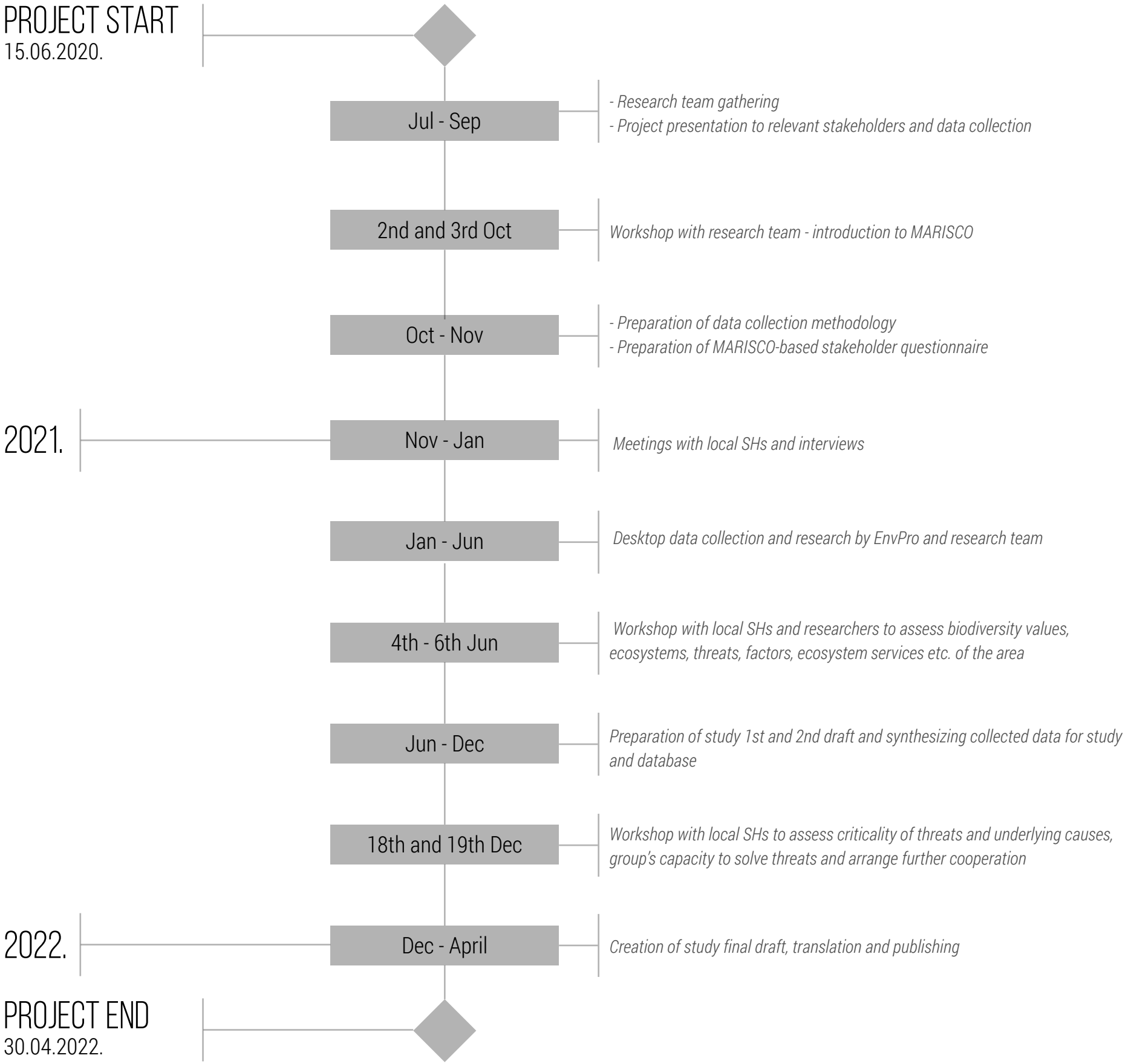
- **June–December (2021),** preparation of study 1st and 2nd draft and synthesizing collected data for study and database. In this period, EnvPro worked on drafting the 1st and then 2nd study draft, which included the sorting and preparing of all collected data, review of studies, reports and papers, as well as the review and integration of researchers' reports. In parallel, the Blueprint document for the development of the database web application was drafted and data sharing with different organizations initiated and formalized.

- **18th and 19th December (2021),** 3rd workshop, "Actions for Conservation of Bojana River Basin". In this workshop, EnvPro gathered potential local champions identified through earlier meetings and also the 2nd workshop. Here, the group revised the MARISCO work previously done and then assessed the current, past and future criticality of ecological stresses, drivers of stress and underlying causes, as well as manageability and available knowledge for solving identified drivers of stress. The group also created a list of solutions to the drivers of stress, ranking them from least to most important, which formed a basis for agreeing on which actions the group can take further with EnvPro support and which project concept notes to develop jointly. Knowledge building on Local Action Group (LAG) concept was also delivered.

- **January–June (2022),** the creation of study final draft and web application final, study translation and dissemination. In this period, EnvPro finalized the study and web application, had them reviewed by the consultant Prof. Dr. Ibisch and prepared for publishing and distribution through wide email list.

*[18]Overall, champions are the stakeholders who are motivated to join the cause a certain organization is promoting, they are willing to advocate for key items of the cause, contribute with ideas, get involved in problem-solving and overall contribute their time, skills or other resources long-term, aiming to solve the given cause*

*Figure 4: Study development timeline and steps*



# 2.3. TEAM COMPOSITION AND APPROACH

EnvPro's team engaged in implementing the method and in creating this study, led by Prof. Dr. Pierre L. Ibisch from Center for econics and ecosystem management, were:

- Ana Katnić, EnvPro – project conceptualization, methodological support and backstopping, participatory SHs engagement support and implementation, workshop facilitation, analysis of strategic, policy and planning documents, Study development and review.

- Nina Lončarević, EnvPro – broad desktop and raw data collection, ecosystem and habitat classification, coordination of research team and review of reports, SHs engagement, database structure development, support in creation and preparation and entry of data into database, Study development, Language editing and translation review.

- Danijela Šundić, EnvPro – analysis of freshwater ecology of LBBUEC and Lake Skadar basin, ecosystem and habitat classification and database development support.
  Mirko Jovićević, EnvPro – creation of database and software application "Bojana River and Ulcinj ecosystem open database".

- Aleksandra Crvenica, EnvPro – support in facilitation of two workshops with local SHs, raising understanding on LAG's concept and Advocacy, support to the action plan and concept notes development.

A broader research team was gathered to support the research and analyses of species, habitats and cultural objects, within given methodological approach, tailored for the scope and size of engagement:

- NGO Dr. Martin Schneider Jacoby Association (MSJA) – represented by Zenepa Lika, local project partner which conducted cultural objects field data collection,

- Independent researcher, Bogić Gligorović – macro invertebrates desktop data collection and and field research

- NGO Montenegrin Ecologist Society (MES) – project partner, terrestrial reptiles and amphibians research and ecosystem and habitat classification,

- NGO Center for Research and Protection of Birds (CZIP) – bird desktop data collection and research,

- NGO Marine Mammal Research Organization (DMAD) – dolphins desktop data collection and research

# 2.4. IMPLEMENTATION THROUGH MARISCO PHASES

Implementation segregated through MARISCO phases is summarized below. A list of workshops held as part of the methodology is given in Annex 1.

**Phase I: Motivation and Scope**

The first workshop EnvPro hosted within the project, "Assessment of the Bojana Basin for Developing Adaptive, Ecosystem-Based, Risk Management Based on MARISCO Methodology", was held for two days in October 2020 with EnvPro team and the research team under guidance of the Center for Econics and Ecosystem Management. The participants underwent an introduction to the MARISCO methodology, all of its steps and phases, and jointly defined the project scope and focus area (Step 1) and management vision for the area (Step 2).

**Step 1.** This step focuses on defining the geographic project scope, which relied on several important criteria, including donor's strategic direction, strategic direction and aspirations of EnvPro and available project resources, as well as a defined set of criteria including ecological and social criteria. We firstly relied on the Strategic Direction of CEPF (project donor), which, within the Strategic Direction "Sustainable Management of Water Catchments" emphasizes the focus on CMZs and Key Biodiversity Areas (KBA) within the Bojana River basin and the broader area of Lake Skadar ecosystem. With this, we combined the aspirations of EnvPro to, through the project, work on preparing the ground for the implementation of a sustainable development model to the transboundary area of the Bojana/Buna basin, which encompasses the entire Ulcinj municipality in Montenegro and a part of the Shkodra municipality in Albania. Other criteria we relied on were the ecological connectivity of the basin, hydrology, social cohesion, administrative boundaries, existing threats, socio-economic-ethnic inter linkage of the transboundary area, etc.

Due to the complexity of defining the project scope, we looked forward to reassessing it using the MARISCO methodology approach and taking into account the perspectives of the research team. At the workshop, after an introduction to the methodology and presentation of each organization, the team had a virtual site visit using the geofolio tool[20], which due to CoVid-19 couldn't be a live field visit as per usual, where the ecosystem biogeographic units were discussed, ecosystem dynamics, stress and risks, etc., focusing on the Bojana basin and the wider area of Ulcinj municipality. Using this knowledge and important criteria set for defining the scope, each participant used the geofolio tool to draw their proposition of the project scope, relying also on the available river basins and sub-basins maps to inform their propositions. The then finalized project scope was also presented to the local SHs on EnvPro's 2nd workshop in June 2021, for the revision of its boundaries and possible amends. The final proposition of the geographical scope was concluded after the 2nd workshop.

[26] *https://geofolio.org/*

**Step 2.** In this step, the group's task was to define a vision for the area's development. The vision defines the existence value and importance of a conservation site and the intended or desired condition after conservation strategies have been implemented to secure its protection from current or potential degradation and loss. To define the vision for the area's management, each participant of the workshop presented a vision of their organization for the future of the Bojana basin, which was further discussed with the consultant. Based on the various visions and ideas presented, several important questions were raised, e.g. Should the protection of the area be exclusive but towards supporting sustainable development?; What is a long-term mechanism or a solution for safeguarding people's awareness of environmental values?; What model should be used to reconcile the vision of raising awareness, improving livelihoods and nature protection?; What outputs do the project and EnvPro, in general, want to create to support the achievement of its vision – a document, a book, papers or structures, plans? After a fruitful discussion and sharing of ideas, the management vision for the area of EnvPro and the wider team was created. This vision was revisited at the 2nd workshop, and then finalized with the input from the local SHs.

At the workshop, it was also decided that not all steps of the methodology can be implemented within the project. Hence, some phases of the approach were completed in their entirety or almost (1st, 2nd, 3rd, 4th and 5th), while the 6th and 7th phase were partly implemented.

The management vision for the area and geographic scope were revisited at EnvPro's 2nd workshop (see next phase), which gathered the local SHs besides the research team.

To complete phases 2, 3 and 4, EnvPro hosted a workshop titled "Enabling Environment for Joint Bottom-up Protection and Sustainable Development Planning", in June 2021 in Ulcinj. In this workshop, besides EnvPro and the research team who contributed with expert knowledge, a suite of local SHs participated and contributed with local and traditional knowledge (more in Section 2.5. Stakeholder Engagement). The workshop gathered 17 people in total, five members of the wider EnvPro team, five representatives of the research team and seven representatives of local stakeholders, ranging from NGOs and community members, to small aspiring business or established businesses and municipality representatives.

## Phase II: People-Centered Phase

**Steps 3 & 7.** In this phase, the task at hand was the identification of human well-being and ecosystem services, i.e local people's needs, demands and activities in relation to local ecosystems. This phase consisted of desktop data collection by EnvPro and research team, and of ES and well-being categories identification by the local SHs in the 2nd workshop.The ecosystem services compiled through desktop research and input from locals at the workshop were classified using the Common International Classification of Ecosystem Services (CICES) (European Environment Agency, 2018).

**Steps 4, 5 & 6.** Social systems in the broad sense were identified only through desktop research, through research of stakeholder and policy information by EnvPro team, while social attributes were not researched within this study.

Due to the aim of the study envisioned by EnvPro and preferred logic, in the Results and Discussion part of the study, phase II is presented following the phase III.

## Phase III: Ecosystem-Based Phase

**Steps 8 & 9.** The task of this phase is to:

- agree upon the landscape-scale ecosystems of highest-order that encompass the most important ecological processes and that likely extend beyond the boundaries of the project scope area
- list all smaller ecosystems/habitats nested within the larger ecosystems
- identify the species or organism groups that are of special importance for the functionality of the ecosystems and conservation, e.g. engineering species, important keystone species etc.

To complete this phase, the research team undertook a thorough data compilation and preliminary field research. The data gathering process consisted of raw data gathering by the EnvPro team from relevant institutions, NGOs and independent researchers; desktop data gathering by the EnvPro team and field and desktop research by broader research team.

The ecosystem and habitat classification compiled by NGO Montenegrin Ecologist Society for the purposes of this study, and further reassessed and adjusted by the EnvPro team and workshop participants on the 2nd workshop. It is primarily based on Milanović et al., 2021 and Caković D. & Milošević D., 2013. The species important for conservation were largely extracted from this literature as well, and also researchers' reports (Aylin Akkaya, 2021; Gligorović B., 2021; Popović J. et al., 2021; Zeković B., 2021) and lists finalized in consultation with the research experts. We complemented this with the additional use of organism group-specific literature (Bubanja N., 2016; Rubinić et al., 2019).

At the 2nd workshop, the gathered research team, EnvPro and local SHs jointly created and agreed upon a final classification of ecosystems, habitats and species, as well as the Key Ecological Attributes (KEA). Ecosystems and biodiversity objects were connected to the corresponding KEA, showing which KEAs are the most important for which ecosystem.

To achieve the phase 4 almost completely, and a significant part of phase 5, EnvPro hosted a 3rd workshop in Ulcinj in December 2021, titled "Actions for Conservation of Bojana River Basin". Here, EnvPro gathered a small group of local SHs based on the motivation shown in the previous workshop, to continue the MARISCO work. Namely, at the workshop, we ranked the past, future and current criticality of drivers of stress, underlying factors and ecological stresses, as well as the knowledge available and manageability of drivers of stress (as they were the most tangible for locals to tackle). This ranking served for estimating the strategic relevance of each driver of stress, the results of which are elaborated in Chapter 9, Strategy Formulation. At the workshop, we also came up with various solutions and strategies and local SHs action plan; a) chose which one solution, on a small scale, they will implement with the EnvPro support during the course of the project and b) based on the priority rating of solutions, three main ones were chosen to further elaborate them into small projects.

## Phase IV: Problem Analysis

At the same workshop as in phases 2 and 3, after the ecosystem diagnostics and the people centered phase, the problem analysis phase ensued.

**Steps 10, 11 & 12.** Ecological stresses, drivers of stress and underlying factors and causes identification and analysis are the focus

of the given steps. All three are relevant for obtaining a detailed understanding of the conditions in the project area and cause-effect relationships.

They were first identified by EnvPro and research team through desktop data collection and in some cases field work by the research team, and afterwards agreed upon and finalized in the workshop with local SHs. Concluding with the 2nd workshop, a full overview and causal connections of ecological stresses, drivers of stress and underlying causes and factors were created. Ecological stresses were connected with the corresponding key ecological attributes; the drivers of stress with ecological stresses and underlying factors cause the various drivers of stress.

In this phase, besides identifying stresses, drivers of stress and factors, in the 3rd workshop with local SHs "Actions for Conservation of Bojana River Basin", we furthered the problem analysis. There are three principal criteria against which stresses, drivers of stress and underlying causes and factors are assessed. These are: manageability, knowledge and strategic relevance. Strategic relevance is further divided into various (sub) descriptors including: criticality (scope, severity, irreversibility, past criticality, current criticality, trend of change of current criticality, and future criticality); and systemic activity (level of activity, number of elements that are influenced). At the workshop, we focused on assessing the overall current criticality, future criticality and past criticality, while manageability and knowledge were assessed only for drivers of stress, due to time limitations. Details of the rating for these assessments are given in the MARISCO guide (Ibisch & Hobson, 2014), while below is an overview of the rating set up of each mentioned criteria.

Current criticality (overall) rating:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Slightly critical | 2 | Moderately critical | 3 | Critical | 4 | Very critical |

Future criticality ratings:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Lower than current | 2 | Equal to current | 3 | Higher than current | 4 | Much higher than current |

Past criticality rating:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Lower than current | 2 | Equal to current | 3 | Higher than current | 4 | Much higher than current |

We assessed manageability and knowledge focusing only on drivers of stress due to limited time. The knowledge assessment of the situation makes clear the interdisciplinary (and trans-disciplinary) nature of conservation planning and also reveals the extent to which scientific knowledge is limited to providing evidence in more linear formats. The assessment of the manageability of drivers of stress as set out below is important for creating strategies that are not misguided, unrealistic and ineffective.

Knowledge:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Well known | 2 | Somewhat known | 3 | Not known, but theoretically knowable | 4 | Not knowable |

Manageability:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Very manageable | 2 | Somewhat manageable | 3 | Poorly manageable | 4 | Not manageable |

Ex Post workshop, these ratings were used to create a Strategic Relevance Score, which sums up the outcomes of the different ratings undertaken in the previous steps and can be used to identify the most relevant elements in the conceptual model (stresses, drivers of stress and contributing factors). Therefore, it serves as an input for prioritizing these elements, which is important when developing strategies. The strategic relevance goes from scores:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Modestly relevant | 2 | Moderately relevant | 3 | Highly relevant | 4 | Extremely relevant |

**Steps 13 & 14.** These steps represent a recent addition to the MARISCO methodology and could not be implemented for various reasons – lack of time and resources, inability of Center for Econics and Ecosystem Management to facilitate the workshop as planned, due to the pandemic and travel restrictions, and the inability to provide a practical training to EnvPro for facilitation of these steps. They were however part of the desktop study to some extent.

**Steps 15–19.** These steps were implemented partially in the 3rd workshop "Actions for Conservation of Bojana River Basin". Similarly to steps above, due to lack of time and other resources, these steps were not fully completed in the workshop, but significant input from local stakeholders was received and desktop analyses completed which was enough to inform the next MARISCO phase.

## Phase V: Strategy Evaluation and Development

**Step 20–25.** At the 3rd EnvPro workshop, "Actions for Conservation of Bojana River Basin", parallel to ranking the past, future and current criticality of drivers of stress and underlying factors and ecological stresses of previous steps, we took note of any solutions and strategies that have been addressed. Later on, a separate session was devoted to brainstorming the solutions and strategies specifically for drivers of stress, as they are within the capacity of local stakeholders to work on them, based on the scale of a driver of threat, available knowledge (or attainable knowledge) and capacities (manageability). The result of this step is a preliminary list of solutions and strategies, where key solutions were ranked by local SHs by importance, and top three solutions chosen as priorities of the group to work on, together with EnvPro. This was complemented by EnvPro team desktop data collection and SHs consultations process, which resulted in an existing policies overview and initial strategies analysis. This allowed identification of the broader strategic directions that are needed which were developed by Prof. Dr Pierre L. Ibisch, presented in this study in Chapter 9, Strategy Formulation.

## Phase VI: Plausibility and Effectiveness Check and Phase VII: Operational Planning and Implementation

**Phase VI and Phase VII** were not achieved within EnvPro's current project nor planned to be accomplished. Some steps of these phases were touched upon within the 3rd workshop, for understanding the MARISCO method circular and adaptive process.

# 2.5. STAKEHOLDERS ENGAGEMENT

An important cross-cutting element of the implementation approach was the stakeholder cooperation, which, since integrated into the entire process, made sense to focus on briefly in a separate subsection.

In the project we put special focus on the collaboration with local, national and international stakeholders, namely institutions, NGOs and individuals. This particular focus is due to the need for knowledge and awareness raising on sustainable use of environmental resources and values, as well as networking and starting collaborations that are geared towards conservation and sustainable development. This approach gives us the leverage to tackle the aspirations, problems and opportunities of the local community, gather them in a coherent and strengthened non-formal group that will pursue a joint conservation and sustainable development agenda for the Bojana/Buna basin. We believe that the holistic research and analyses methodology we used, engaging a wide front of SHs, can bring about a strategic plan for the area's sustainable development that will be shared on many levels.

For the start of SHs cooperation, we created a list of organizations, institutions and independent researchers for data sharing, networking and ensuring project support, and regularly updated it throughout the project implementation. We held a total of 25 meetings with 20 different SHs: Ministry of Agriculture – Water Directorate and Directorate for Fisheries, Ministry of Ecology and Spatial Planning – Nature Protection Directorate, International Cooperation and EU Directorate, Sustainable Development, Coastal/Marine Zone Management and Climate Change Directorate (and consultation with Spatial Planning Directorate), Coastal Zone Management Body ("Morsko dobro"), Environment Protection Agency (EPA), Institute for Hydro-Meteorology, Institute for Marine Biology, Ministry of Science, Education, Culture and Sport – UNESCO National Commission Office, Ulcinj municipality – Directorates for Communal Affairs and Environmental Protection, Spatial Planning and Sustainable Development and Economy and Economic Development, EuroNatur, IUCN, consultations with GIZ representatives, NGO Center for Research and Protection of Birds (CZIP), NGO Montenegrin Ecologists Society, NGO Montenegrin Naturalists Society, NGO Green Home, etc. Among others, as a product of this activity, EnvPro collected raw data from 7 NGOs/institutions: CZIP and EuroNatur bird monitoring data for Ulcinj Salina; Marine Mammal Research Organization (DMAD) dolphin data for Ulcinj marine waters; Wetlands International – International Waterbird Census (IWC) water birds data for Long Beach and Ada Bojana; Birdlife International IBA and KBA data; Plantlife International IPA data; NGO Riverwatch hydropower plant in the Balkans data and Ministry of Ecology and Spatial Planning GEF Adriatic project data. Other stakeholders shared reports and studies in their possession, while with some SHs data sharing is expected in the future, once the data is published, adequately prepared, etc.

EnvPro also created a second comprehensive list of local stakeholders – institutions, NGOs and individuals – which are potential champions of Bojana basin sustainable development and environment protection: next to the local partner MSJA, NGO Monitoring Group Ulcinj (MogUl), Ulcinj Fishermen Association, NGO Ulcinj Business Association, Radio Ulcinj, Association of Beach Tenants, Association of Ada Bojana Restaurants, Association of Ada Bojana Tenants, Mt. Club Rumija, Reborn by Adventures, NGO Green Living, and many others. We held a total of 20 meetings with local SHs, where we introduced the project and planned activities and explored the possibilities for cooperation and synergy creation in the project. In parallel, we conducted MARISCO-based semi-structured interviews with 19 of the local

SHs. The purpose of the interviews was to, in preparation for the workshop with local SHs, preliminarily gather their knowledge of the area's ecological values, drivers of stress, ecosystem services, underlying factors and, possibly, on solutions and opportunities they envision.

The questionnaire (Annex 2), bearing a structure relying on MARISCO elements, covered questions related to different MARISCO phases such as "What is an area/species/resource/ cultural object/tradition you find is important to preserve in the project scope area?"; "What are the most important ecosystem services provided to you?", "What threats do you identify to the project scope area?" etc. The interviews were conducted to also assist EnvPro in getting to know the local SHs and local conditions, as well as collect data included in the assessment. The response list is not made available as it is considered an internal document, in order to protect the micro profile data and opinions of SHs.

After the necessary preparation through creating and updating a relevant list, meetings and interviews, local stakeholders were included in the process of study creation through two workshops we implemented. In the first workshop, "Ecosystem Based Assessment of Values and Threats to the Bojana Basin", with the research team and local SHs, we worked on assessing biodiversity values, ecosystem services, human well-being, stresses and drivers of stress to the Bojana River basin, based on the MARISCO methodology. The group further worked on defining a vision and an approach for joint work towards the area's conservation. In the second workshop with local SHs, "Actions for Conservation of Bojana River Basin", we initiated the establishment of a non-formal local action group (LAG) involving the potential champions included in the previous workshop. We worked together on assessing the criticality of ecological stresses, drivers of stress and underlying factors, defining realistic solutions and strategies to tackle them, assessed available resources and capacities of the group and need for growth. Finally, with the local SHs, we created an activity plan, for the group to act upon to achieve the desired outcomes, with EnvPro collaboration and support.

*Snails mating © Jelena Popović*

# 2.6. DATA COLLECTION
## DESKTOP, FIELD AND OPEN DATA

We divided data collection in several categories, presented below, pertaining to EnvPro and the research team expertise. The entire team was provided with a data-collection Excel document, with sheets and explanations on MARISCO elements, scope area, habitat and ecosystem based/landscape classification, reference list, geo-referenced data and photo collection. The MARISCO based excel sheet contained most of the MARISCO categories: ecosystems, key ecological attributes, ecological stresses, drivers of stress, underlying factors, ecosystem services, human well-being and social systems. The sheet excluded social attributes and social services since the current project could not support their inclusion. The categories are defined in more detail in the MARISCO method guide (Ibisch & Hobson, 2014). Based on these categories and instructions given, the broader research team conducted desktop research, and when applicable, field research, providing an overview of the current knowledge on their area of expertise.

- **Strategies and Policy Documents Analysis.**

The compilation of strategic and policy documents is a result of long term EnvPro work in environment protection, resulting in a good document base of current strategies and policies and background knowledge. Relevant documents were gathered during the preparation of the project proposal and additionally throughout the project implementation, through publicly available sources, mainly relevant institutions' websites and documents obtained within the SHs consultation process. The documents were gathered and analyzed finally for the purpose of this study's creation and integration into the database. Relevant documents are of national level (national strategies e.g. of sustainable development, biodiversity; national spatial plan; national laws), of local level (strategies, plans and laws by Ulcinj municipality and Coastal Management Facility;) and of international level (studies and research by international organizations such as EuroNatur, Global Environment Facility (GEF), Global Water Partnership Mediterranean (GWP-Med); international policies and conventions ratified by Montenegro such as the Barcelona Convention etc.). Documents were gathered, analyzed and interwoven into this study.

- **Freshwater Ecology of Bojana River Basin and Lake Skadar Basin.**

The desktop analysis undertaken in this segment included the wider transboundary area, Bojana River on the Albanian side, as well as parts of Lake Skadar on both sides of the border and where needed (e.g. for the purpose of ecological connectivity or threats assessment), Drin River basin. The most recent scientific data on freshwater ecology, species, and also threats coming from the transboundary areas were analyzed (Crnobrnja-Isailović et al., 2018; Dhora D. et al., 2016; Pešić, Gadawski, et al., 2018; Pešić, Karaman, et al., 2018; Radujković & Šundić, 2018; Rakočevič-Nedović & Hollert, 2005; Rakočević-Nedović J. & Rakaj M., n.d.; Rakočević, 2018; Shumka et al., 2018; Šundić et al., 2011; Šundić, 2007; Šundić & Radujković, 2012). The comprehensive desktop investigation summarized biological and ecological findings in the Bojana drainage basin. Raw data from key research was also gathered and presented in the data base. Also, the research identified ecosystem services, key ecological attributes and drivers of stress that affect the biota in this area and cause stress to certain populations, as well as identified causes and roots of causes. The main focus of the investigation was on freshwater ecosystems and their species, in particular freshwater Oligochaeta as part of the benthic communities, as well as freshwater algae/phytoplankton. As a result of this research, the lists of species identified in this area so far, including the species abundance and protection status, for the species for which data exists, are provided.

- **Ecosystems and Habitats.**

The process of classification of ecosystems and habitat types had several phases. The classification of habitats was devised by our collaborators from NGO Montenegrin Ecologists Society (MES), relying primarily on Natura 2000 Ecological Network Habitat Classification, presented through the Guide on Determination of Habitat Types (Milanović et al., 2021), and the Study of Biodiversity and Protection of Coastal Montenegro (Caković D. & Milošević D., 2013). The classification was processed and revised by the EnvPro project team and the Center for Econics and Ecosystem Management. The final classification, based on the current draft, was created in the 2nd workshop jointly by all researchers, EnvPro project team and local participants. Based on the newly agreed upon classification from the workshop, the habitat classification and accompanying habitat descriptions with basic vegetation descriptions and key species was prepared by NGO MES.

- **Herpetofauna.**

Herpetofauna was researched through literature review, collecting of existing raw data and additional field research, all undertaken by NGO Montenegrin Ecologist Society. The literature review relied on key works related to herpetofauna (Crnobrnja-Isailović & Džukić, 1997; Polović & Čađenović, 2014), as well as on broader biodiversity-related literature that encompassed the research of herpetofauna, their habitats, main drivers of stress, ecosystem services etc. (Caković D. & Milošević D., 2013; Schneider-Jacoby et al., 2006). Existing raw data was collected from the study of the Lake Skadar frog (Ljubisavljević K. & Iković V., 2020) and green frog which shares the same habitats with it, as well as from Karaman M.G. et al., (2012) by and Global Biodiversity Information Facility (GBIF) database (Global Biodiversity Information Facility, 2021).

Field research was conducted by MES over three days in May and June 2021. Based on the previous knowledge of the Bojana delta reptile and amphibian species and the knowledge on their suitable habitat and ecological conditions, 15 locations were chosen for research (locations available on request). The transect method was used on the locations, and species were captured for proper identification according to the standard herpetological literature (Arnold & Ovenden, 2002) and for photographing, and released back into the capture spot afterwards. Besides species, data on ecological stress and drivers of stress of species and their habitats was gathered in the field through observation and photographs.

- **Avifauna.**

For this taxonomic group, we collected existing raw data, provided by the NGO Center for Research and Protection of Birds (CZIP), International Waterbird Census (IWC) and downloaded from GBIF (Global Biodiversity Information Facility, 2021). We partnered with CZIP additionally for desktop and field research.

CZIP, in partnership with the German NGO EuroNatur, provided extensive data on bird monitoring from Ulcinj Salina for years 2003–2020, with 2014 skipped (Center for Research and Protection of Birds & EuroNatur, 2021). The bird count in the Ulcinj Salina is done in each Salina pool/channel, using the transect method. The bird count is performed usually in the same day, to reduce the number of double counts to a minimum. The equipment used for the count is a telescope and binoculars. The count is performed once per season, from September to April. In May and June, the mapping of nesting birds is done.

Avifauna data was gathered also from Andrej Vizi representing Wetlands International and their International Water Bird Census (IWC) in Montenegro, for years 2013–2020. (Wetlands International, 2021) IWC is a monitoring program operating in 143 countries to collect information on the numbers of waterbirds at wetland sites. The IWC conducts a single count at each site which is repeated every year at the same site. The precise dates of the count vary slightly but take place in January or February.

The desktop data collection by CZIP relied primarily on Rubinić et al., (2019) publication, being an extensive publication on bird hotspots as well as Schneider-Jacoby et al., (2006) and Sovinc A. et al., (2017).

Additionally, CZIP conducted a census of the Baillon's crake (Zapornia pusilla) in the hinterland of the Long Beach, a species whose distribution in Montenegro is limited to the Bojana delta and which hasn't been targeted through research for a number of years. The monitoring was done in the evenings of May 1st and May 2nd. Since Z. pusilla is a hiding species whose period of singing and mate search is very short, it was necessary to match a lot of conditions that enable real monitoring. Among other things,

these are the calm weather and the reduced activity of frogs that can disrupt the ability to hear the calling of the target species. During the monitoring, on a chosen transect in the hinterland of the Long Beach, the playback method (Bibby et al., 2000) was used (transect data available on request).

- **Marine Ecosystem and Marine Mammals.**

The marine ecosystem was researched through the review of existing literature (mainly Akkay A. et al., 2020; Awbery et al., 2019; Awbery T. et al., 2019; Bas et al., 2018; Ministry of Sustainable Development and Tourism; UNEP; PAP/RAC, 2014). Complementary to that, NGO Marine Mammal Research Organization (DMAD) provided dolphin sighting data (land and boat survey) for Ulcinj municipality marine waters for years 2016–2020, with 273 days of survey effort and a total of 92 sightings (Marine Mammal Research Organization, 2021). Additionally, we partnered with DMAD to conduct a desktop analysis of marine mammals, as well as field research of dolphins in Ulcinj marine waters. The land survey of dolphins took place over the course of four days in Ulcinj in June. Methodological details are available in Aylin Akkaya, 2021).

- **Macroinvertebrates.**

For assessing macroinvertebrates of the Bojana delta, field research and desktop research were conducted, and the unpublished data of the researcher, dr. Bogić Gligorović included, alongside GBIF database (Global Biodiversity Information Facility, 2021). Field research was conducted in 25 locations (location data available on request). At each research location, transects of 500 m length were determined, along which invertebrates sampling was performed. For each investigated locality, basic parameters were recorded: altitude, geographic coordinates, date and time of sampling, number of individuals and habitat type. Terrestrial invertebrates were collected by manual entomological network, while aquatic species were collected by a planktonic network. Window traps and sticky traps were also used. Collected samples were determined, photographed and released, while species whose identification could not be done in the field were stored in ethyl alcohol vials (76%) or paper bags, then sorted and determined in the laboratory. Standard identification keys were used to determine the species (Dijkstra & Lewington, 2006; Gergely P., 2021). For individual species located around and in aquatic habitats, collection around the habitat was conducted.

- **Ecosystem Services.**

Aiming to gather available information on ES in the LBBUEC, we used the Common International Classification of Ecosystem Services (CICES) (European Environment Agency, 2018) to systematically present data compiled from the National Statistics Agency – Monstat, Ulcinj Municipality Spatial Plan 2016–2020, reports of researchers provided for this study, supporting literature and input from local SHs from the workshop "Ecosystem Based Assessment of Values and Threats to Bojana Basin" that EnvPro held in Ulcinj. The ES list is not comprehensive and it does not contain economical parameters that describe the value of a given ES, as that would need a research effort dedicated especially to ES.

- **Cultural Objects.**

According to the IUCN, "a protected area is a clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long term conservation of nature with associated ecosystem services and cultural values" (Dudley & Stolton, 2008). Aiming to include cultural heritage in our overview of values and drivers of stress to the LBBUEC, we engaged our local partner, NGO Martin Schneider-Jacoby Association (MSJA), for cultural object mapping. Three settlements around Lake Šas were chosen as the focus of the mapping: Šas, Ambula and Donja Klezna. Having in mind the limited resources of the project, the objects in need of thorough archaeological or historical analysis were avoided (e.g. mosques, churches and similar). The three settlements were surveyed for material cultural objects: houses, wells, yards and fences, walls etc, and the encountered objects are presented within this report. Non-material cultural heritage (tradition etc.) is included in this study interwoven with the material cultural objects presentation, gathered through non-formal interviews conducted by NGO MSJA during data collection. The data collection sheet differed from that of the one for other NGOs/experts research, and was adapted to include: the basic description of the object, year, tradition and culture related to it, ecosystem services, geographic coordinates and photographs.

- **Broad Data Collection of Overall Knowledge, Raw Data and Filling in Gaps.**

To create a complete picture of the so far undertaken research in the Bojana basin, EnvPro project coordinator collected a broad range of existing literature regarding history, geography, ecology, hydrology, waste and other threats, ecosystem services and taxonomic groups not covered by the research team or complementary to the research team, and conducted a desktop analysis. Literature was collected using search engines of Research Gate and Google Scholar platforms, search engine of the National Library System, through the compilation of literature suggested in the collected references and through institutions' and NGOs' websites. When needed, researchers, organizations or institutions were approached for the sharing of data published in respective papers or publications.

- **Open Data Collection.**

Within this project, open data was collected to enable a better analysis of data on species and other, to provide a more complete picture of the Bojana basin as a whole. While the primary goal of collecting open data was to include it in the software application, which is a living, digital extension to this study, we consider it important to present this segment of data collection here as well.

Open data is considered as "Open means anyone can freely access, use, modify, and share for any purpose (subject, at most, to requirements that preserve provenance and openness)." (Open Knowledge Foundation., n.d.) It was collected with the aim to complement the existing species data, and to provide an even more informative picture on species habitats, their ecology and changes within them. We focused on various ecological data available through the EU or worldwide institutions and organizations such as European Environment Agency, World Wildlife Fund (WWF), United Nations Environment Programme (UNEP) etc, as well as included available relevant national government open data.

## SPATIAL DATA ANALYSES

To spatially analyze collected data and visualize it in this study, we used the Quantum Geographic Information System (QGIS) software, version 3.18.2. (QGIS.Org, n.d.). The species richness maps, presented in Chapter 4, Ecosystems, Biodiversity Objects and Key Ecological Attributes, were developed using the data provided through the fieldwork done by researchers, open data collected through Global Biodiversity Information Facility (GBIF) (Global Biodiversity Information Facility, 2021) and existing raw data collected through relevant scientific reports, papers or studies. For the visualization of species richness, we used the European Environment Agency (EEA) reference grid for Montenegro (European Environment Agency, 2022a).

*High hinterland of LBBUEC © Rina Kovači*

# GEOGRAPHICAL SCOPE OF THE PROJECT AND MOTIVATION

# 3. 3.1. SCOPE AREA

Based on the predefined criteria and consultations with the research team, a geographic scope consisting of scope on three different scales was created (Figure 5). The main challenge in defining the project scope was to reconcile the fact that the Bojana basin is nested in the transboundary and extended Lake Skadar basin and moreover Drin basin, which spreads across a large transboundary area including five countries. With limited resources available in the project to provide for the inclusion of the entire Drin basin, the focus had to be given to a smaller scope but with a long term perspective on transboundary and extended basin expansion.

The **narrowest scope,** "Lower Bojana Basin and Ulcinj Ecosystem Complex", our focus in this study and the project, is concentrated on the area of Ulcinj municipality. It consists of Bojana River and its tributaries, as well as lakes (Šas and Žaka) and wetlands within its basin which are hydrologically connected. Besides that, it includes the Ada Bojana Island, Long Beach with its hinterland, coastal cliffs and marine waters, lower hinterland with grasslands and populated area, Ulcinj Salina (former Lake Zoganj) and forests as well as olive plantations. The scope is enlarged from the initial pre-project plan to focus on Bojana CMZ (Figure 1) due to conclusions of EnvPro and the research team of the large connectivity of the area as well as the biodiversity values crucial to be conserved. For example, the Ulcinj Salina is outside of Bojana CMZ, but hosts cca. 230 bird species and represents a very important bird stop-over site on the Adriatic, while these species can also be found throughout the Bojana basin too. Also, for instance, Valdanos – olive plantation with many very old olive trees – is very important to local SHs for conservation, although located outside of the Bojana basin. This scope was also chosen as suitable for the given project due to financial and human resources available currently, that only allowed focusing on a smaller area. Also, larger basins that Bojana belongs to, Lake Skadar and the Drin River basin, but considered of high importance and of lower priority for this project, due to project financial and time constrains.

Transboundary cooperation was recognized as very valued and important, due to ecological connectivity of the basin but also cultural similarities of the TB area and the need for cooperation on the management of the shared natural resources. Hence the **extended project scope** includes the entire Bojana/Buna River with all its tributaries from the Montenegrin side, a small part of Lake Skadar, and tributaries from the Albanian side, excluding the Drin (only the estuary of the Drin into Bojana/Buna is included). It encompasses the entire LBBUEC with Velipoje protected landscape on the Albanian side, stretching over the entire Ulcinj municipality and a part of Shkodra municipality.

The **long term** scope encompasses the entire Lake Skadar/Shkodra and the Drin/Drim basin, which is drained through the Bojana River. This 3rd scope reflects the long term aspiration of EnvPro to enlarge its focus and work in the entire Lake Skadar/Shkodra basin and Drin/Drim basin.

The three scopes also informed the making of the project assessment and work plan, in which we decided to focus research efforts primarily on the 1st scope, i.e. the Montenegrin side of the Bojana basin. Freshwater ecology, threats and underlying factors and causes were assessed fully or partially also at the level of the 2nd and/or 3rd scope. The project work plan also defined collaboration with local SHs to focus on Ulcinj municipality, based on which the SHs were later mapped.

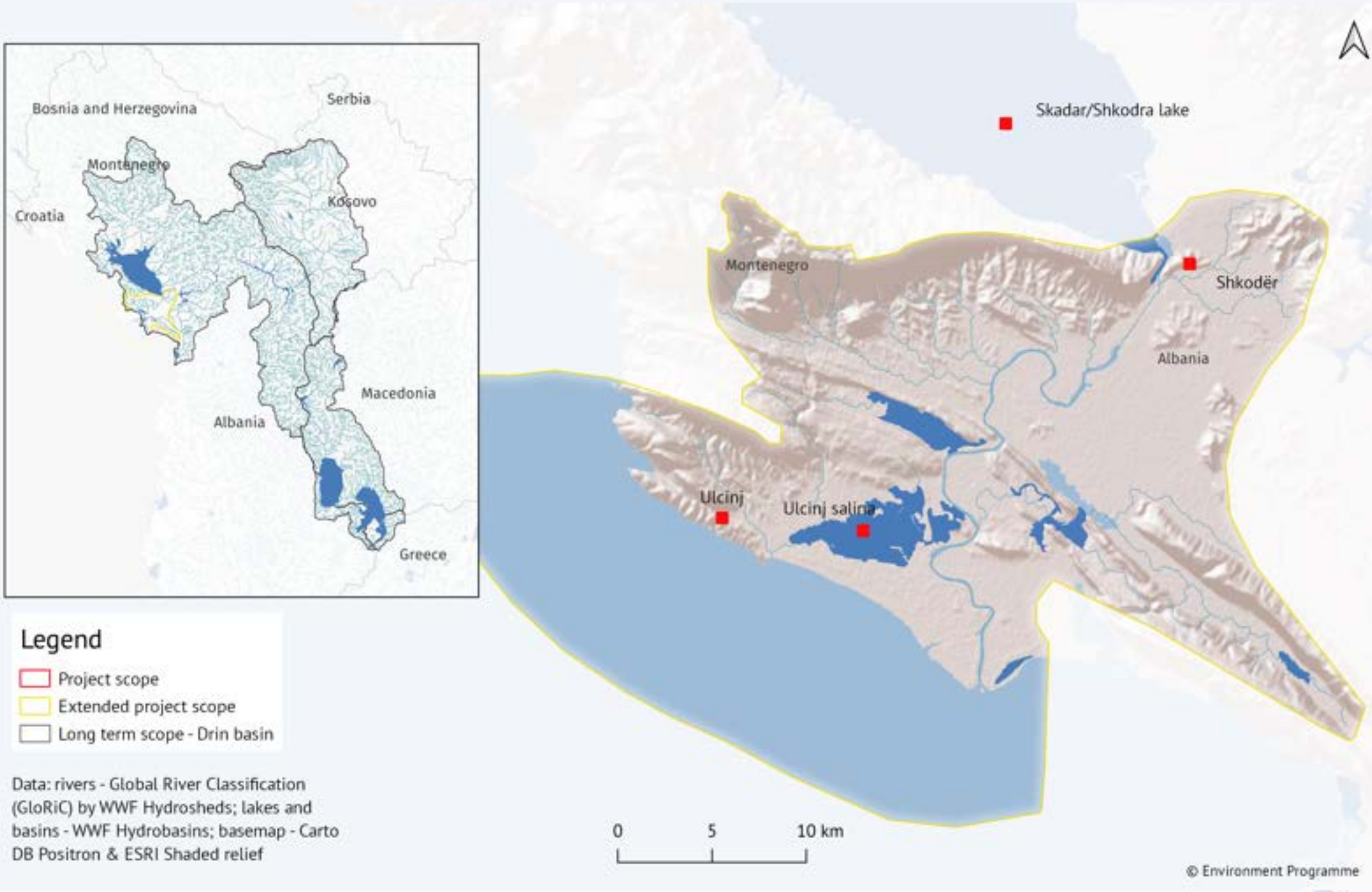



*Figure 5: Map of the three project and assessment scopes*

# 3.2. VISION

In the 1st workshop, the main short term (project-wise) vision that we defined by EnvPro team and its collaborators was: “to engage local SHs to understand the benefits that protection and sustainable development can generate using a capacity development participatory approach”.

In the 2nd workshop, local SHs and research team created the vision for the area’s future with two “setting of the scene/scenarios” envisaged.

It was identified that local SHs have a very pronounced sense of pride, and aspire to economic development, thus the final version of the vision incorporated these two.

Vision statement:

**PROUD OF A COMMUNITY THAT LIVES IN HARMONY WITH NATURE AND FROM NATURE!**

The local SHs group ideas that perpetuate the vision are as follows:

- The entire Bojana basin is protected formally (under a UNESCO Man and Biosphere Reserve and/or as a Nature Park)
- Formal protection (of local tradition, culture, nature) is important
- Local government and local communities cooperate and jointly adopt management guidelines for the Bojana basin
- Clean drinking water (and sewage system) are provided
- Abiding by the law (assuming law enforcement first and obeying the law by citizens)
- Economic prosperity (local community preservation, local products, authenticity, etc.)
- Development of ecological tourism using local products
- Economic revival based on man and nature

The researchers group main points for the creation of a vision:

- "Rich and clean" – living in prosperity from sustainable resource use and having a clean environment we are taking care of
- "Adriatic Okavango" – Okavango is the largest wetland in the world, in Botswana, which has protection zones, integrated tourism and nature protection
- Harmony of landscape and architecture
- Economic independence of the municipality
- Energy independence (from renewable energy sources)
- Local food
- Tourists involved in the work of locals (beekeeping, olive growing, land cultivation, food preparation, work around the house – active vacation)
- Silence and peace (especially on Bojana River where there is a lot of tourism pressure in the summer)
- Infrastructure – primarily for wastewater treatment
- Development and vision of the national government consolidated with the municipality and supporting the municipality
- Less is more (save space from overdevelopment and focus on one area of commercial tourism development if it must happen, etc.)
- Conservation of nature and the environment is a priority

# 4

# ECOSYSTEMS, BIODIVERSITY OBJECTS AND KEY ECOLOGICAL ATTRIBUTES

*View from cape Đeran © Mihailo Jovićević*

Ecosystems are dimensionless and comprise of the nested systems from the micro and meso level to the global one. For ecosystem management, landscape ecosystems are of special relevance, as they provide very important ecosystem services, dominate local and regional land use as well as economies and, by shaping landscape boundaries, they have a decisive meaning for management scopes and strategies. The landscape ecosystems are ecosystem complexes comprising of smaller units that are easily recognized. We identified 6 main landscape ecosystems in the Bojana basin (Figure 6):

1. Sea
2. Coastal area
3. Low hinterland
4. Stagnant waters
5. Running waters
6. High hinterland

The ecosystems are presented starting from those in lowest elevations to those in highest elevations in the project scope. The ecosystems are not neatly categorized, but are naturally intertwined and interconnected. However, we find that the lowest to highest elevation representation of ecosystems provides a certain degree of order and clarity in explaining them and their nested biodiversity objects (habitats and species important for conservation). Nested within the ecosystem are habitat types whose classification we based on the Natura 2000 EU Ecological Network.

*Figure 6: Landscape-scale ecosystems map of the LBBUEC*

*Common bottlenose dolphin (Tursiops truncatus) © Saskia Martin*

# 4.1. SEA

The marine ecosystem complex is typically separated into benthos (sea bottom) and pelagic (open sea) area. To this classification, we add two smaller ecosystems in our project scope that are under direct impact of seawater, bays and coves, and marine islands and a rock islet. (Table 1, Figure 7) The information on marine ecosystem in the project area is limited when it comes to available data, since most studies so far focused on Boka Kotorska bay (Pestorić et al., 2011; Petović S., 2020).

## OPEN SEA.

The open sea i.e. pelagic area is any ocean part lying away from the shore, and it doesn't refer to the sea bottom, solely the ocean. It is divided by depth into epipelagic (0–200 m), mesopelagic (200–1,000 m), bathypelagic (1,000–3,000 m) and abyssopelagic (3,000–6,000 m) zones. (Duffy, 2021) Open sea is inhabited by various animals, in Montenegro most commonly dolphins (Figure 8), sharks and other large fish and sea turtles (Aylin Akkaya, 2021; Gvozdenović et al., 2021) and smaller animals such as jellyfish, plankton etc. (Pestorić et al., 2011) Recently, a record of a rare species, bull ray (*Aetomylaeus bovinus*), was made between Ulcinj and Bar, as well as the sandbar shark (*Carcharhinusplumbeus*) in Ulcinj (Ćetković I., 2020; Gerovasileiou et al., 2019).

## SEA BOTTOM.

Sea bottom is divided by seafloor topography to littoral (near-shore), supra-littoral (spray zone), bathyal (200–2,000 m), abyssal (2,000–6,000 m), ultra-abyssal (deeper than 6,000 m). The project scope involves infralittoral and partly the circalittoral zone (European Commission, 2021b). The European Nature Information System (EUNIS) provides a comprehensive classification of habitats that covers terrestrial and marine habitats and is suitable for use here (Figure 7) (Davies et al., 2004). The habitat types are identified by specific codes, names and descriptions and come with cross-walks to other habitat typologies. For the purposes of this study, which focuses on the most important conservation objects, we present three habitat types: reefs, *Posidonia oceanica* meadows and sandbanks slightly covered by sea water all the time.

Reefs are very common in the Montenegrin marine zone, mainly situated in the infralittoral zone, but also found in the circalittoral. They are usually occupied by benthic algae and invertebrates, such as date shell (*Litophaga litophaga*) which is protected nationally, as well as by the Habitat Directive/Annex IV. Algae and invertebrates form distinguished biogenic concretions, inlays, coralligenous formations or compact shell deposit, forming a solid bottom (Gligorović B., 2021; Milanović et al., 2021).

*Posidonia oceanica* or Neptune grass, one of the few marine flowering plants, is a Mediterranean endemic, highly important for forming habitats for numerous other forms of life, in biogeochemical cycles and in protecting shallows water habitats from strong currents and beaches from erosion. In Montenegro, it forms meadows from 0.5 m up to 20 m depth, due to lower water transparency in Ulcinj sea waters (Environment Protection Agency, 2021). Its distribution is recorded around Stari Ulcinj Island (marine protected area) to 455 ha, and also around Đeran cliff (Ministry of Sustainable Development and Tourism; UNEP; PAP/RAC, 2014). *P. oceanica* meadows represent a priority habitat for conservation under the EU Habitats Directive (European Commission, 1992) due to various ecological functions it performs. In the Mediterranean, 50 fish species (many commercial ones too) live inside the *Posidonia* habitats. It is also a refuge and breeding place for more than 400 plant species and 1,000 animal species. (Boudouresque C. F. et al., 2012; Díaz-Almela E. & Duarte C.M., 2008; Telesca et al., 2015)

Following the *P. oceanica* meadows, going towards the shore, we find sandbanks slightly covered by sea water all the time. In the LBBUEC, this habitat is present in the Long Beach and Bojana Island beach. It is most often present up to maximum 20 m depth from shore, and as a rule is covered by a sandy substrate. This habitat bottom brims with macroinvertebrate organisms, such as *Pina nobilis,* endangered and protected at national and international level, presenting an important feeding site for fish and birds, but

much poorer in biodiversity and biomass than *P. oceanica* meadows (Caković D. & Milošević D., 2013).

## BAYS AND COVES.

Bays and coves are large dents in the coast, with a limited or non-existing freshwater influence. They often have high natural trophicity and thus are home to a number of filtrating organisms (invertebrates) that live in the base sediment layer and feed on organic detritus (Caković D. & Milošević D., 2013). The most distinct cove in our project scope is Valdanos, and it is intersected by various marine and terrestrial habitats. Other, smaller, coves in our project scope are Vučja, Udovica, Lalova Njiva, Doce, Rakita, Kruče, Hladna and Paljuska (Environment Protection Agency, 2021).

## MARINE ISLANDS AND ROCKS.

Old Ulcinj Island is the most relevant island of our project scope, located on the border of Ulcinj and Bar municipalities, in close proximity to the shore. It is small, 1.8 ha, but the area around it, up to 35–40m of depth, is identified as important for conservation and recently proclaimed as a marine protected area. In the open sea we also find a rock islet – Đeran – located about 5 km from the mouth of the Bojana and less than 1.5 km from the coast of the Long Beach. It is the only significant rock islet of this part of the marine ecosystem. It is hugely neglected by the scientific community, although the location is attractive to fishermen and also visited by tourist boats. Recent research found that it is surrounded by 8–17m deep P. oceanica meadows, evaluated to have a high conservation index (CI) (Ministry of Sustainable Development and Tourism; UNEP; PAP/RAC, 2014).

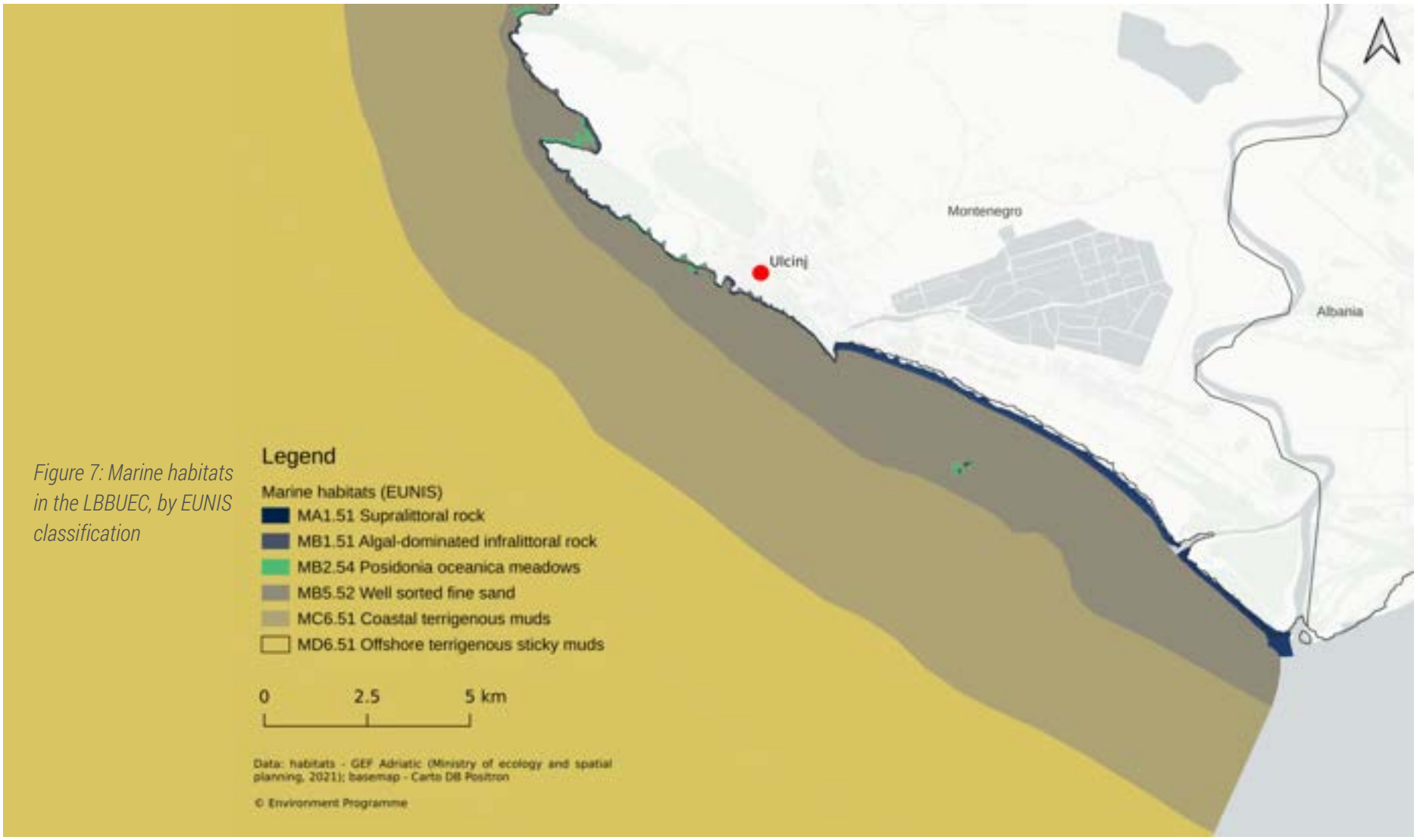



*Figure 7: Marine habitats in the LBBUEC, by EUNIS classification*

*Grey heron (Ardea cinerea) © Isidora Ćalović*

*Table 1: Marine habitats and most important conservation species*[21]

| No. | Landscape Level Ecosystem/Natura 2000 Habitat | Most Important Conservation Species[22] |
|---|---|---|
| **1** | Open Sea (Epipelagic Zone[23]) | **Animals:** Dolphins: *Tursiops truncatus, Stenella coeruleoalba* / Sharks: *Mustelus mustelus, Prionace glauca* / Sea Turtles: *Caretta caretta* / Fish: *Acipenser naccarii, Acipenser sturio, Anguilla anguilla, Alosa fallax* |
| **2** | Sea Bottom | **Plants:** /<br>**Animals:** Sponges: *Spongia lamella* / Invertebrates: *Tonna galea* |
| **2a** | 1170 Reefs | |
| **2b** | 1120 Posidonia Beds (*Posidonion oceanica*) | **Plants:** *Posidonia oceanica, Flabellia petiolata, Peyssonnelia spp., Hydrolithon spp.*<br>**Animals:** Invertebrates: *Paracentrotus lividus, Holothuria tubulosa, Pinna nobilis, Echinaster sepositus, Electra posidoniae, Halocynthia papillosa* / Fish: *Sarpa salpa, S. rostratus, Sympodus ocellatus, Chromis chromis* |
| **2c** | 1110 Sandbanks Which Are Slightly Covered by Sea Water All the Time | **Plants:** *Cymodocea nodosa, Zostera noltii, algae from families Ceramiaceae and Corallinaceae*<br>**Animals:** Invertebrates: *Onuphis eremita, Sigalion spp.,Tellina fabula, T. nitida, Acanthocardia tuberculata, Callista chione, Venus verrucosa, Ensis spp., Natica spp., Bolinus brandaris,Echinocardium cordatum, Astropecten spp., Trachinus spp., Xyrichtys novacula, Arnoglossus thori* |
| **3** | 1160 Large Shallow Inlets and Bays | **Animals:** Invertebrates: *Loripes lacteus, Tapes decussata, Pinna nobilis, Upogebia pusilla, Carcinus maenas, Myxicola infundibulum, Schizaster spp., Holothuria spp* |
| **4** | Stari Ulcinj Island and Rock Islet Đeran | **Plants:** *Posidonia oceanica, Cystoseira spinosa, C. amentacea, C. foeniculacea, C. corniculata, Lithophyllum byssoides, Codium spp. and Flabellia spp.*<br>**Animals:** Invertebrates: *Palinurus elephas, Luria lurida, Tonna galea, Lithophaga lithophaga*<br>Corals: *Cladocora caespitosa* / Sponges: *Axinella (damicornis, canabina, verrucosa), Sarcotragus foetidus, Aplysina spp., Spongia officinalis, S. lamella*<br>Mammals: *Tursiops truncatus, Monachus monachus* (potentially)<br>Fish: *Epinephelus marginatus, Apogon imberbis, Boops boops, Chromis chromis, Chromis julis, Diplodus annularis, Diplodus vulgaris, Mullus surmuletus, Serranus cabrilla* |

[21] *References: Aylin Akkaya, 2021; Caković D. & Milošević D., 2013; Ćetković I., 2020; Environment Protection Agency, 2021; Gligorović B., 2021; Milanović et al., 2021; Ministry of Sustainable Development and Tourism; UNEP; PAP/RAC, 2014*

[22] *In making the conservation species list, the focus was on assigning species to a habitat/ecosystem they are key representatives of and are the most important for conservation within it. This does not mean many species are not present in other habitats/ecosystems, merely that it was not the purpose of this particular list to be exhaustive for each habitat/ecosystem.*

[23] *Belongs to the project scope area, hence the focus is on it*

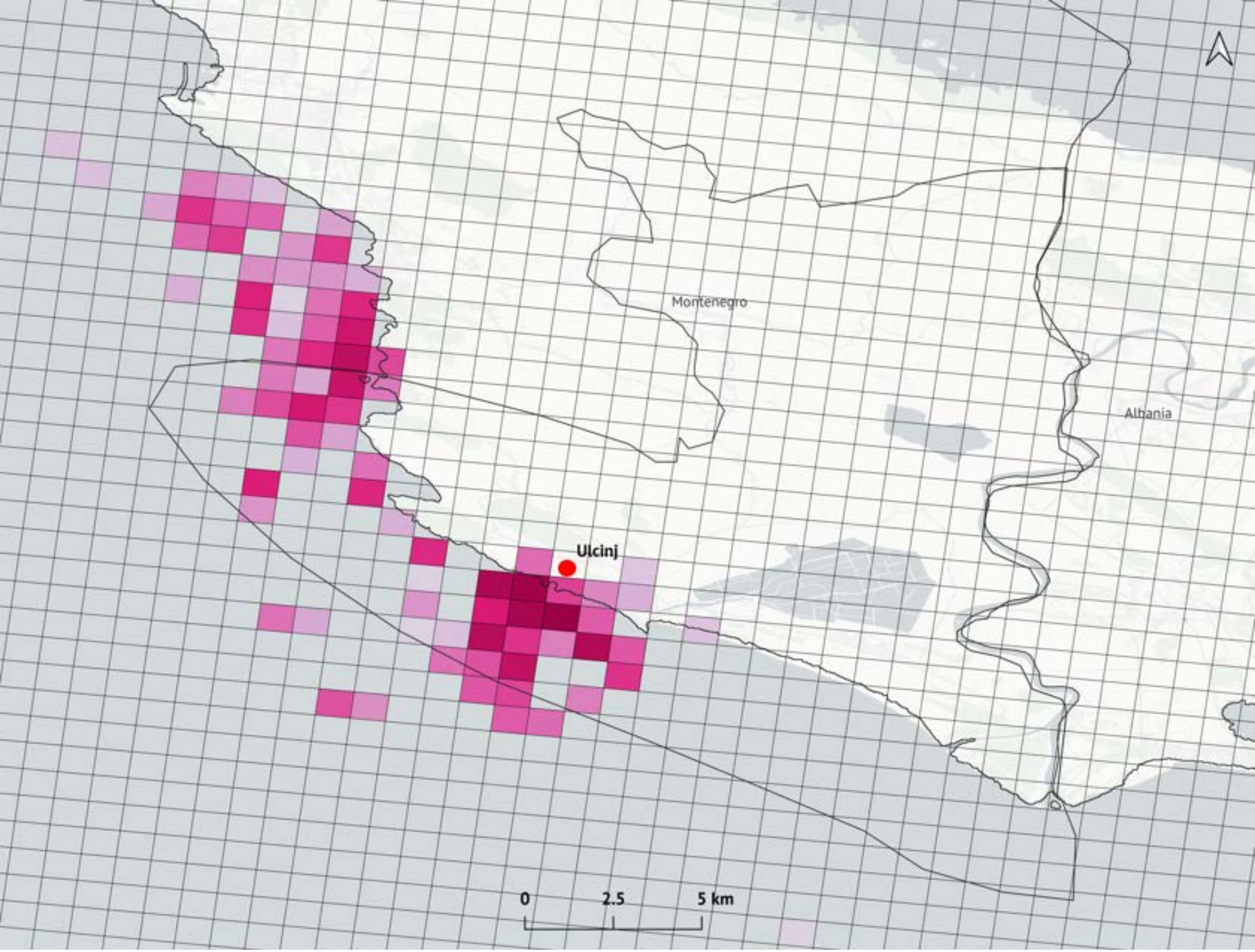
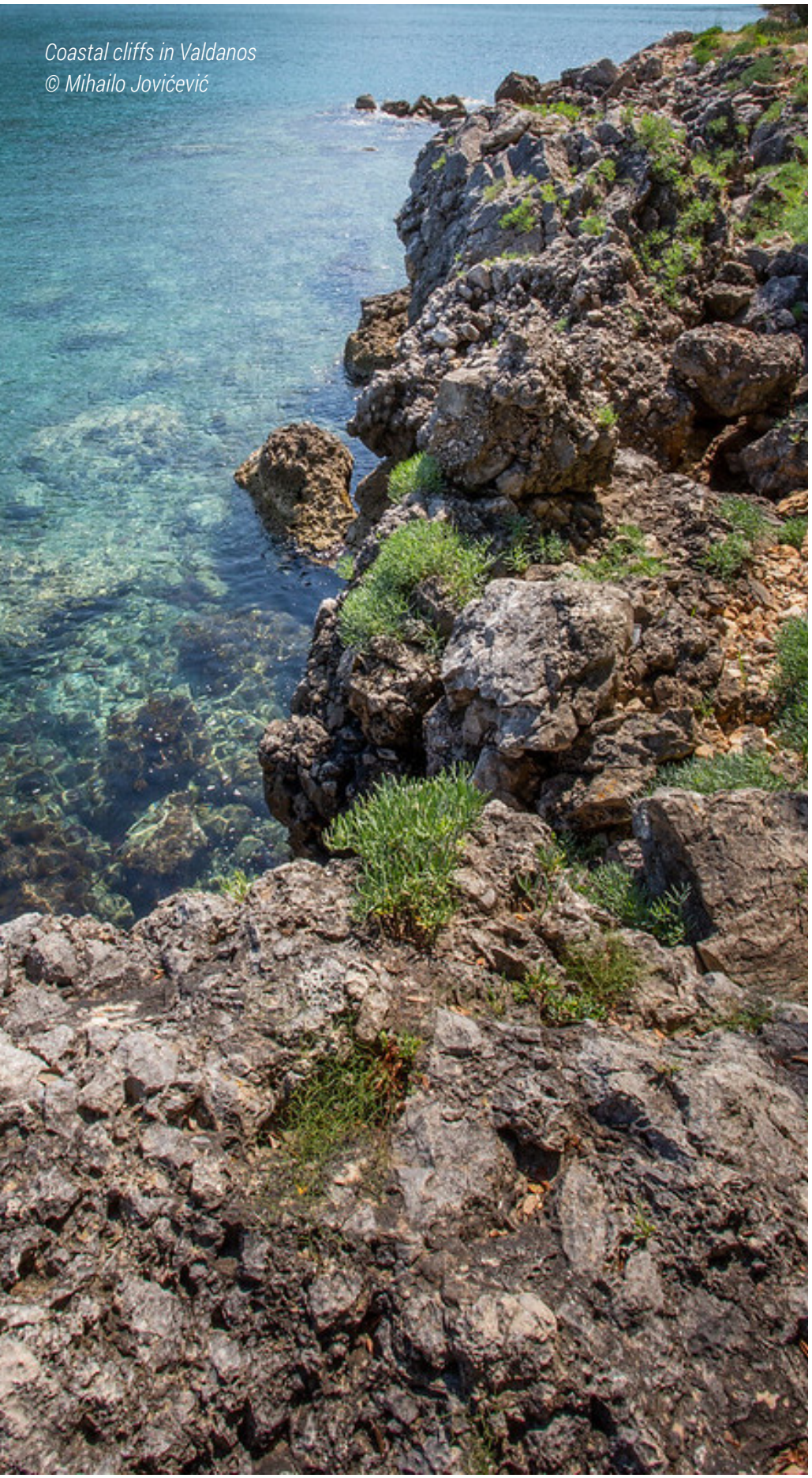



*Figure 8: Dolphin species abundance 2016–2020 in Ulcinj and Bar area (Akkaya et al., 2021)*

*Stari Ulcinj island © Mihailo Jovićević*



*Coastal cliffs in Valdanos*
*© Mihailo Jovićević*

# 4.2. COASTAL AREA

The coastal area assumes a complex of habitats influenced by sea water. Continuing on the marine ecosystem, sandbanks slightly covered by seawater all the time, we identified 4 main small-scale ecosystems in the coastal area: estuaries, sandy beaches, vegetated sea cliffs and coastal sea lagoons (Table 2).

**Estuaries** are lower reaches of river valleys that are influenced by the tide, and extend from the boundary of the brackish water to the sea. By far the most important estuary on the Montenegrin shore is the Bojana River estuary, forming a unique delta and complex of habitats in its basin. The mixing of salt and fresh water and slow flow in the estuary cause deposition of fine sediment, so large, low, muddy and sandy shores are often formed, causing a formation of various habitat sub-units, primarily depending on the water depth and salt concentration. Bojana estuary is an important feeding ground for many birds e.g. velvet scoter (*Melanitta fusca*), red-throated loon (*Gavia stellata*), sea gull species and others, due to richness in macrophytic communities, commonly dominated by dwarf eelgrass (*Zoostera noltii*) and phyto- and zoo-plankton communities (Milanović et al., 2021; Zeković B., 2021).

Adjacent to estuaries is the beginning of **sandy beaches,** classified by the Natura 2000 Ecological Network as mudflats and sandflats that make a narrow strip of coast along the sea where vascular plants cannot form communities due to the constant wave splash and tide pressure. They are exposed to air at low tide and covered by sea water at high tide. It is a rare habitat type, present in the Long Beach and Bojana Island beach. Leaning on mudflats and sandflats, we find **annual vegetation of drift lines,** exposed to wave splashing, occasional flooding and strong winds. However, they are enough apart from the sea to form species-poor halophytic and psammofitic plant communities, where we can find the endangered and nationally protected sand lily, (*Pancratium maritimum*), then invasive *Xanthium italicum*, as well as European beach grass (*Ammophilia arenaria*). Several macroinvertebrate species are typical here, and adapted to sandy substrates, e.g. tiger beetle (*Calomera littoralis nemoralis, Cicindela sahlbergii albanica,*

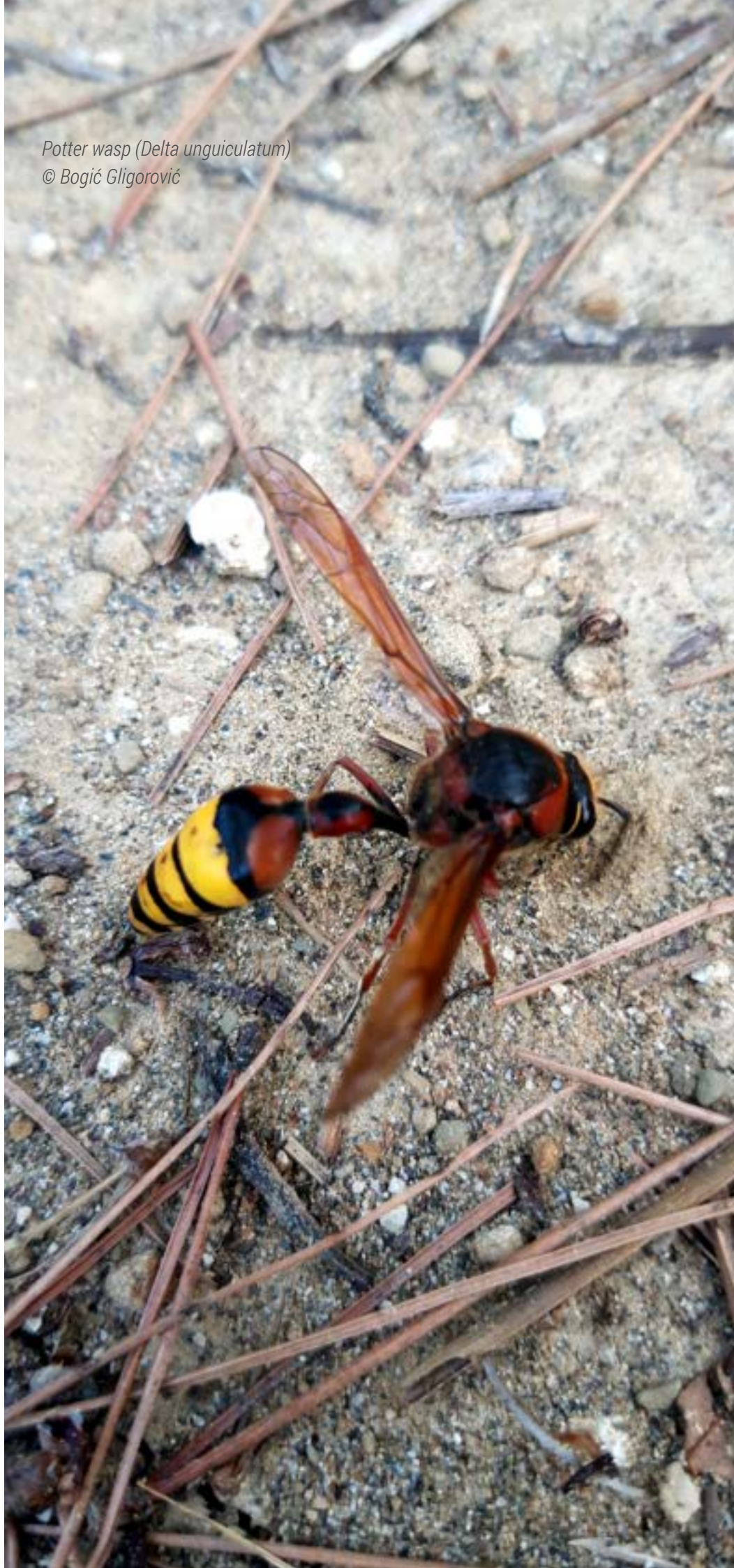
*Pygmy cormorant (Microcarbo pygmaeus) in the Long beach 2 © Isidora Ćalović*

*Cylindera arenaria viennensis, Cylindera trisignata hellenica*), ant lion (*Myrmeleon formicarius*), great ant lion (*Palpares libelluloides*) and desert locusts (*Oedipoda spp.)* (Gligorović B., 2021; Milanović et al., 2021).

In direct contact with the sea we also find **vegetated sea cliffs,** with endemic sea-lavender (*Limonium spp.*) being typical representatives, and also rock samphire (*Critnum maritimum*). They constitute a large part of the Ulcinj shore, from Cape Đeran (adjacent to the beginning of the Long Beach) to hotel Albatros in the city center, and after the Old Town Ulcinj and beaches "Liman" to Valdanos Bay, including the area after Valdanos Bay all the way to Kruče Bay, to the border with Bar municipality. Extreme environmental factors, primarily high salt concentrations due to sea water and constant wave hits have conditioned the development of a poor plant communities with low plant abundance (Milanović et al., 2021).

**Lagoons** and the habitats they host within them are primarily found, sporadically placed, in the Long Beach hinterland, Ulcinj Salina and Ada Bojana Island. They are areas completely or partially separated from the sea by an embankment of gravel or sand (rarely rock), that contain shallow coastal sea water. They include a broad range of other habitats within them, depending on the depth of the water and its salinity. E.g. Mediterranean salt meadows are most often developed in areas where fresh and salt water mix so they are usually found within lagoons, shallow bays, next to channels and streams in the hinterland of beaches. Typical representatives of coastal lagoons are common reed (*Phragmites australis*) and spiral ditchgrass (*Ruppia cirrhosa*) (Caković D. & Milošević D., 2013; Milanović et al., 2021).

*Little stint (Calidris minuta)*
*© Mihailo Jovićević*



*Potter wasp (Delta unguiculatum)*
*© Bogić Gligorović*

*Seaside eryngo (Eryngium maritimum) © Jelena Popović*

*Sea lily (Pancratium maritimum) © Jelena Popović*

*Prickly Samphire (Echinophora spinosa) © Jelena Popović*

*Table 2: Coastal habitats and most important conservation species*[24]

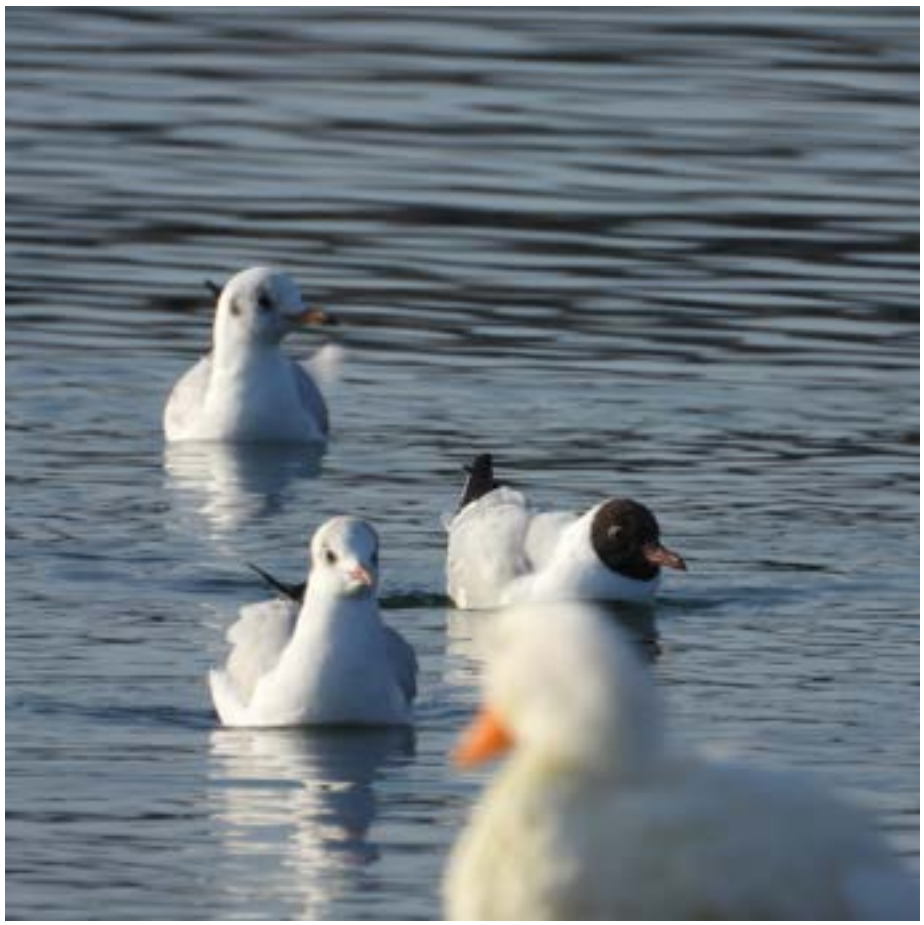
| No. | Landscape-level Ecosystem/ Natura 2000 Habitat | Most Important Conservation Species |
|---|---|---|
| **1** | 1130 Estuaries | **Plants:** *Zostera noltii, Z. marina, Ruppia maritima, Ulva lactuca, U. intestinalis*<br>**Animals:** Reptiles/Amphibians: *Mauremys rivulata, Emys orbicularis, Carreta carreta*<br>Birds: *Melanitta fusca, Gavia stellata, G. arctica, Larus melanocephalus, Larus ridibundus, Gallinula chloropus, Aythya nyroca, Hydrocoloeus minutus*<br>Invertebrates: *Nereis diversicolor, Cerastoderma glaucum, Abra ovata; Hydrobia spp.*, numerous amphipod and isopod crabs |
| **2** | Sandy Beaches | |
| **2a** | 1140 Mudflats and Sandflats Not Covered by Seawater at Low Tide | **Plants:** *Zostera noltii,Cymodocea nodosa*<br>**Animals:** Birds: *Larus melanocephalus, Charadrius dubius, Calidris pugnax, Pluvialis squatarola, Numenius arquata, Calidris alpina, Himantopus himantopus*<br>Invertebrates: *Calomera littoralis nemoralis* |
| **2b** | 1210 Annual Vegetation of Drift Lines | **Plants:** *Cakile maritima, Polygonum maritimum, Pancratium maritimum, Glaucium flavum, Euphorbia paralias, Eryngium maritimum*<br>**Animals:** Birds: *Calidris alba, Himantopus himantopus, Haemantopus ostralegus, Galerida cristata, Charadrius dubius*<br>Mammals: *Mus spicigeus, Micromys minutus, Talpa stankovici montenegrina*<br>Invertebrates: *Calomera littoralis nemoralis* |
| **3** | 1240 Vegetated Sea Cliffs of the Mediterranean Coasts with Endemic Limonium spp. | **Plants:** *Limonium cancellatum, L. anfractum, Crithmum maritimum*<br>**Animals:** Birds: *Phalacrocorax carbo, Microcarbo pygmaeus, Alcedo atthis, Actitis hypoleucos, Larus michahellis*<br>Invertebrates: *Iphiclides podalirius*<br>Bats: *Miniopterus schreibersii, Myotis capaccini* |
| **4** | *1150 Sea Lagoons[25] | **Plants:** *Ruppia maritima, R. cirrhosa, Najas marina, Utricularia vulgaris*<br>**Animals:** Reptiles/Amphibians: *Emys orbicularis, Mauremys rivulata, Pelophylax shquipericus*<br>Birds: *Zapronia pusilla, Acrocephalus melanopogon, Botaurus stellaris, Platalea leucorodia, Egretta garzetta, Aythya nyroca, Ixobrychus minutus*<br>Invertebrates: *Cerastoderma glaucum, Abra alba, Tapes spp., Rissoa spp.*, Cyclope neritea, isopod and amphipod crabs. |
| **4a** | 1410 Mediterranean Salt Meadows (*Juncetalia maritimi*) | **Plants:** *Juncus maritimus, Juncus acutus, Artemisia caerulescens*<br>**Animals:** Reptiles/Amphibians: *Emys orbicularis, Mauremys rivulata, Triturus macedonicus*<br>Birds: *Cisticola juncidis, Vanellus vanellus, Burhinus oedicnemus, Zapornia pusilla*<br>Invertebrates: *Trithemis annulata* |

[24] *References: Bubanja N., 2016; Caković D. & Milošević D., 2013; Milanović et al., 2021; Rubinić et al., 2019; Théou et al., 2020; Zeković B., 2021*

[25] *In Natura 2000 Network, (*) next to a habitat represents that it is exceptionally important for conservation*

*Valdanos cove © Mihailo Jovićević*

*Mediterranean gull (Larus melanocephalus) © Isidora Ćalović*



*Long beach pine forest © Zenepa Lika*

# 4.3. LOW HINTERLAND

The low hinterland area of the LBBUEC encompasses habitats at or close to 0 m elevation, the area from Long Beach hinterland, after the direct impact of the sea, to the beginning of the forest and maquis ecosystem in the northern part and western part of Ulcinj municipality, in the wide Ulcinj and Šas plains. It is the most diverse ecosystem unit within the project scope (Table 3). In the hinterland of the Long Beach, it includes **coastal dunes** (embryonic shifting dunes, white dunes, humid dune slacks, dunes with *Euphorbia terracina*), two types of **dune grasslands** and **wooded dunes** with pines (*Pinus pinea* and/or *Pinus pinaster*, in Montenegro only occurring on the Long Beach). The dune habitats are, in Montenegro, best developed in the Long Beach, but also found in the Bojana Island beach, where the distribution of dunes is a typical example of vegetation zonation rules, from initial dunes closest to the sea with lowest plant diversity and vegetation cover, to closed dunes deeper into the hinterland, with more stable ecological conditions, fragments of nearby grasslands and a larger vegetation cover (Milanović et al., 2021) (Figure 9).


*Figure 9: Natura 2000 dune habitat types in the Long Beach*

Upward into the lower hinterland we encounter **grasslands, mainly pseudo-steppe habitats and Mediterranean and sub-Mediterranean grasslands** with a low to higher moisture gradient, intersected with populated area and cultivated land, although all of these can also be found, not so dominantly, directly in the hinterland of the Long Beach. The mentioned grasslands are home to several orchid species, charismatic butterfly species such as Scarce swallowtail (*Iphiclides podalirius*) and Old World swallowtail (*Papilio machaon*), as well as birds nesting in the ground such as Eurasian stone-curlew (*Burhinus oedicnemus*) (Gligorović B., 2021; Zeković B., 2021). Populated areas are often home to bats, which are also found in famous Jošova and Sumporna caves in Pinješ (Théou et al., 2020) (Figure 11).

Alluvial forests cover 670 ha of Bojana delta on the Montenegrin side, and extend up to 9 km upstream from the estuary, forming the

largest complex of floodplain forests of the eastern part of the Adriatic coast. The forests are often inhabited by European rhinoceros beetle (*Oryctes nasicorus*), Great capricorn beetle (*Cerambyx cerdo*), European stag beetle (*Lucanus cervus*) and Hermit beetle (*Osmoderma ermita/barnabita*), as well as European rollers (*Coracias garrulus*) which nest in solitary trees of willows, white poplar and narrow-leaved ash (*Salix spp., Populus alba, Fraxinus angustifolia*) (Figure 10).

Important species for conservation represent also endemics and sub-endemics of the Long Beach and Ada Bojana with hinterland, identified by Bubanja N., (2016): *Berteroa mutabilis, Chaerophyllum coloratum, Colchicum cupanii, Colchicum hungaricum, Crocus dalmaticus, Crocus tommasinianus, Iris pallida, Limonium cancellatum, Lysimachia atropurpurea, Petrorhagia obcordata, Petteria ramentacea, Quercus robur ssp. scutariensis, Rhamnus intermedius, Sideritis romana ssp. purpurea, Tanacetum cinerariifolium and Vincetoxicum huteri.*

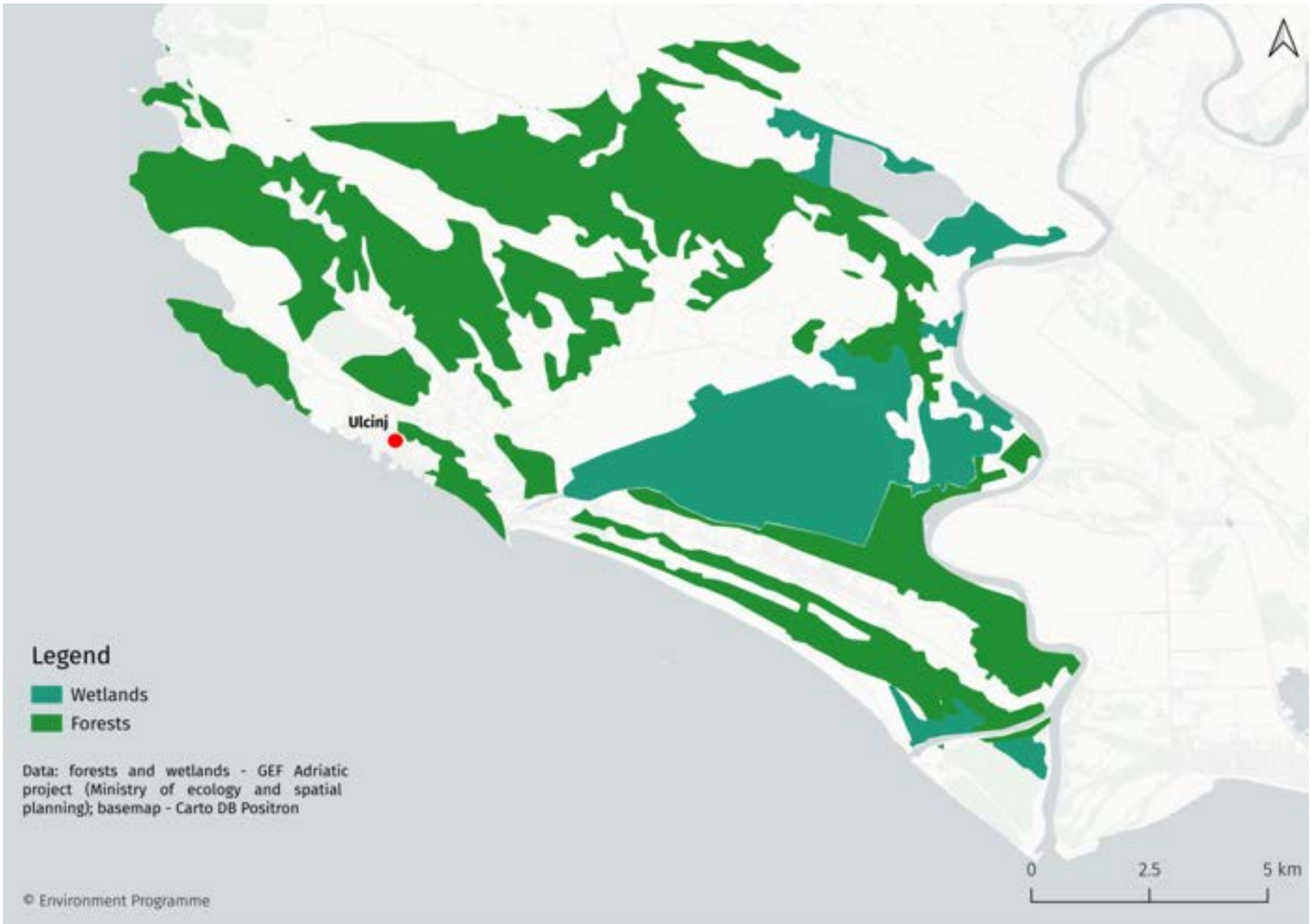



*Figure 10: Forests and wetlands (Ministry of Ecology and Spatial Planning, 2021)*

European bee-eater (Merops apiaster) © Mihailo Jovićević

European tree frog (Hyla arborea) © Aleksandar Simović

Lax-flowered orchid (Orchis laxiflora) in Sub-mediterranean wet meadows © Jelena Popović

*Small wetland in Long beach hinterland © Andrijana Mićanović*

*Table 3: Habitats of the low hinterland and most important conservation species*[26]

| No. | Landscape level ecosystem/ Natura 2000 habitat | Most Important Conservation Species |
|---|---|---|
| **1** | Coastal Dunes | |
| **1a** | 2110 Embryonic Shifting Dunes | **Plants:** *Elytrigia juncea, , Calystegia soldanella, Echinophora spinosaS, porobolus pungens, Euphorbia peplis, Medicago marina, Eryngium maritimum, Pancratium maritimum*<br>**Animals:** Birds: *Glareola pratincola, Charadrius alexandrinus, Charadrius dubius, Burhinus oedicnemus, Galerida cristata /* Invertebrates: *Calomera littoralis nemoralis* |
| **1b** | 2120 Shifting Dunes along the Shoreline with Ammophila Arenaria (White Dunes) | **Plants:** *Ammophila arenaria, Eryngium maritimum, Euphorbia paralias*<br>**Animals:** Reptiles/Amphibians: *Malpolon insignitus, Elaphe quatuorlineata*<br>Birds: same as for 1a / Invertebrates: *Iphiclides podalirius, Cataglyphis nodus, Acrotylus longipes, Delta unguiculatum, Myrmeleon formicarius, Cataglyphis nodus, Acrotylus longipes, Myrmeleon formicarius, Theba pisana, Vanessa cardui* |
| **1c** | 2190 Humid Dune Slacks | **Plants:** *Cladium mariscus*<br>**Animals:** Reptiles/Amphibians: *Hyla arborea, Pelophylax ridibundus, Natrix natrix, Natrix tessellata /* Birds: *Himantopus himantopus, Gallinago gallinago, Rallus aquaticus, Gallinula chlorous, Fulica atra /* Invertebrates: *Theba pisana* |
| **1d** | 2220 Dunes with Euphorbia Terracina | **Plants:** *Euphorbia terracina, Pancratium maritimum, Alkanna tinctoria*<br>**Animals:** Reptiles/Amphibians: *Malpolon insignitus, Elaphe quatuorlineata*<br>Birds: *Glareola pratincola, Charadrius alexandrinus, Charadrius dubius, Burhinus oedicnemus, Galerida cristata /* nvertebrates: *Iphiclides podalirius, Danaus chrysippus, Delta unguiculatum, Myrmeleon formicarius, Acrida turrita, Acrotylus longipes, Cataglyphis nodus, Theba pisana, Vanessa cardui* |
| **2** | Dune Grasslands | |
| **2a** | 2230 Malcolmietalia Dune Grasslands | **Plants:** *Alkanna tinctoria, Onobrychis caput-galli, Silene conica*<br>**Animals:** Reptiles/Amphibians: *Malpolon insignitus, Elaphe quatuorlineata*<br>Birds: same as for 1d / Invertebrates: same as for 1d |
| **2b** | 2240 Brachypodietalia Dune Grasslands with Annuals | **Plants:** *Trachynia distachya, Artemisia campestris, Fumana thymifolia*<br>**Animals:** Reptiles/Amphibians: *Malpolon insignitus, Dolichophis caspius, Podarcis melisellensis /* Birds: same as for 1d / Invertebrates: same as for 1d |
| **3** | Forests | |
| **3a** | 2270* Wooded Dunes with Pinus Pinea and/or Pinus Pinaster[27] | **Plants:** *Pinus pinea, P. pinaster, P. halepensis*<br>**Animals:** Reptiles/Amphibians: *Testudo hermanni /* Birds: *Caprimulgus europaeus*<br>Invertebrates: *Buprestis splendens* (potentially in old trees) |

| | | |
|---|---|---|
| **3b** | Planted Pine Forests in the City Center | / |
| **4** | Alluvial Forests and Thickets | |
| **4a** | 92A0 Salix Alba and Populus Alba Galleries | **Plants:** *Salix alba, Populus alba, Quercus robur ssp. scutariensis (CR)*[28]*, Alnus glutinosa, Fraxinus angustifolia*<br>**Animals:** Reptiles/Amphibians : *Podarcis melisellensis, Podarcis muralis, Anguis fragilis*<br>Birds: *Accipiter brevipes, Otus scopus, Dendrocopus syriacus, Plegadis falcinellus, Platalea leucorodia, Egretta gazetta, Ardea cinerea, Nycticorax nuctycorax, Ardeola ralloides, Phalacrocorax carbo, Streptopelia turtur, Coracias garrulus, Remiz pendulinus*<br>Invertebrates: *Osmoderma eremita, Oryctes nasicornis, Cucujus cinnaberinus* |
| **4b** | 92D0 Southern Riparian Galleries and Thickets (Nerio-Tamaricetea and Securinegion Tinctoriae) | **Plants**: *Nerium oleander, Vitex agnus-castus, Tamarix dalmatica*<br>**Animals:** Reptiles/Amphibians: *Elaphe quatuorlineata, Testudo hermanni, Telescopus fallax /*<br>Birds: *Sylvia communis, Emberiza melanocephala, Miliaria calandra, Iduna pallida*<br>Invertebrates: *Saga natoliae, Papilio machaon, Iphiclides podalirius, Danaus chrysippus, Palpares libelluloides /* Bats: *Miniopterus schreibersii* |
| **5** | Populated and Cultivated Area | **Animals:** Reptiles/Amphibians: *Testudo hermanni, Elaphe quatuorlineata, Zamenis situla*<br>Birds: *Dendrocopos syriacus, Streptopelia turtur /* Invertebrates: *Papilio machaon, Iphiclides podalirius* |
| **6** | Grasslands | |
| **6a** | 6220* Pseudo-Steppe with Grasses and Annuals of the Thero-Brachypodietea[29] | **Plants:** *Serapias cordigera, Orchis quadripunctata*<br>**Animals:** Reptiles/Amphibians: *Testudo hermanni, Zamenis situla, Malpolon insignitus*<br>Birds: *Saxicola rubetra, Merops apiaster /* Invertebrates: *Papilio machaon, Iphiclides podalirius, Euphydryas aurinia* |
| **6b** | 6420 Mediterranean Tall Humid Herb Grasslands of the Molinio-Holoschoenion | **Plants:** *Juncus spp., Orchis laxiflora, Serapias spp.*<br>**Animals:** Reptiles/Amphibians: *Emys orbicularis, Dolichophis caspius /* Birds: *Bubulcus ibis, Cisticola juncidis, Burhinus oedicnemus, Merops apiaster /* Invertebrates: *Euphydryas aurinia, Papilio machaon, Iphiclides podalirius, Zerynthia polyxena* |
| **6c** | 6540 Sub-Mediterranean Grasslands of the Molinio-Hordeion Secalini | **Plants:** *Scilla litardierei, Narcissus poeticus*<br>**Animals:** Reptiles/Amphibians: *Testudo hermanni, Podarcis muralis, Elaphe quatuorlineata*<br>Birds: *Bubulcus ibis, Cisticola juncidis, Burhinus oedicnemus, Merops apiaster*<br>Invertebrates: same as for 6b |

*[26] References: Bubanja N., 2016; Caković D. & Milošević D., 2013; Milanović et al., 2021; Popović J. et al., 2021; Rubinić et al., 2019*

*[27] In Natura 2000 Network, (*) next to a habitat represents it is exceptionally important for conservation*

*[28] The IUCN conservation status is determined in the Spatial Plan of Special Intention for National Park Lake Skadar (2018): "Given the current size of the population, as well as the factors that pose a threat to the biodiversity of Lake Skadar, applying the IUCN criteria (Guidelines for Using the IUCN Red List Categories and Criteria, 2013) the species can be assigned CR (critically endangered) endangered category according to the criterion B2a (III, IV, V)".*

*[29] In Natura 2000 Network, (*) next to a habitat represents it is exceptionally important for conservation*

*Sympetrum sanguineum or Sympetrum striolatum in Mediterranean saline meadows and wetlands © Nina Lončarević*

*Black-winged stilt (Himantopus himantopus) © Mihailo Jovićević*

*Zasukcija (Spiranthes spiralis) © Nina Lončarević*

*Old world swallowtail (Papilio machaon) © Bogić Gligorović*

*Marsh fritillary (Euphydryas aurinia) © Jelena Popović*

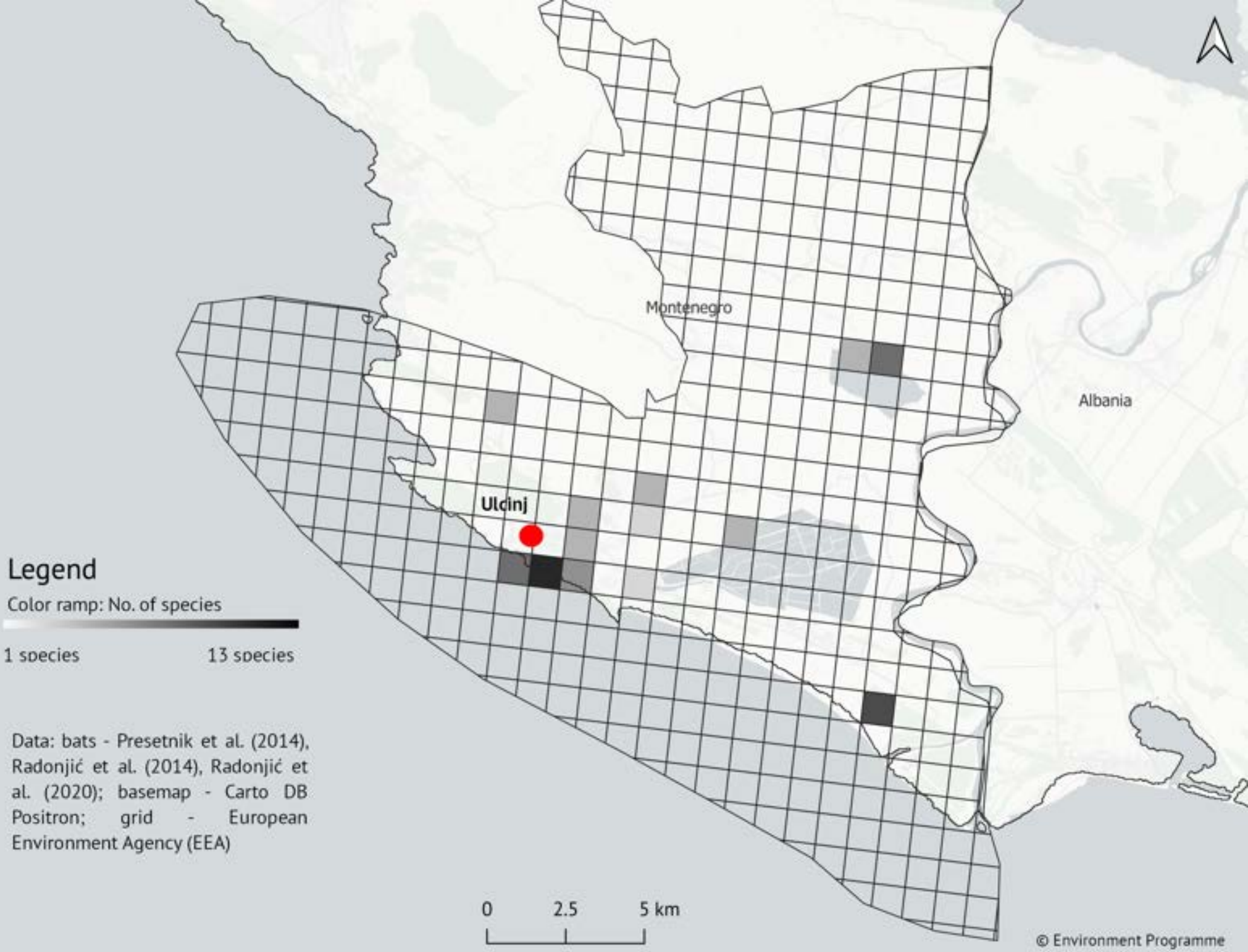



*Figure 11: Bat species richness*

*Marsh frog (Pelophylax ridibundus) © Aleksandar Simović*

*Dalmatian wall lizard (Podacris melisellensis) © Aleksandar Simović*

*Eastern Montpellier snake (Malpolon insignitus) © Aleksandar Simović*

# 4.4. STAGNANT WATERS

Stagnant waters of the Bojana basin area encompass three types, scattered across the Bojana River delta: wetlands, lakes and a salina. (Table 4)

**Small wetlands** (Alb. knete) are the remains of the former Lake Zoganj lagoon, with 6 of them in Bojana delta: Darza, Ćurke, Velika, Mala, Fraskanjel and Donja Klezna (Schneider-Jacoby et al., 2006). Knete are habitats with extreme ecological conditions, forming a gradient between brackish and freshwater wetland habitats. A small part is always under water, while a large part is occasionally flooded. They consist of dense stands of tamarisk (*Tamarix dalmatica*) that create a mosaic with alluvial forests with softwoods such as narrow-leaved ash (*Fraxinus angustifolia*) Skadar oak (*Quercus robur ssp. scutariensis*), or stands of common reed (*Phragmites australis*) etc. (Caković D. & Milošević D., 2013). They host an enormous macroinvertebrate biodiversity (Figure 12) and are visited by many birds which inhabit or use it for migration such as herons, cormorants and ibises (Gligorović B., 2021; Zeković B., 2021).

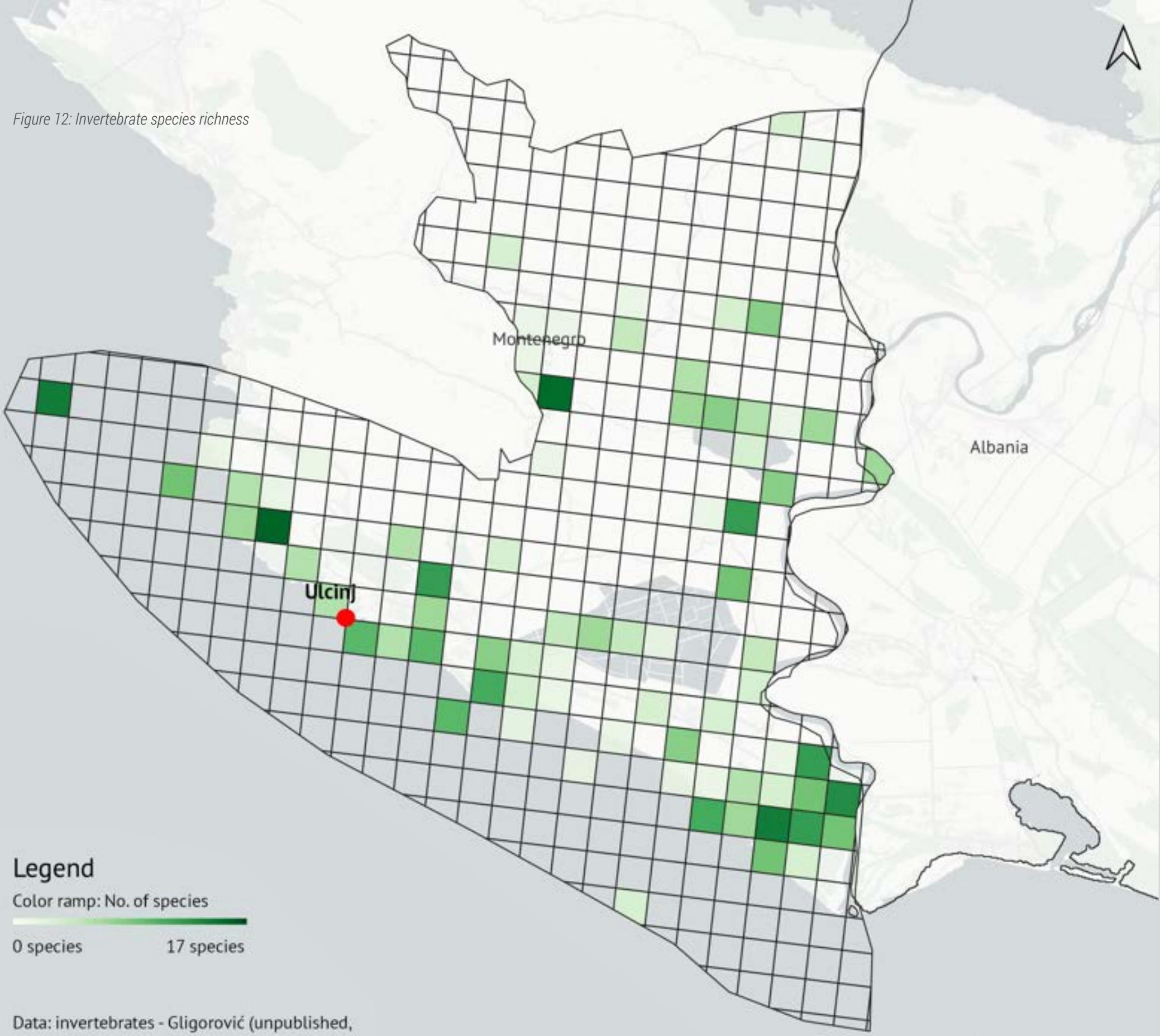
There are three lakes in the Bojana River basin, lakes Šas, Žaka and an unnamed lake. These lakes vary in size from ponds to large lakes like Šas, and have predominantly grayish to blue-green, more or less turbid water rich in dissolved bases (pH usually above 7), with free-swimming Hydrocharition plants or in deeper open waters with rooted Magnopotamion communities (Gligorović B., 2021; Milanović et al., 2021).

**Lake Šas** is by some dubbed as the "small" Lake Skadar, indicating its large conservation value. It has 12 springs which feed it throughout the year, along with its main tributary, Međurječ River, which flows out of the lake on the other side to join Bojana River. The lake is about 4 km long in winter and 1.5 km wide. The lake is up to 10 m deep in the middle, and 1–3 m along the shore. (Franetović-Bure, 1960) The benthic fauna of Lake Šas is poorly investigated. There has been no systematic, comprehensive research carried out when it comes to this lake. According to the literature data, sporadic research limited in space and time, has been conducted so far by Ajtić et al., 2004; Pešić & Dhora, 2001; ŠUNDIĆ et al., 2011; Šundić & Radujković, 2012 and Wilke et al., 2010 and as such does not provide a clear picture of the benthic fauna of Lake Šas. The most recent research of benthic fauna in this lake was conducted in (Caković et al., 2016). According to these findings, the benthic fauna of Lake Šas does not show specificity, since it consists of species that are typical and widespread in lakes of this type.

**The Ulcinj Salina**, formerly Lake Zoganj, was turned into a salina in the 1930s. It hosts 230 bird species (Puzović, 2002; Stumberger et al., 2005), which either use it during their migration on the Adriatic flyway or to overwinter in the Salina, making it one of the most important bird hotspots in the Adriatic. Due to extreme conditions of the high salinity level (brought by the channel port Milena, initially built to drain Lake Zoganj to create agricultural fields) and the varying water level, the vegetation of the salina is scarcely developed, with mostly dominant species being glasswort (*Salicornia herbacea*), herbaceous seepweed (*Suaeda maritima*), sea-lavander (*Limonium angustifolium*) and spiny rush (*Juncus acutus*) (Đurović M et al., 2020; Milanović et al., 2021).

Stagnant waters have high reptile and amphibian diversity (Figure 13), including some threatened and/or near threatened species, like Lake Skadar frog (*Pelophylax shqipericus*), European pond turtle (*Emys orbicularis*) (Popović J. et al., 2021).

*Figure 12: Invertebrate species richness*



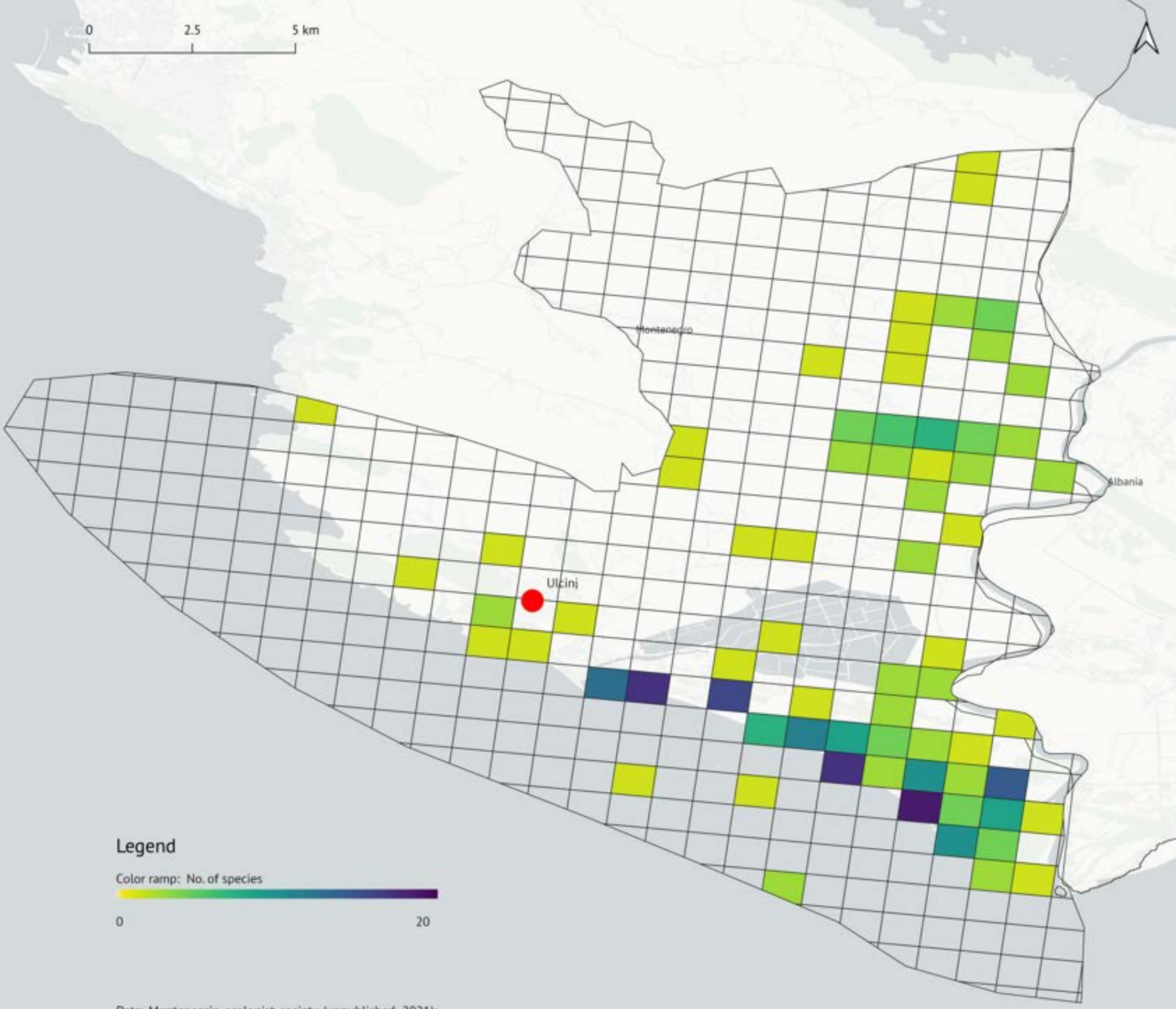



*Figure 13: Reptile and amphibians species richness*

*Willow emerald damselfly (Lestes viridis) © Nina Lončarević*

*Ulcinj salina © Mediterranean Wetland Secretariat, A. Camaro*

*Eurasian spoonbill (Platalea leucorodia) ©Marija Šoškić Popović*

*Common greenshank (Tringa nebularia) in Ulcinj salina © Bojan Zeković*

*Table 4: Stagnant waters habitats and most important conservation species*[30]

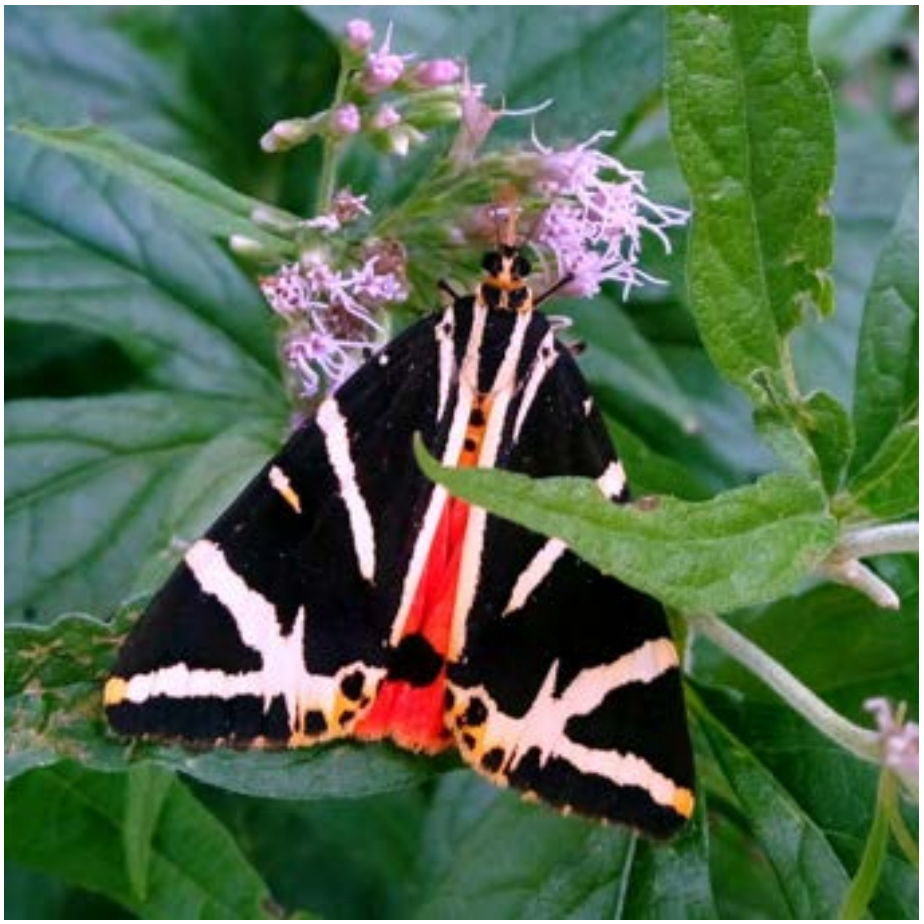
| **Landscape-level ecosystem/ Natura 2000 habitat** | | **Indicator Species** |
|---|---|---|
| **1** | Ulcinj Salina | **Plants:** *Salicornia europaea, Suaeda maritime*<br>**Animals:** Birds: *Aythya ferina, Aythya nyroca, Phoenicopterus roseus, Grus grus, Platalea leucorodia, Plegadis falcinellus, Nyctycorax nyctycorax, Ardea alba, Egretta garzetta, Pelecanus crispus, Mycrocarbo pygmaeus, Burhinus oedicnemus, Recurvirostra avosetta, Himantopus himantopus, Pluvialis apricaria, Charadrius alexandrinus, Vanellus vanellus, Numenius arquata, Limosa limosa, Calidris pugnax, C. ferruginea , C. alpine, Tringa erythropus, T. glareola, Glareola pratincula, Sternula albifrons, Sterna hirundo, Circus aeroginosus, Coracias garrulus, Motacilla flava /* Bats: *Rhinolophus ferrumequinum, R. hipposideros /* Invertebrates: *Lindenia tetraphylla, Artemia parthenogenetica* |
| **1a** | 1420 Mediterranean and Thermo-Atlantic Halophilous Scrubs (Sarcocornetea Fruticosi) | **Plants:** *Sarcocornia fruticosa, S. perennis, Arthrocnemum macrostachyum*<br>**Animals:** Reptile/Amphibians: *Testudo hermanni, Lacerta trilineata, Pseudopus apodus*<br>Birds: *Burhinus oedicnemus, Glareola pratincula, Charadrius alexandrinus, Tringa glareola, Himantopus himantopus /* Invertebrates: *Lindenia tetraphylla, Theba pisana* |
| **1b** | 1310 Salicornia and Other Annuals Colonizing Mud and Sand | **Plants:** *Salicornia herbacea aggr., Salsola soda, Suaeda maritima*<br>**Animals:** Birds: same as 1a / Invertebrates: *Selysiothemis nigra, Theba pisana* |
| | Lakes – Šas, Žaka, Unnamed Lake | Bats: *Hypsugo savii, Myotis blythii oxygnathus, Myotis spp., Pipistrellus kuhlii / nathusii, Rhinolophus ferrumequinum, R. hipposideros* |
| **2** | 3150 Natural Eutrophic Lakes with Magnopotamion and Hydrocharition Type Vegetation | **Plants:** *Nymphaea alba, Nuprar lutea, Nymphoides peltata, Trapa natans, Lemna minor, Spirodela polyrhiza*<br>**Animals:** Reptiles/Amphibians: *Triturus macedonicus, Lissotriton graecus, Emys orbicularis, Mauremys rivulata /* Birds: *Chlidonias hybrida, Fulica atra, Ardeola ralloides, Microcarbo pygmaeus* |
| **3** | 3170* Mediterranean Temporary Ponds[31] | **Plants:** *Serapias lingua, S. vomeracea, Isoetes sp. (histrix, duriei), Kickxia cirrhosa, Centaurium spicatum, Cicendia fili-formis, Crypsis alopecuroides, C. schoenoides, Cyperus flavescens, Fimbristylis bisumbellata, Glinus lotoides*<br>**Animals:** Reptiles/Amphibians: *Triturus macedonicus, Pelophylax shqipericus, Lissotriton graecus, Emys orbicularis, Mauremys rivulata /* Birds: *Plegadis falcinellus, Numenius arquata, Vanellus vanellus, Calidris pugnax, Ardea alba, Ardea cinerea /* Invertebrates: *Lindenia tetraphylla* |

[30] *References: References: Bubanja N., 2016; Caković D. & Milošević D., 2013; Milanović et al., 2021; Popović J. et al., 2021; Rubinić et al., 2019; Théou et al., 2020.*

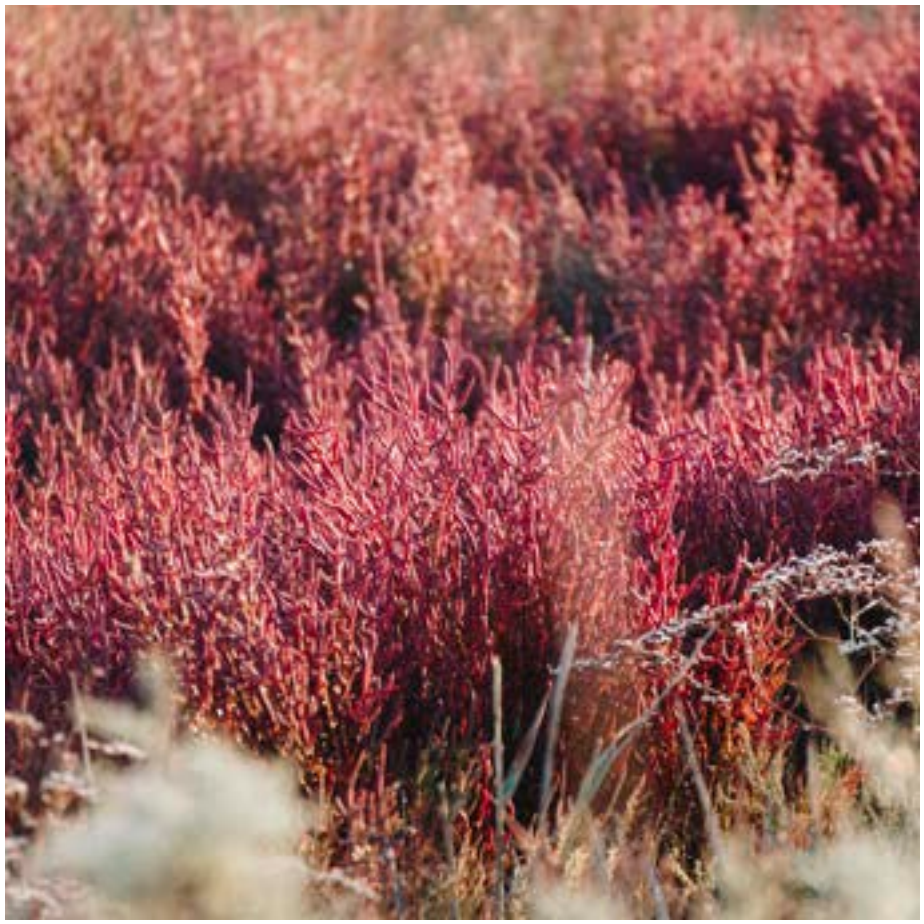
[31] *In Natura 2000 network, (*) next to a habitat represents it is exceptionally important for conservation*

*Little egret (Egretta garzetta) © Mihailo Jovićević*

*Surrounding of small wetland Ćurke © Bogić Gligorović*



*Jersey tiger moth (Euplagia quadripunctaria) © Bogić Gligorović*



*Prickly saltwort (Salsola kali) © Marija Šoškić Popović*

*Šas lake © Rina Kovači*

*Ulcinj salina © Mediterranean Wetland Secretariat, A. Camaro*

*Ulcinj salina ©Marija Šoškić Popović*

*Flamingo (Phoenicopterus roseus)*
*© Isidora Ćalović*

*SUP board paddling in Bojana river © Rina Kovači*

# 4.5. RUNNING WATERS

The LBBUEC consists of 1 main channel – Port Milena, 1 main river – Bojana (with tributaries and numerous springs in its basin), and 2 river islands – Bojana Island and Paratuk (Table 5).

**The Port Milena Channel** was created partly as a result of human activities, and largely under the influence of natural factors. Namely, at the end of the nineteenth century, a channel was dug, from Cape Đeran to Lake Zoganj. The goal of this endeavor was to drain the lake and use it for agriculture. Since the water level in the lake was slightly lower than the sea level, the lake couldn't be drained but, on the contrary, sea water entered through the channel into the lake. In this way, both the lake and the surrounding land were saltified. According to the locals, the dug channel was very narrow, but its widening and deepening were influenced by frequent floods in the Bojana River basin and in a few decades created a channel with an average width of 100 m and depth of 8 to 10 m. Its length is approximately 4 km (Đurović M et al., 2020). The channel is also recognizable by fishermen houses named "kalimera", now mostly abandoned.

**The Bojana River** flows out of Lake Skadar, through the 2nd biggest plain in Montenegro, consisting of Šas and Ulcinj fields, and its specific hydrology with constant flooding (up until the building of embankments), created a rich, mosaic-like and diverse delta, with ecological niches for many organisms and biodiversity blossoming in habitats of varying moisture content, salinity, water level and water regime. It is cca. 1.2 to 2 km downstream receives its biggest tributary, the Drin. After 18 km of flowing through Albania, it flows for about 25 km through Montenegro, representing the border between Montenegro and Albania, but officially governed by Montenegrin management bodies. On the Montenegrin side, it receives several tributaries: Kravarski spring; River Meraja (formed by Rastiš and Brajše); River Vladimirska (which forks in the upstream part and flows into Bojana near Štodra, while the other part flows into Lake Šas from where it flows further into Bojana) as well as the River Međurječ and watercourse Sveti Đorđe (which receives the Klezna stream that previously passes through the Lake Šas) (Government of Montenegro, 2019c). The area that is the richest with springs is the northern part of the scope, which encompasses the most eastern part of the Mountain Rumija and nearby hills (they have not been mapped).

The Bojana River came to be as we know it today due to several factors. In 1859, due to a large flood, the Drin changed its course from flowing into the Adriatic Sea (with an estuary 25 km east from River Bojana), to flow into Bojana, causing a significant increase in the Bojana water levels and sediment amounts (Petković & Sekulić, 2019). After 1945, the amount of water discharge by the River Bojana increased due to meliorating works and the flow of River Gjadri. From 1955 to date, 5 dam hydropower stations were built on the Drin, two in Macedonia (Gllobočica and Shpilje) and three in Albania (Vau Dejes, Fierza and Koman) (Rakaj M., 2012) additionally affecting its hydrology.

During an independent expert investigation conducted in 2017 (Šundić & Rakočević, 2017) in River Bojana, the calculations of different ecological metrics based on macro invertebrates where applied which indicated moderate to high biological quality of the water in the Bojana River, and poor sediment quality. Also, these metrics showed eutrophic condition in the water. High water temperature in the summer months causes an increase of nutrients in the water, and the value of trophic conditions. Therefore, the organic production is somewhat higher in this period as well as. During another independent expert investigation (Šundić & Rakočević, 2017) in River Bojana, the ecological indices, based on algae communities, the water quality ranged from high (unpolluted water) to moderate. Considering trophic status of the water, the meso-eutrophic conditions i.e. moderate to elevated nutrients concentration in water was observed

during this short-term investigation, as well as oligo-betamesosaprobity i.e. slight organic pollution, when it comes to saprobic level.

The River Bojana basin is rich in **springs** which dry out during the year. Their riverbeds can be completely dry or permanent puddles can remain in it, with or without vegetation. Occasional Mediterranean rivers are a special phenomenon, important for the development and reproduction of numerous animals, primarily insects, reptiles and amphibians (Milanović et al., 2021).

**River islands** are formed when floodplain rivers empty into a sea, diminishes its longitudinal slope over time, and its sediment transport capacity becomes less.

They are formed in those places where two nearby river meanders intersect, which mostly happens when they pass through a wide valley and at the mouth of a river in a weak current. **Paratuk Island** is located in the middle of Bojana. It is 1 km long, narrow and extends in the direction of the river flow. The vegetation of the island is maquis, figs, reed, elms and willows. Its lengthening is visible on a yearly basis due to sand deposition along the southern end (Caković D. & Milošević D., 2013).

The largest island in the delta is the **Bojana Island**, also called Ada Bojana (ada is a Turkish word for island ), located at the mouth of the river. Today's Bojana Island was created by a combination of factors – the sinking of a ship and deposition of sediment by Bojana. First, a sandbar was gradually formed, then an islet, to finally turn into an island, today 5 km long. The first news about the origin of this island dates back to 1882, stating that the island is 30 years old, and that it became so from an Italian ship which sank there, under the command of Captain Naporelli, after which reed, dust and mud accumulated around the hull (Franetović-Bure D., 1960; Petković & Sekulić, 2019).

The island gradually formed as Bojana, a floodplain river, discharged into the sea along its sediment, diminishing its longitudinal slope over time and decreasing its sediment transport capacity, which gradually increased the surface area of Ada Bojana and the western part of the Long Beach. This processe changed after the 5 dams were built on the Drin, decreasing the amount of water and sediment transported by Bojana. The Bojana Island has since been in a state of dynamic equilibrium, i.e. the sediment supply from the River Bojana to the Adriatic Sea is sufficient to compensate for the erosion of the coastline due to sea waves and currents (Petković & Sekulić, 2019).

*Table 5: Running waters habitats and most important conservation species*[33]

| | **Landscape Level Ecosystem/ Natura 2000 habitat** | **Indicator Species** |
|---|---|---|
| **1** | Channels | |
| **1a** | Port Milena | **Plants:** /<br>**Animals:** Fish: *Anguilla anguilla, Aphanius fasciatus, Atherina boyeri, Chelon labrosus, Dicentrachus labrax, Diplodus annularus, D. vulgaris, D: sargus sargus, Gobius spp., Lithognathus mormyrus, Liza ramada, L. saliens, Liza aurata, Mugil cephalus, Mullus surmeletus, Platichthys flessus luscus, Pomatoschistus spp. Sarpa salpa, Solea lascaris, S. vulgaris* / Reptiles/Amphibians: *Bufo bufo, Pelophylax shqipericus, Emys orbicularis* Birds: *Rallus aquaticus, Tachybaptus ruficollis, Gallinula chloropus* / Invertebrates: *Lindenia tetraphylla* |

| | | |
|---|---|---|
| **2** | River and Springs | **Animals:** Invertebrates: *Cordulegaster heros, C. bidentata, Gomphus schneiderii* |
| **2a** | Bojana River | **Animals:** Fish: *Acipenser naccari, Acipensersturio, Anguilla anguilla, Alosa agone,Dicentrarchus labrax, Lisa ramadoMugil cephalus, Platichthys flesus /* Reptiles/ Amphibians: *Emys orbicularis, Mauremys rivulata, Lissotriton graecus /* Birds: *Phalacrocorax carbo, Microcarbo pygmaeus, Nycticorax nycticorax, Ardeola ralloides, Egretta garzetta, Ardea cinerea, Platalea leucorodia, Bubulcus ibis, Plegadis falcinellus, Alcedo atthis /* Invertebrates: *Lindenia tetraphylla, Gomphus schneiderii, G. flavipes, Hirudo verbena* |
| **2b** | 3280 Constantly Flowing Mediterranean Rivers with Paspalo-Agrostidion Species and Hanging Curtains of Salix and Populus Alba | **Plants:** *Salix sp. (alba, fragilis), Populus alba*<br>**Animals:** Reptiles/Amphibians: *Emys orbicularis, Mauremys rivulata /* Birds: *Remiz pendulinus, Plegadis falcinellus, Bubulcus ibis, Egretta garzetta /* Invertebrates: *Osmoderma eremita, Cucujus cinnaberinus* |
| **2c** | 3290 Intermittently Flowing Mediterranean Rivers of the Paspalo-Agrostidion | **Animals:** Reptiles/Amphibians: *Mauremys rivulata /* Birds: *Cettia cetti, Plegadis falcinellus, Ardea cinerea, Egretta garzetta /* Invertebrates: *Gomphus schneiderii* |
| **3** | River Islands | |
| **3a** | Paratuk | **Plants:** *Populus alba, Fraxinus angustifolia*<br>**Animals:** Reptiles/Amphibians: *Emys orbicularis, Mauremys rivulata, Elaphe quatuorlineata /* Birds: *Egretta garzetta, Phalacrocorax pygmeus, P. carbo, Platalea leucorodia, Nycticorax nycticorax, Ardeola ralloides, Corvus monedula* |
| **3b** | Ada Bojana<br>(Also Called Bojana Island) | Includes habitat types mentioned previously, and accompanying species: 1110 Sandbanks which are slightly covered by sea water all the time; 1140 Mudflats and sandflats not covered by seawater at low tide; 1210 Annual vegetation of drift lines; *1150 Sea lagoons1<br>1410 Mediterranean salt meadows (*Juncetalia maritimi*); 2110 Embryonic shifting dunes; 2120 Shifting dunes along the shoreline with Ammophila arenaria (white dunes); 2190 Humid dune slacks<br>2220 Dunes with Euphorbia terracina; 92A0 *Salix alba* and *Populus alba* galleries; 92D0 Southern riparian galleries and thickets (*Nerio-Tamaricetea and Securinegion tinctoriae*) |

[32] *https://tureng.com/en/turkish-english/ada*

[33] *References: Caković D. & Milošević D., 2013; Dhora D. & Beqiraj S., 2012; Đurović M et al., 2020; Milanović et al., 2021; Popović J. et al., 2021*

*Bojana / Buna river © Mediterranean wetland secretariat, A. Camaro*

*Channel Port Milena © Mihailo Jovićević*

# 4.6. HIGH HINTERLAND

High hinterland of the Bojana basin is dominated by a variety of forests, maquis and scrubland, intersected with rocky pastures (Table 6).

Unlike ecosystem wholes so far, high hinterland encompasses all hills and higher elevations of the LBBUEC, as well as any forested terraces and milder slopes. It is distributed from next-to-shore areas to the northern limits of our project scope.

Until approximately 30 years ago, the high hinterland landscape was, from the sea level until cca (Milanović et al., 2021). 350 m in elevation, dominated by evergreen Mediterranean forests, with evergreen oak (*Quercus ilex*) andoak bush (*Quercus coccifera*) near-shore, and Macedoniann oak (*Quercus trojana*) further into the hinterland. In the past several decades, due to forest exploitation and urbanization, most of the well preserved forests were cut, and nowadays it is nearly impossible to find these forests in the Mediterranean, especially the near-shore ones where most urbanization happened. However, some not too representative remnants are present in the LBBUEC.

They are replaced mostly by **maquis** – scrubland with sporadic old and majestic trees or pioneer tree stands of once dominant evergreen oak, then typical of the area – oriental hornbeam (*Carpinus orientalis*), characteristic for forest pioneer stages, with plenty of shrubby species, vast impassable plant communities of green olive tree (*Phillyrea media*), tree heath (*Erica arborea*), common smilax (*Smilax aspera*), butcher's-broom (*Ruscus aculeatus*) and common myrtle (*Myrtus communis*). Although not recognized by the Natura 2000 Ecological Network, this habitat type is considered very important in the Eastern-Adriatic for conservation. It gives a specific landscape aesthetic to the Southern-Mediterranean areas, with many aromatic species in maquis used in traditional medicine and Mediterannean cusine (Caković D. & Milošević D., 2013). Some typical inhabitants of forests and maquis are European the stag beetle (*Lucanus cervus*), longhorn beetle (*Cerambyx cerdo*), levant sparrowhawk (*Accipiter brevipes*) and forest turtle (*Testudo hermanni*) (Gligorović B., 2021; Popović J. et al., 2021).

A landscape-level ecosystem we find important for conservation are the **olive tree plantations,** which cover vast areas in the Valdanos cove, but also other parts of Ulcinj, with olive trees as much as 2000 years old (Caković D. & Milošević D., 2013).

Besides maquis, **Mediterannean junipers** took place of the forests, as well as **rocky pastures**, the most degraded stadium after forest exploitation. They are mostly found in the northern parts of the project scope, on hill slopes, dominated by grasses as well as aromatic species such as germander (Teucrium spp.), sandwort (*Arenaria spp*.), sage (*Salvia spp*.), savory (*Satureja spp*.) etc. (Caković D. & Milošević D., 2013; Milanović et al., 2021). Typical animal inhabitants of rocky pastures are rock partridge (*Alectoris graeca*) and four-lined snake (*Elaphe quatuorlineata*) (Popović J. et al., 2021; Zeković B., 2021).

A forest type also found in the northern parts of the scope are deciduous forests with Turkey oak (*Q. cerris*) and sessile oak (*Q petrea*). (Milanović et al., 2021)

*Nature of high hinterland of LBBUEC © Rina Kovači*

*Olive plantations Ulcinj ©Zenepa Lika*

*Scarce swallowtail (Iphiclides podalirius) © Nina Lončarević*

*Table 6: High hinterland habitats and most important conservation species*[34]

| | **Landscape level ecosystem/ Natura 2000 habitat** | **Indicator Species** |
|---|---|---|
| **1** | Maquis | **Plants:** *Myrtus communis, Querxus ilex, Q. coccifera, Fraxinus ornus, Pistacia lentiscus,*<br>**Animals:** Invertebrates: *Oryctes nasicornis, Osmoderma eremita, Iphiclides podalirius, Saga natoliae /* Reptiles/Amphibians: *Testudo hermanni, Hierophis gemonensis, Lacerta viridis /* Mammals: *Canis aureus* |
| **2** | 5210 Arborescent Matorral with Juniperus spp. | **Plants:** *Juniperus oxycedrus, Juniperus phoenicea, Gladiolus palustris*[35](potentially)<br>**Animals:** Reptiles/Amphibians: *Hierophis gemonensis, Testudo hermanni*<br>Birds: *Sylvia canuntilans, Turdus merula /* Invertebrates: *Saga natoliae* |
| **3** | Olive Plantations | **Plants:** *Olea europea*<br>**Animals:** Birds: *Streptopelia turtur* |
| **4** | Forests | |
| **4a** | 9340 Quercus Ilex Forests | **Plants:** *Quercus ilex, Q. coccifera*<br>**Animals:** Reptiles/Amphibians: *Testudo hermanni, Zamenis situla*<br>Birds: *Caprimulgus europaeus /* Invertebrates: *Lucanus cervus, Cerambyx cerdo, Oryctes nasicornis, Saga natoliae* |
| **4b** | 9250 Quercus Trojana Woods | **Plants**: *Quercus trojana, Q. pubescens, Q. cerris, Juniperus spp, Acer spp.*<br>**Animals:** Reptiles/Amphibians: *Testudo hermanni /* Birds: *Caprimulgus europaeus /* Invertebrates: *Lucanus cervus, Cerambyx cerdo, Osmoderma eremita, Oryctes nasicornis* |
| **4c** | 9260 Castanea Sativa Woods | **Plants:** *Castanea sativa, Quercus frainetto, Q. pubescens, Q. trojana, Fraxinus ornus, Corylus avellana, Carpinus orientalis, C. betulus*<br>**Animals:** Reptiles/Amphibians: *Testudo hermanni, Elaphe quatuorlineata*<br>Birds: *Sitta europaea, Parus major, Picus viridis /* Invertebrates: *Oryctes nasicornis* |
| **4d** | 91M0 Pannonian-Balkanic Turkey Oak – Sessile Oak Forests | **Plants:** *Quercus petraea, Q. cerris, Q. frainetto, Acer tataricum, Carpinus orientalis, Fraxinus ornus*<br>**Animals:** Reptiles/Amphibians: *Testudo hermanni, Zamenis situla /* Birds: *Caprimulgus europaeus, Leiopicus medius /* Invertebrates: *Lucanus cervus, Cerambyx cerdo, Osmoderma eremita, Oryctes nasicornis, Luciola novaki* |
| **5** | 62A0 East Sub-Mediterranean Dry Grasslands (Scorzoneretalia villosae) | **Plants:** *Satureja (montana, subspicata, cuneifolia), Asphodelus aestivus, Artemisia alba, Eryngium amethystinum, Himantoglossum adriaticum*[36] (potentially)<br>**Animals:** Reptiles/Amphibians: *Lacerta trilineata, Vipera ammodytes, Telescopus fallax*<br>Birds: *Alectoris graeca /* Invertebrates: *Saga natoliae* |

[34] *References: Bubanja N., 2016; Caković D. & Milošević D., 2013; Milanović et al., 2021; Popović J. et al., 2021; Zeković B., 2021*

[35] *Species on the Annex IV of the EU Habitat Directive*

[36] *Species protected under Annex IV of the EU Habitat Directive*

*Horned viper (Vipera ammodytes) © Aleksandar Simović*

*Old world swallowtail (Papilio machaon) © Bogić Gligorović*

*Common primrose (Primula vulgaris) © Rina Kovači*

*Olive plantations in Valdanos cove © Mihailo Jovićević*

*Maquis © Jelena Popović*

# 4.7. KEY ECOLOGICAL ATTRIBUTES

**Key ecological attributes (KEA)** are best described as integral elements and properties of ecological systems that maintain the function of ecosystems and provide the necessary adaptation and resilience to cope with disturbances. They are a measure of the function of the ecosystem. In this context, the function represents the resilience of the ecosystem to disturbances and the innate adaptive capacity to withstand change (in the environment).

Biodiversity represents the diversity of genes, species, ecosystems and overall, life on Earth. **A stable and developed biodiversity** is of high importance for optimal ecosystem functioning and its resilience. A greater biodiversity leads to a greater stability in communities and ecosystems, guarantees the provision and maintenance of ecosystem services, and therefore contributes to the well-being of local communities. This KEA is found important for all six ecosystems in the project area (sea, coastal zone, low hinterland, stagnant water, running water and high hinterland). This restates its ecological importance for the area, and speaks well about the current biodiversity conservation level, since this KEA is relevant to each ecosystem.

**Habitat integrity** represents a system's capacity to sustain native biological and physical organisms and properties that have adapted to a given area. In the investigated area, the existing connectivity among ecosystems and different habitats ensures the survival of species, distribution and diversity of gene pools, and maintaining of ecological processes, thus supporting the complexity and adaptability and therefore resilience of ecosystems and their services. This KEA is important for the five ecosystems and their respective biodiversity objects: sea, coastal area, stagnant waters, running waters and high hinterland. The lower hinterland ecosystem is not included here since it is heavily fragmented and thus the habitat integrity within it is already violated and not one of the relevant KEAs.

**Stable nutrient inflow.** In aquatic ecosystems, nutrients are essential for the growth of algae and macrophytes that are an important source of food for many small invertebrates and fish. The main nutrients in waterways come in the form of inorganic nitrogen and phosphorus, and increases in nutrients are almost always a result of agriculture activities. Therefore, a stable nutrient influx is of high importance for proper ecosystem functioning and resilience. This KEA is found most important for the sea, coastal area, running waters and stagnant waters ecosystems.

**Stable hydrological regime** presumes continuous and predictable water discharge dynamic and water characteristics, and it enables optimal life cycle functioning for aquatic and semi-aquatic species, as well as terrestrial species. A stable hydrological regime in terms of groundwater and seawater interactions provides the appropriate conditions for the exchange of nutrients and energy, which is important for species diversity. Also, a stable hydrological regime facilitates connectivity between different habitats. This KEA impacts all ecosystems of the area.

**Stability of physio-chemical parameters of water and soil.** Physical and chemical parameters reflect the quality of water and soil. The physio-chemical parameters are very important for all of the species which are strictly related to aquatic habitats and soil. Considering seawater, a change of its quality would directly affect Posidonia oceanica, which is one of the key species for the provisioning of ecosystem services. For the sea and high hinterland ecosystems, as well as coastal area and stagnant and running waters, the stability of physio-chemical parameters plays a significant role for its functioning and resilience. This KEA is not found stable for the lower hinterland ecosystem, because it is deemed as such due to the concentration of agricultural production in this area.

S**pecies populations' composition and abundance** assumes the structure of species populations and the number of individuals

in populations. This KEA is closely connected with stable and developed biodiversity. We find this KEA is connected with all of the six ecosystems.

**Biomass** is defined as the amount of living material provided by a given area, terrestrial or aquatic. It reflects the distribution of both energy and materials in the community. This KEA has a significant role on the ecosystems resilience in the sea, lower hinterland, running waters, stagnant waters and high hinterland ecosystems. For the coastal ecosystem, biomass as an ecological attribute is not relevant, since it is a very narrow strip of shoreline with very little vegetation present and scarce fauna.

**Native species** are those species that are developed and found in a certain ecosystem and have adapted to living in a particular environment typical for that ecosystem. These species are recognized as very important KEA in the investigated area, because they compose the food web. Many native species populations in the project area are declining due to degraded habitats and the spread of invasive species. This KEA is interconnected with all above mentioned six ecosystems.

**Stable climate** refers to continuous and predictable climatic conditions typical of a certain area, including parameters such as temperature, precipitation, wind etc. It is crucial for securing the existence of species in different ecosystems. Stable climate enables high diversity of species, stable energy flow etc. This KEA is connected to all 6 ecosystems.

*Temporary Mediterranean ponds © Aleksandar Simović*

# ECOSYSTEM SERVICES AND HUMAN WELL-BEING

*Thunder above high hinterland of LBBUEC © Nina Lončarević*

# 5.1. ECOSYSTEM SERVICES BASED ON CICES CLASSIFICATION

Ecosystem services are largely underresearched, not only in Montenegro but also globally, since this concept is relatively new and in development (Millennium Ecosystem Assessment (Program), 2005). Hence, there is little data that comprehensively covers ecosystem services and shows their economic value too.

The only ES valuation in Ulcinj municipality was by Sovinc A. et al., 2017 in the Study for the Protection of Ulcinj Salina. More details, also on their methodology, can be found in the study, while a basic economic valuation summary is: "Based on the transfer of benefits, the total economic value can be estimated at 5,842,016 EUR per year. This means that every year the area of the Ulcinj saltworks of 9,969 ha provides a regular flow of ecosystem services of approximately 6 million. According to this, it is a rather conservative estimate. This is the average value of ecosystem services in the amount of 586 EUR/ha."

Below we present a preliminary list of ecosystem services with definitions (provided where we felt needed) based on the CICES most recent classification and guidance document, as well as relevant data when available (European Environment Agency, 2018; Haines-Young R. & Potschin M., 2018). The ES are divided into three main groups: provisioning, regulation & maintenance and cultural. Furthermore, following the CICES classification, each is divided into biotic and abiotic, and each ecosystem service has its own CICES reference number.

## PROVISIONING ECOSYSTEM SERVICES

The definition of provisioning ES: "All nutritional, non-nutritional, material and energetic outputs from living systems as well as abiotic outputs (including water)". Below are presented ES we identified LBBUEC.

### BIOTIC

**1.1.1.1** Cultivated Terrestrial Plants (Including Fungi, Algae) Grown for Nutritional Purposes

According to the Spatial and Urbanistic Plan of Ulcinj municipality 2016–2020 (Municipality Ulcinj, 2016a) there is 11.502 ha of agricultural land, of which arable land is 56.52%; pastures 41.11%, while ponds, fisheries and peatlands are 2.36% (Table 7). Tables 8, 9 and 10 show the production of main crops, vegetables, fruit as well as grapes, olives and citrus fruits separately.

*Locally picked chestnuts © Rina Kovači*

*Table 7: Agricultural land in Ulcinj municipality*

| **no.** | | **Area (ha)** |
|---|---|---|
| **1** | Agricultural Land | 6,501 |
| **a** | Arable Land and Gardens | 3,481 |
| **b** | Orchards | 820 |
| **c** | Vineyards | 95 |
| **d** | Grasslands | 2,105 |
| **2** | Pastures | 4,729 |
| **3** | Ponds, Fisheries and Peatland | 272 |
| **TOTAL** | | 11,502 |

*Table 8: Crops and vegetables produce in Ulcinj municipality/year*

| **Type of Crop/Vegetable** | **Area (ha)** | **Yield (t)** | **Yield per ha** |
|---|---|---|---|
| Corn | 800 | 3200 | 4 |
| Wheat | 300 | 900 | 3 |
| TOTAL | 1100 | 4100 | 3.5 |
| Potato | 400 | 40 | 10 |
| Tomato | 250 | 30–35 | 8 |
| Bell Pepper | 250 | 30–36 | 8 |
| Watermelon | 400 | 30–35 | 11 |
| Beans | 60 | 9–12 | 5 |
| Other | 221 | 30–35 | 7 |
| **TOTAL** | 1,581 | 193 | 8 |

*Table 9: Fruit production in Ulcinj municipality*

| | **No. of Trees** | **t** | **Yield per Tree** |
|---|---|---|---|
| Apple | 700 | 42.5 | 40.0 |
| Pear | 3,500 | 87.5 | 40.0 |
| Plum | 2,200 | 55.0 | 40.0 |
| **TOTAL** | 7,400 | 184.5 | 40.0 |

*Table 10: Production of grapes, olives and citruses*

| | **Number of Vines/Trees** | **t** | **Yield per Vine/Tree (kg)** |
|---|---|---|---|
| Vineyards | 119,000 | 143 | 0.8 |
| Olives | 120,000 | 60 | 2 |
| Citruses | 286,000 | 14 | 20 |

*Local food in LBBUEC © Rina Kovači*

**1.1.1.2** Fibres and Other Materials from Cultivated Plants, Fungi, Algae and Bacteria for Direct Use or Processing (Excluding Genetic Materials)

Ulcinj inhabitants use timber from local forests primarily for heating, and they use reed, which is plentiful along Bojana River, wetlands and lakes, for e.g. fencing houses. The total forest area and forest land on the territory of the municipality of Ulcinj is 11,792.25 ha or 46.24% of the area of the municipality. Of that, state forests and forest land are 6,770.60 ha or 57.4%, and private ownership is 5,021.65 ha or 42.6%. The structure of state forests and forest land according to the form of cultivation is: high forests 4%, coniferous plantations 3%, floodplain forests 7%, shrubs 23%, marsh shrubs 5%, maquis 20% and forest land 37% (Municipality Ulcinj, 2016a). Table 11 gives an overview of tree cutting in the municipality (National Statistics Agency - Monstat, 2016). A lack of data is evident from the table and the reported numbers are likely significantly higher since illegal deforestation is an issue noted by local SHs.

*Table 11: Tree cutting in and out of forests in Ulcinj (m3)*

| Year | Gross Volume | Cutting of Deciduous | Cutting of Coniferous | State Forests Total | Saw Logs, Lumber and Space Wood | Firewood | Waste |
|---|---|---|---|---|---|---|---|
| **2012** | 925 | 925 | - | - | - | 925 | |
| **2013** | - | - | - | - | - | - | |
| **2014** | - | - | - | - | - | - | |
| **2015** | - | - | - | - | - | - | |
| **2016** | 2,302 | 2,302 | - | 10 | 2,302 | - | |

**1.1.3.1** Animals Reared for Nutritional Purposes and 1.1.3.2 Fibres and Other Materials from Reared Animals for Direct Use or Processing (Excluding Genetic Materials)
It is uncertain how many reared animals are used for nutritional purposes and how many are used for their products. The Spatial and Urbanistic Plan (Municipality Ulcinj, 2016a) provides an overview of animals in Ulcinj municipality for the years of 2006, 2010 and 2011 (Table 12).

*Table 12: Animals reared for consumption or derived products*

| | No. of Livestock/Units | % compared to entire MNE | No. of Livestock/Units | % compared to entire MNE | No. of Livestock/Units | % compared to entire MNE |
|---|---|---|---|---|---|---|
| | **2005** | | **2010** | | **2011** | |
| Cow | 4533 | 4,5 | 2610 | 3,1 | 3312 | 3.9 |
| Sheep | 7431 | 3,3 | 6627 | 2,9 | 6516 | 3.1 |
| Horses | 97 | 1,4 | 90 | 1,3 | 31 | 0.8 |
| Pigs | 255 | 2,1 | 93 | 0,9 | 130 | 0.9 |
| Poultry | 24552 | 6,5 | 26327 | 6,2 | 20162 | 6.1 |
| Bee hives | 433 | | 1079 | | 842 | 2.0 |

**1.1.5.1** Wild Plants (Terrestrial and Aquatic, Including Fungi, Algae) Used for Nutrition & 1.1.6.1 Wild Animals (Terrestrial and Aquatic) Used for Nutritional Purposes

This assumes plants such as sage (*Salvia officinalis*), asparagus (*Asparagus acutifolius*), pomegranate (*Punica granatum*), rosemary (*Rosmarinus officinalis*) etc., and non-woody forest products such as fungi. The data on the amount of wild plants and fungi, according to our literature research, is not collected thoroughly. Although companies who collect edible plants and fungi have to apply for a collection and selling permission to the Environment Protection Agency (EPA), many collectors are not registered as companies or entrepreneurs and pick and sell the collected material on the black market.
The data on wild animals, i.e. game, fish and seafood is collected for the Ulcinj municipality by the Ministry of Agriculture, Forestry and Water Management, but is not publicly available, and was not obtained for the purposes of this study.

*Sheep © Jelena Popović*

*Fishing in Buna river © Mediterranean wetland secretariat, A. Camaro*

**4.2.1.1** Surface Water for Drinking, **4.2.2.1** Ground (and Subsurface) Water for Drinking, **4.2.1.2** Surface Water Used as Material (Non-drinking Purposes) & **4.2.2.2** Ground Water (and Subsurface) Used as Material (Non-drinking Purposes)

According to the Spatial and Urbanistic Plan of Ulcinj municipality 2016–2020 (Municipality Ulcinj, 2016a) both surface and groundwater from the municipality territory is used for drinking (Table 13). River Bojana is also used for irrigation, as well as groundwater sources (Ministry of Agriculture and Rural Development, 2017).

*Table 13: Water sources in Ulcinj municipality*

| **Water Source** | **Type** | **No. of Pumps** | **Flow (l/s)** |
|---|---|---|---|
| **System for Water Distribution in Ulcinj (Center)** | | | |
| Lisna Bori | Well | 12 | 200 |
| Gač | Well | 3 | 30 |
| Klezna | Well | 3 | 15 |
| Mide | Spring | - | 10 |
| Kaliman | Spring | - | 4 |
| Salč | Spring | - | 3 |
| **System for Water Distribution in Vladimir (2nd Largest Settlement in Ulcinj)** | | | |
| Lisna Bori | Exploitation Well | - | - |
| Brajše | Spring | - | 5 |
| TOTAL | | 18 | 267 |

**4.3.1.1** Mineral Substances Used for Nutritional Purposes

This is a potential ecosystem service (that also existed in the past) and refers to the production of salt for nutritional purposes. The Ulcinj Salina in Ulcinj municipality is among the 10 biggest salinas in the Mediterranean, although it is one of the smallest when it comes to annual production rates. The production of salt stopped more than a decade ago due to the bankruptcy of the company "Bajo Sekulić", but many have been advocating for its re-establishment. The Ulcinj Salina capacity is around 50,000 t, but the maximum achieved production was around 41,000 t (Municipality Ulcinj, 2016a).

**4.3.1.2** Mineral Substances Used for Material Purposes

ES that currently exist and are exploited are: construction stone, decorative stone and gravel and sand. Construction stone is extracted from 3 locations, "Ristova ponta", "Darza" and "Borik 2" (Table 14, 15 and 16). Decorative stone is extracted from the location "Krute" (Table 17). Gravel and sand are extracted from the locality "Sv. Nikola" in the Ulcinj field, and the reserves are estimated to be over 200

milion $m^3$ (Municipality Ulcinj, 2016a).

*Table 14: Construction stone extraction – Darza*

| **Reserves ($m^3$)** | **Category B** | **Category C1** | **Total Reserves ($m^3$)** |
|---|---|---|---|
| Geological | 862,410.00 | 1,542,560.00 | 2,404,970.00 |
| Balance Reserves | 862,410.00 | 1,542,560.00 | 2,404,970.00 |
| Exploitational | 776,169.00 | 1,388,304.00 | 2,164,473.00 |

*Table 15: Construction stone extraction – Borik II*

| **Reserves ($m^3$)** | **Category B** | **Category C1** | **Total Reserves ($m^3$)** |
|---|---|---|---|
| Balance and Geological | 290,304.00 | 62,851.00 | 353,155.00 |
| Exploitational | 276,789.00 | 59,780.00 | 336,569.00 |

*Table 16: Construction stone extraction – Ristova Ponta*

| **Reserves ($m^3$)** | **Category B** | **Category C1** | **Total Reserves ($m^3$)** |
|---|---|---|---|
| Geological | 759,617.90 | 918,388.34 | 1,678,006.24 |
| Balance | 759,617.90 | 918,388.34 | 1,678,006.24 |
| Exploitational | 683,251.10 | 826,549.50 | 1,509,800.60 |

*Table 17: Decorative architectural stone – Krute*

| **Category of Reserves** | **Total Geological Reserves** | **Reduced Reserves** | **Reserves in Blocks** |
|---|---|---|---|
| A | 321,125.70 | 285,801.87 | 61,447.40 |
| B | 245,518.50 | 218,511.47 | 46,979.96 |
| A+B | 566,644.20 | 504,313.34 | 108,427.36 |

The potential ES that could be utilized in the future are: salt (for healing), peloid, sulfur thermo-mineral waters, asphalt, crude oil and gas, cement marls, bauxite and quartz sand. These are all recognized as potential by the Spatial and Urbanistic Plan of Ulcinj Municipality 2016–2020 (Municipality Ulcinj, 2016a).

Besides NaCl as the basis of salt, salt contains other minerals: K, Li, Sr, Rb, Ca, M, Al, Fe, Si, P, parts of microorganisms and sea water, algae and plantktons. With the degradation of these, amino acids are created (proline, tryptophan, lysine, histidine), and thus salt can also be used in medicinal and balneological purposes, for healing various rheumatic diseases, neurological diseases and complications, muscle injuries, tendons, peripheral nerves and after-fracture and after-trauma states. It also has antiseptic and antihistaminic effect which makes it beneficial for treating skin allergy reactions (Sovinc A. et al., 2017).
After "salt picking", the salt solution that remains is fine peloid. According to research, the highest quality peloid can be found in Lake 1 in Ulcinj Salina. It is a very greasy type of mud, dark gray to almost black in color. It has a fine kaloid structure (Ph 8.4–8.5), salty taste

and odor similar to hydrogen sulfide. Peloid is covered with earth and sand. Its reserves are very large and are estimated at more than 350,000 m3. Peloid is a heterogeneous compound containing: Na, K, $SiO_2$, $Al0_3$, $FeO_3$, CaO, MgO, $CO_2$, then bitumen, minerals from sand, humic acid 3.30%, organic matter and radioactive elements uranium and radium. Elements and compounds such as S, Ca, P, $H_2S$, $CO_2$ by penetrating the skin act as biologically active substances. The use of peloids for medical purposes is called peloidotherapy and is a very important method of physical medicine. It has a thermal and mechanical effect, and has a beneficial effect on local inflammatory processes, regenerative processes, trophic changes in the skin, and the like. It also acts on the symptoms of pain (analgesic and antispasmodic). It is therefore widely used in code arthritis, arthrosis, periarthritis, tendinitis, bursitis, myalgia, fibrositis, spondylosis and discopathy, post-traumatic contractures, delayed callus production, neuralgia and neuritis, peripheral nerve lesions, chronic gynecological diseases, sterility, postoperative infiltrates, in uncomplicated varicose syndrome (without ulceration). It is also used for cosmetic purposes. Peloid irritates both extero and interoreceptors, causing a number of neurohumoral and neuroenfocrine reactions because it induces production through the adrenal cortex glucocorticoids, which has a beneficial effect on inflationary processes (Sovinc A. et al., 2017).

Other minerals that could potentially be used for non-nutritional purposes:

- Cement marls, found in the location "Donja Klezna", have significant potential quantities of basic raw materials for cement production
- Bauxites occur around the area Pelinković, then from Kunj through Mala and Velja Gorana to Sv. Đorđe
- Quartz sand is found in the northern part of Ulcinj field, Pistula, in two localities, "Škaret" (estimated reserves 2,140,000 t) and "Zekova šuma" (estimated reserves 1,396,000 t). Their granulometric composition is from 0.02 to 1.5 mm.
- Asphalt is found at the locations Katrani, Bašbuljuci, on the west side of Meternice and beneath the Pinješ area
- Crude oil and gas were found in Ulcinj in 5 deep and 4 shallow wells, in the drilling period of 1952–1960. In the most recent drillings of crude oil in marine water of Ulcinj beneath the depth of 6000 m, crude oil was not found in quantities sufficient for extraction (Slobodna Evropa, 2022).

**4.3.2.1** Non-Mineral Substances or Ecosystem Properties Used for Nutritional Purposes

Due to very high average solar radiation in Ulcinj, to which only Bar municipality has a small advantage in Montenegro, 4,254 Wh/m2/day, sunlight as source of Vitamin D is an important ES in this area. (Ministry of Sustainable Development and Tourism with IBI Group, 2012)

**4.3.2.3** Wind Energy, **4.3.2.4** Solar Energy, **4.3.2.5** Geothermal & **4.3.2.6** Cooling with Sea Water

The potential ecosystem services in Ulcinj municipality are obtaining electricity from wind, solar and geothermal energy and cooling of buildings from sea water.
The Spatial and Urbanistic Plan for Ulcinj Municipality 2016–2020 (Municipality Ulcinj, 2016a) due to the MORT's "solar study" (Ministry of Sustainable Development and Tourism with IBI Group, 2012) with main directions for use of municipality space for obtaining electricity from solar energy. In rural area predicted are 9 zones, with a total area of 576.70 ha, whose solar energy potential is 144.17 MW. In the urban area, there are 2 zones with a total area 4.45 ha, whose solar energy potential is 1.11 MW. More specifically, in the rural area, 6 locations were chosen, of total area 33.15 ha, with solar energy potential 8.29 MW. In the urban area, 6 locations were chosen, total area 0.94 ha, with solar energy potential 0.23 MW. Most of the rural zones and locations are on Briska gora hill, while urban area zones and locations are in the city core, on suitable public buildings.

As a wind energy project, the Spatial Plan planned wind turbines on Možura Hill, on the border of Ulcinj and Bar municipality, which was accomplished and wind turbines opened in 2019.

The Spatial Plan for Ulcinj Municipality also recognizes geothermal energy as a potential electricity source – especially in the hinterland of the municipality, and establishment of a system of cooling with sea water as a potential energy project. The Spatial plan also states feasibility studies will be created for these energy projects.

# REGULATION AND MAINTENANCE ECOSYSTEM SERVICES

The definition of this ES group: "All the ways in which living organisms can mediate or moderate the ambient environment that affects human health, safety or comfort, together with abiotic equivalents." This group of ecosystem services is particularly under-researched, hence only sporadic data is available or simply general knowledge on ecosystem and species functioning. We identify the following in the LBBUEC:

## BIOTIC

**2.1.1.2** Filtration/Sequestration/Storage/Accumulation by Micro-organisms, Algae, Plants, and Animals

Definition: "The fixing and storage of an organic or inorganic substance by a species of plant, animal, bacteria, fungi or algae that mitigates its harmful effects and reduces the costs of disposal by other means." This ES is provided by all freshwater, brackish and sea water bodies of the project scope area (Bojana River and tributaries, lakes, small wetlands, Ulcinj Salina, Port Milena channel and marine waters) as microorganisms filter substances from the water and e.g. salt marsh grass can trap particles in their roots, sequestering wastes/toxicants in the sediment (Govers et al., 2014).

**2.1.2.1** Smell Reduction

Definition: "The reduction in the impact of odors on people that mitigates its harmful or stressful effect, or the cost of the nuisance". Birds, benthic organisms (epifauna, infauna and bacteria) contribute to this service by removing material such as rotting algae in the coastal area or the sea.

**2.1.2.2** Noise Attenuation

Definition: "The reduction in the impact of noise on people that mitigates its harmful or stressful effect, or the cost of the nuisance. Example services: shelter belts along motorways." This ES is provided, at minimum, by the flood plain forests of the hinterland of the Long Beach, protecting Donji Štoj and other nearby settlements fully or partially from noise coming from the Long Beach during the tourist season and especially loud music at night.

**2.2.1.1** Control of Erosion Rates

Definition: "The reduction in the loss of material by virtue of the stabilizing effects of the presence of plants and animals that mitigates or prevents potential damage to human use of the environment or human health and safety." All forested areas provide soil erosion prevention, most significantly forests of the Mountain Rumija where the soil erosion is the strongest in the project scope (Figure 18). Macroalgae, microphytobenthos, macrophytes and benthic organisms (epifauna and infauna) contribute to sediment stabilization in water bodies (Gligorović B., 2021).

**2.2.1.3** Hydrological Cycle and Water Flow Regulation (Including Flood Control and Coastal Protection)

Definition: "The regulation of water flows by virtue of the chemical and physical properties or characteristics of ecosystems that assists people in managing and using hydrological systems, and mitigates or prevents potential damage to human use, health or safety." This includes the capacity of vegetation to retain water and release it slowly, hence all forested areas of the LBBUEC are included.

**2.2.1.4** Wind Protection

Definition: "The reduction in the speed of movement of air by virtue of the presence of plants and animals that mitigates or prevents potential damage to human use of the environment or human health and safety". Forest belts are proven to provide wind protection, e.g. forest belt in the hinterland of the Long Beach providing wind protection to Donji Štoj and other settlements.

**2.2.1.5** Fire Protection

Definition: "The reduction in the incidence, intensity or speed of spread of fire by virtue of the presence of plants and animals that mitigates or prevents potential damage to human use of the environment or human health and safety". All water or semi-water bodies are natural "fire extinguishers", i.e. Bojana River, lakes, small wetlands, Ulcinj Salina, Port Milena channel, and are able to reduce the frequency, spread or magnitudes of fires.

**2.2.2.1** Pollination (or 'Gamete' Dispersal in a Marine Context)

Definition: "The fertilisation of crops by plants or animals that maintains or increases the abundance and/or diversity of other species that people use or enjoy". About 88% of all flowering plants and 35% of the global plant-based food supply relies on pollinators to be successful. Insect pollinators, from order Lepidoptera, Hymenoptera and Diptera are mostly responsible for pollination (Franchi & Pacini, 1996). Ulcinj municipality has 1,931.1 ha perennial pastures and meadows which serve the purpose of providing pollinator habitat (Zvizdojević J. et al., 2010).

**2.2.2.3** Maintaining Nursery Populations and Habitats (Including Gene Pool Protection)

Definition: "The presence of ecological conditions (usually habitats) necessary for sustaining populations of species that people use or enjoy". This assumes conservation of existing wild species habitats which are many in Ulcinj, some of the most vulnerable being coastal and brackish water habitats, due to intensive tourism pressures and climate change.

**2.2.3.1** Pest Control (Including Invasive Species) & **2.2.3.2** Disease Control

Definition of pest control: "The reduction by biological interactions of the incidence of species that prevent or reduce the output of food, material or energy from ecosystems, or their cultural importance, by the consumption of biomass or competition".
Definition of disease control: "The reduction by biological interactions of the incidence of species that otherwise could prevent or reduce the output of food, material or energy from ecosystems, or their cultural importance, by hindering or damaging the ecological functioning of useful species".

In the LBBUEC there are Odonata (dragonflies) and water-based predator Coleoptera (beetle) species, which are natural regulators of many parasite Diptera species (mosquitos, flies, gadflies, sewer flies etc.) and as such participate in the control of disease transmission like yellow fever, leishmaniasis etc. Additionally, the LBBUEC provides valuable habitat for native pest control agents due to the diversity of freshwater and brackish habitats (Gligorović B., 2021).

**2.2.4.2** Decomposition and Fixing Processes and Their Effect on Soil Quality

Definition: "Decomposition of biological materials and their incorporation in soils that maintains their characteristics necessary for human use". Species from orders Annelida (segmented worms), Myriapoda (millipedes, centipedes etc.) and saproxyl larvae of Coleoptera (beetles) participate in the creation of fertile soils by feeding on dying trees and other vegetation and thus enabling the decomposition of organic matter (Gligorović B., 2021).

**2.2.6.1** Regulation of Chemical Composition of Atmosphere and Oceans & **2.2.6.2** Regulation of Temperature and Humidity, Including Ventilation and Transpiration

Definition **2.2.6.1**: "The regulation of the concentrations of gases in the atmosphere that impact the global climate or oceans".
Definition **2.2.6.2**: "Mediation of ambient atmospheric conditions (including micro- and meso-scale climates) by virtue of presence of plants that improves living conditions for people. Example service: Evaporative cooling provided by urban trees". Tranvik et al., (2009) show that lakes are regulators of carbon cycling and climate; carbon is stored in forests (Liski et al., 2006) and wetlands (Santos et al., 2004).

## ABIOTIC

**2.2.2.2** Seed Dispersal

Definition: "The dispersal of seeds and spores of plants and other organisms that are important to people in use and non-use terms". Seed dispersal in temperate climates is done mostly abiotically, i.e. through wind dispersal, but also occasionally by insect dispersal (Franchi & Pacini, 1996).

**5.1.1.1** Dilution by Freshwater and Marine Ecosystems

Definition: "The reduction in concentration of an organic or inorganic substance by mixing in a fresh water ecosystem that mitigates its

harmful effects and reduces the costs of disposal by other means". Water bodies of the LBBUEC, primarily River Bojana and the marine ecosystem where waste waters are disposed of, act as pollution sinks and purify waste waters that are inputed.

**5.2.1.1** Mass Flows

Definition: "Mediation of solid flows by natural abiotic structures that can protect people". An example service is sand bars providing coastal protection, which are present in the Long Beach and Ada Bojana Island beach. Also, an ES are the large amounts of sediments carried by the Drin and Buna rivers and support the stabilization of the Adriatic shoreline.

**5.2.2.1** Maintenance and Regulation by Inorganic Natural Chemical and Physical Processes

Definition: "Maintenance of physical, chemical, abiotic conditions that affect people's well-being or comfort". Example service are land/sea breezes, which are very common in Ulcinj, where there are only 14.23 days without wind (Municipality Ulcinj, 2016a).

# CULTURAL ECOSYSTEM SERVICES

Cultural services are defined by CICES as: "All the non-material, and normally non-rival and non-consumptive, outputs of ecosystems (biotic and abiotic) that affect physical and mental states of people". Material cultural objects for which data exists can be seen in Figure 14.

We identify the following cultural ES in the LBBUEC:

## BIOTIC

**3.1.1.1** Characteristics of Living Systems That Enable Activities Promoting Health, Recuperation or Enjoyment through Active or Immersive Interactions

*SUP board paddling in Bojana river © Rina Kovači*

*SUP board paddling 1 © Rina Kovači*

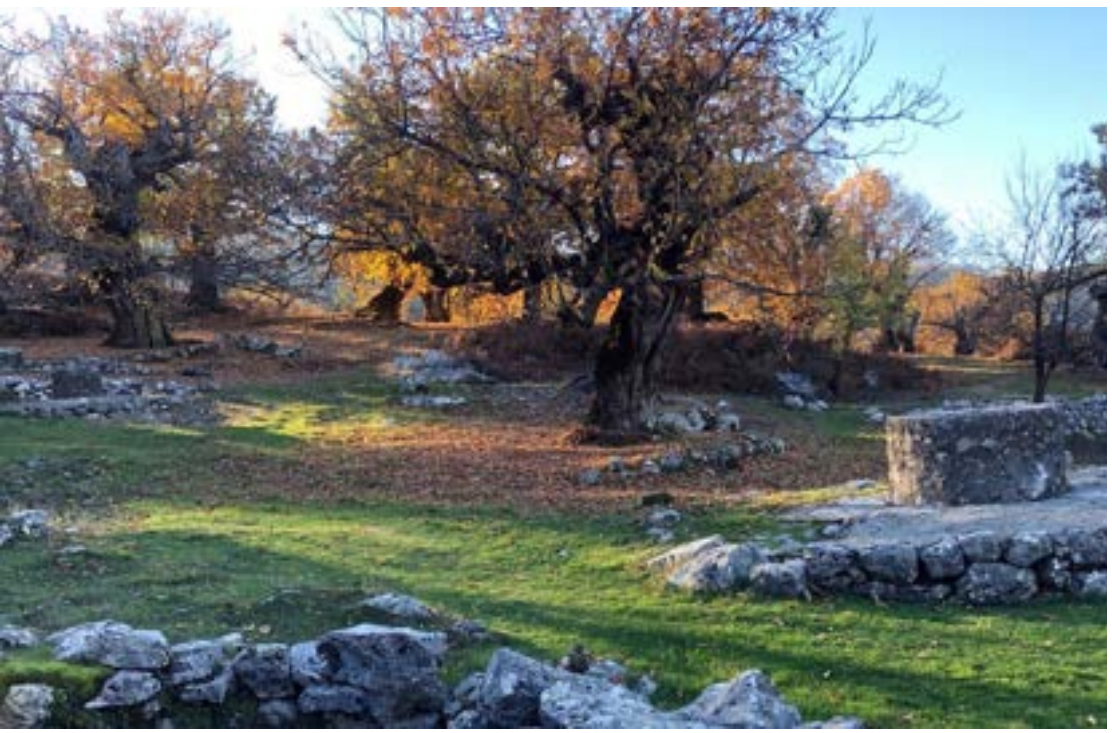
*Kitesurfing on the Long beach © Kiteloop club*

*SUP board paddling 2 © Rina Kovači*

*SUP board paddling in Bojana river and Šas lake © Rina Kovači*

This assumes swimming, wind surfing, kayaking, snorkelling and scuba diving; beach sports; running, hiking, biking; etc., which is all possible in the LBBUEC while some activities (e.g. hiking) are possible year round, due to the variety of habitats (coastal, pastures, woodland, lakes etc.) and favourable temperature.

*Archaeological park Šas © Zenepa Lika*



*Wells and drinking source on the Mide-Ostros hiking trail © Rina Kovači*

*Olive plantations in Valdanos © Rina Kovači*

*Birdwatching in Ulcinj salina © Marija Šoškić*

**3.1.1.2** Characteristics of Living Systems That Enable Activities Promoting Health, Recuperation or Enjoyment through Passive or Observational Interactions

E.g. wildlife observation e.g. birds, dolphins, reptiles etc.

**3.1.2.1** Characteristics of Living Systems That Enable Scientific Investigation or the Creation of Traditional Ecological Knowledge

Assumes sites that are of special scientific interest or protected areas etc.

**3.1.2.2** Characteristics of Living Systems That Enable Education and Training

Assumes training of young conservationists/biologists on site, or performing voluntary conservation activities.

**3.1.2.3** Characteristics of Living Systems That Are Resonant in Terms of Culture or Heritage

The best example for the LBBUEC are the Valdanos olive plantations and olive plantations in the LBBUEC in general, where biophysical characteristics of species contribute to cultural heritage or historical knowledge. Olive picking and economic dependency on this branch of agriculture created a culture of respect and appreciation of olive gardens, where, especially the older Ulcinj citizens, were taught to respect, take care and thank the olives at the end of picking with a special ritual (Geci R., 2020).

*Fishing near Ada Bojana island 2 © Isidora Ćalović*

**3.1.2.4** Characteristics of Living Systems That Enable Aesthetic Experiences

Refers to the areas of outstanding natural beauty that provide aesthetic enjoyment, artistic inspiration etc. Several places in the LBBUEC are known for their aesthetic appeal, Long Beach and Ada Bojana beach with beautiful sunset views, Ulcinj Salina with an enormous bird diversity, Valdanos olive plantations, Lake Šas and Bojana River with amazing wildlife surrounding them etc.

**3.2.1.3** Elements of Living Systems Used for Entertainment or Representation

Refers to the elements of nature used to make nature films, archive records or collections. Several independent nature-based clips/films for Ulcinj municipality have been made (e.g. by Citiesin4k), and the Natural History Museum of Montenegro contains material collected from this municipality, as well as, likely, other Museums in the region or wider too.

**3.2.2.1** Characteristics or Features of Living Systems That Have an Existence Value

Definition (CICES 5.1.): "The biophysical characteristics or qualities of species or ecosystems (settings/landscapes/cultural spaces) which people seek to preserve because of their non-utilitarian qualities".

**3.2.2.2** Characteristics or Features of Living Systems That Have an Option or Bequest Value

Definition (CICES 5.1.): "The biophysical characteristics or qualities of species or ecosystems (settings/landscapes/cultural spaces) which people seek to preserve for future generations for whatever reason".

## ABIOTIC

**6.1.1.1** Natural, Abiotic Characteristics of Nature That Enable Active or Passive Physical and Experiential Interactions

An example of abiotic nature characteristics that enable interactions are caves, and potential ecotourism in them. Sumporna and Jošova caves are present in the Ulcinj city center with recently re-discovered bat colonies (Đurović M., 2019), as well as many caves along the coastal cliffs of Ulcinj, a cave beneath the Old Town of Ulcinj and potentially more.

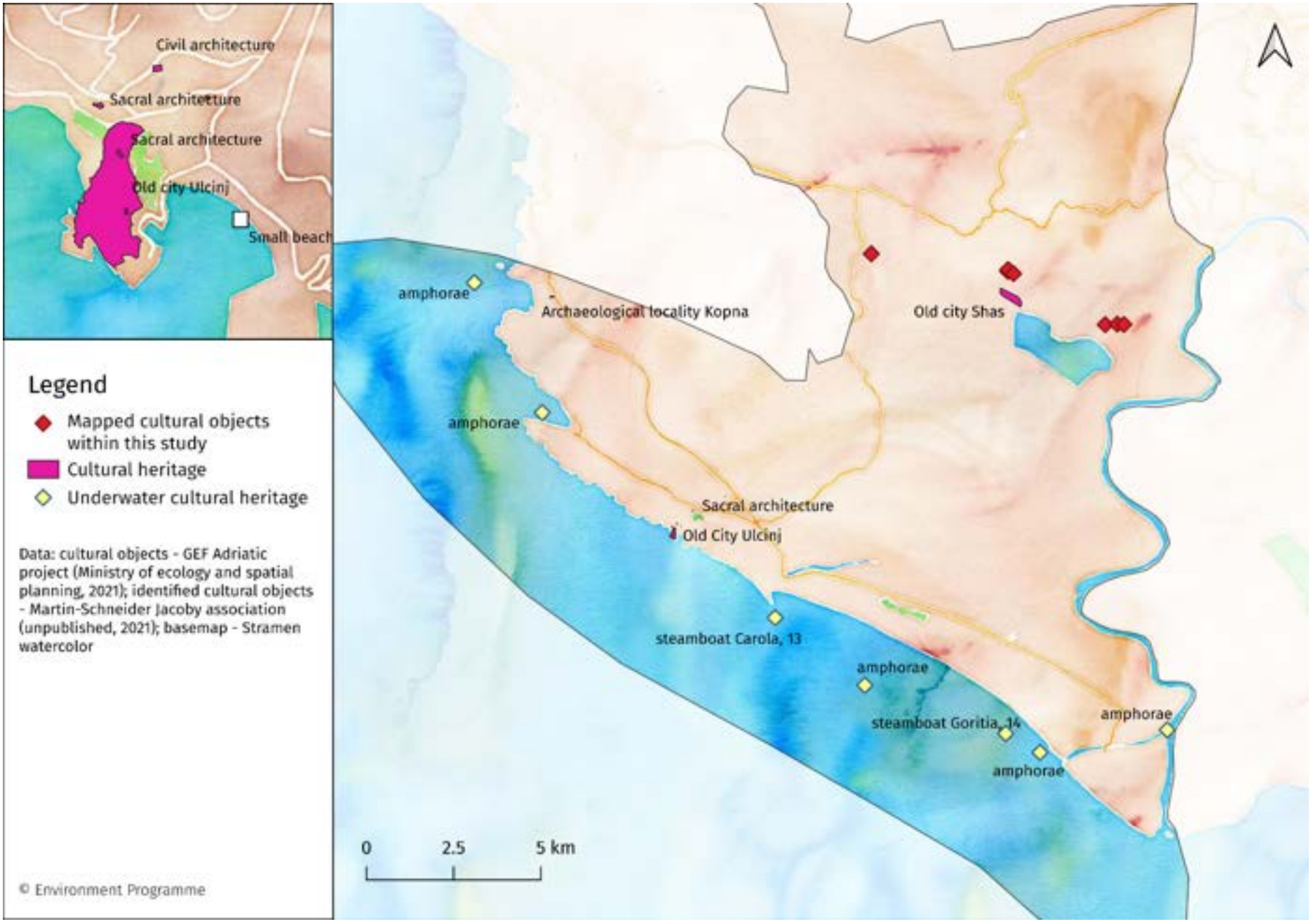
**6.1.2.1** Natural, Abiotic Characteristics of Nature That Enable Intellectual Interactions

E.g. Rock faces for climbing. This is a potential ecosystem service in Ulcinj as there are potential cliffs/rocks that could be bolted for free climbing or used for alpinistic climbing too.

**6.2.1.1** Natural, Abiotic Characteristics of Nature Spiritual, Symbolic and Other Interactions

We believe that for some people, locals or tourists, the nature of the LBBUEC can have a spiritual or symbolic meaning.

*Figure 14: Cultural objects in the LBBUEC and housing objects mapped by NGO MSJA*




# MAPPING CULTURAL ECOSYSTEM SERVICES IN ŠAS, AMBULA AND DONJA KLEZNA

Within the project, the project partner and collaborator NGO Martin Schneider-Jacoby Association mapped material cultural objects on 3 locations in the Bojana basin: Šas, Ambula and Donja Klezna, covering 10 different houses. Excluded from this mapping were the cultural objects such as churches and archaeological sites, which require more time and effort, due to the limited resources of the project.

The houses identified in these three settlements are all made from stone, and date back in the period from 1924 to 1960. They were mostly built by the people themselves, with the guidance of an artisan of the area.

Stone houses authentically depict the way of life of the Ana e malit area – the construction of the space is minimized and harmonized with the ambient and terrain conditions. They are

not luxurious or built to impress, they are primarily functional, aiming to provide a roof over the heads of residents, guests and cattle. At this time, it was usual to build one common house for both cattle and people, not minding the cattle odors and other inconveniences, as the financial conditions were not very permitting to build separate stables, and because of one important benefit: the cattle kept the house warm during the winter. The houses were precisely carved by thick stone walls, and regardless if the construction of the houses was of closed type, the doors of people were always open to anyone in need of a short shelter or a longer stay. The hospitality of this area is characteristic and a part of the mentality today as well.

The following section represents an overview of the cultural mapping by Lika Z., (2021) from NGO MSJA with interesting and relevant details from family life, housing etc.

## I Šas Settlement

*House of Osman Salaj, built around 1938–1945 © Zenepa Lika*

"The staircase is like a triumphal arch with a rectangular finish, framed by a massive  masonry pillar. This segment is unique in the whole Šas area and a sign of a rich family engaged in agriculture and livestock. ""The plot is fenced with a high dry stone wall where the access to the house used to be. In the yard there is a well over 350 years old and a trough for livestock feeding."

*House of Dyn Salaj, built circa 1960 © Zenepa Lika*

"... The double roof is very specific, seemingly flying in the air. Symbolically implies there are two heirs in the family."

## II Ambula Settlement

*House of Ćafo Boga © Zenepa Lika*

"Three generations lived in this two-story stone house. The house has traditionally built stone walls. On the north side of the house, a bakery used to be located, and this part is connected like a labyrinth with all other living spaces."

*House of Pralush Zef Shkreli © Zenepa Lika*

"This is one of the few single-story stone houses in the area. The building is oriented to the south and offers a spacious view of the large estate… The family of Boga migrated to the United States in the mid-1960s. An interesting fact that indicates multi ethnicity and coexistence is that half of the Boga family is of Catholic faith while the other half is Islamic."

## III Donja Klezna

*Old tools from the house of Merush Brahima Rexha © Zenepa Lika*

"This house is located near the old and protected stone bridge Klezna of the Ottoman period…A narrow hallway with built-in lanterns leads directly to the first room, where the kitchen and pantry were located. In the guest room there is an open firewood (fireplace and chimney) as well as a traditional stone stove (Alb. furra)."
"The house is still in a good shape and the owners are willing to renovate it but haven't had the financial possibilities to do so yet."

# 5.2. HUMAN WELL-BEING

Local SHs described the following as the most important aspects of their well-being in the project scope area:

Physical health: pine forest, healing mud, medicinal sand, sulfur water, medicinal herbs, healthy local food, clean environment, and clean water; mental health; economic well-being: tourism (& sports tourism), salt production, and renewable energy sources (solar energy); values and community; maturity of institutions to recognize the needs of the community; belonging to an organized community with a high level of awareness of the common good; family upbringing and family values (satisfaction with the community as a value); knowledge: awareness of sustainable development throughout the community as a general goal, and educational activities related to nature.

It is evident that, together with ecosystem services, more work on the human well-being is needed for both scientific argumentation and awareness raising on the components and their interrelation with the biodiversity.

*Coastal cliffs in LBBUEC © Robert Janković*

# 6

# POLICY AND STAKEHOLDERS

*Red bartsia (Parentucellia latifolia)*
*© Jelena Popović*

# 6.1. INTERNATIONAL AND NATIONAL POLICY FRAMEWORK FOR BIODIVERSITY PROTECTION

Montenegro ratified the Convention on Biological Diversity (1993) (CBD) on June 3rd 2006 and at the same time also the Cartagena Protocol on Biosafety to the Convention on Biological Diversity, (2000). In addition to the Convention on Biological Diversity, Montenegro is a party to many other international instruments closely related to the protection of nature and biodiversity, such as: the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) (1983), Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) (1982), Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (1975), Convention on Wetlands of International Importance (Ramsar) (1976) etc.

The Constitution of Montenegro (Article 23) (Government of Montenegro, 2007) states that everyone shall have the right to receive timely and full information about the status of the environment and to influence the decision-making related to issues of importance for the environment, and that everyone, the state in particular, shall be bound to conserve and promote the environment.

Laws[37] that provide a basis for biodiversity protection in Montenegro and therefore the Ulcinj municipality are:

- Law on the Environment (Official Gazette of Montenegro 52/16 and 73/2019),
- Law on Nature Protection (Official Gazette of Montenegro 54/16 and 18/2019),
- Law on Strategic Environmental Impact Assessment (Official Gazette of the Republic of Montenegro 80/2005 and Official Gazette of Montenegro 40/2011 and 52/2016),
- Law on Environmental Impact Assessment (Official Gazette of Montenegro 75/2018)
- Law on Game and Hunting (Official Gazette of Montenegro 2/08, 40/2011 and 48/2015),
- Law on Freshwater Fisheries and Aquaculture (Official Gazette of Montenegro 17/18),
- Law on Waters (Official Gazette of the Republic of Montenegro 27/07 and Official Gazette of Montenegro 73/10, 32/11, 47/11, 48/15, 052/16, 55/16, 02/17, 80/17 and 84/2018),
- Law on Forests (Official Gazette of Montenegro 74/2010, 40/2011 and 47/2015)
- Law on Waste Management (Official Gazette of Montenegro 64/2011 and 39/2016)
- Law on Exploration and Production of Hydrocarbons (Official Gazette of Montenegro 41/2010)

*[37] References: Government of Montenegro (2010, 2015b, 2015a, 2016a, 2016b, 2018a, 2018b, 2018c, 2019b, 2019a)*

The Law on the Environment governs the principles of environmental protection and sustainable development, instruments and measures for environmental protection and other issues of importance to the environment. The Law on Nature Protection governs the conditions and procedures for nature protection and conservation. The Law on Strategic Environmental Impact Assessment lays down the conditions, methods and procedures for assessing the impact of certain plans and programs on the environment by integrating environmental protection principles into the process of preparation, adoption and implementation of plans and programs that have a significant environmental impact. Objectives of strategic assessments include: 1) to ensure that environmental and human health issues are fully taken into account in the development of plans and programs; 2) establishing clear, transparent and efficient procedures for strategic assessment; 3) ensuring public participation; 4) ensuring sustainable development; 5) improving the level of protection of human health and the environment. The Law on Game and Hunting governs game management and hunting in Montenegro. The Law on Freshwater Fisheries and Aquaculture governs the use, conservation, fishing, aquaculture and trade of fish, crustaceans, shellfish, frogs and other living aquatic organisms in freshwater and other issues of importance for freshwater fisheries. Fish, crustaceans, shellfish, frogs and other living aquatic organisms in freshwater enjoy special protection. The Law on Waters governs the methods of integrated water management, water and coastal land and water facilities, conditions and method of performing water activities and other issues of relevance to water and water resources management. This law applies to: surface water, groundwater and mixed estuaries flowing into the sea; mineral and thermal waters; water resources; drinking water deposits in the territorial sea; coastal sea waters from land-based pollution. The Law on Waters defines the width of protection zones along rivers in which construction is not allowed, as well as the guidelines to be followed by the users of water bodies. The Law on Forests governs the cultivation, protection, conservation and improvement of forests, planning, conditions and methods of forest use, construction and maintenance of forest roads, forest monitoring, as well as other issues of relevance to forests, forest land and forestry. The Law on Waste Management governs the types and classification of waste, planning, conditions and procedures for waste management and other issues of relevance to waste management. Waste management involves the prevention and reduction of waste or the reuse of waste and the collection, transport, processing and disposal of waste, oversight of these procedures and subsequent maintenance of landfills, including the activities undertaken by waste traders and intermediaries.

Current protection recognitions (Figures 15 and 16) that encompass Montenegro and Albania are: Bojana/Buna basin and Skadar lake – Key Biodiversity Area (KBA), Important Bird Area (IBA) and Important Plant Area (IPA); "Shkodra Lake and River Buna" and "Lake Skadar" – Ramsar Wetland of International Importance.
In Albania: "Protected Landscape of Buna River and Velipoja" – Nature Park; "Protected Landscape of Buna River – Velipoja" – EMERALD candidate site; Lake Shkodra – Nature park; "Protected Landscape of Buna River – Velipoja" and Lake Shkodra – Important Bird Area (IBA).
In Montenegro: Ulcinj Salina – Nature park; "Ulcinj Salina" - Ramsar Wetland of International Importance; Stari Ulcinj Island – Nature Park (Marine Protected Area); Long Beach, Small Beach, Valdanos beach, Stari Ulcinj Island with its beach and six oak trees of three different species – Monuments of Nature; Ada Bojana Island with a part of the Long Beach – Important Plant Area (IPA); Ulcinj Salina and Lake Šas – Important Bird Areas (IBAs); River Bojana, Ada Bojana Island, Knete (small wetlands), Lake Šas and Long Beach with Ulcinj Salina – EMERALD candidate sites.

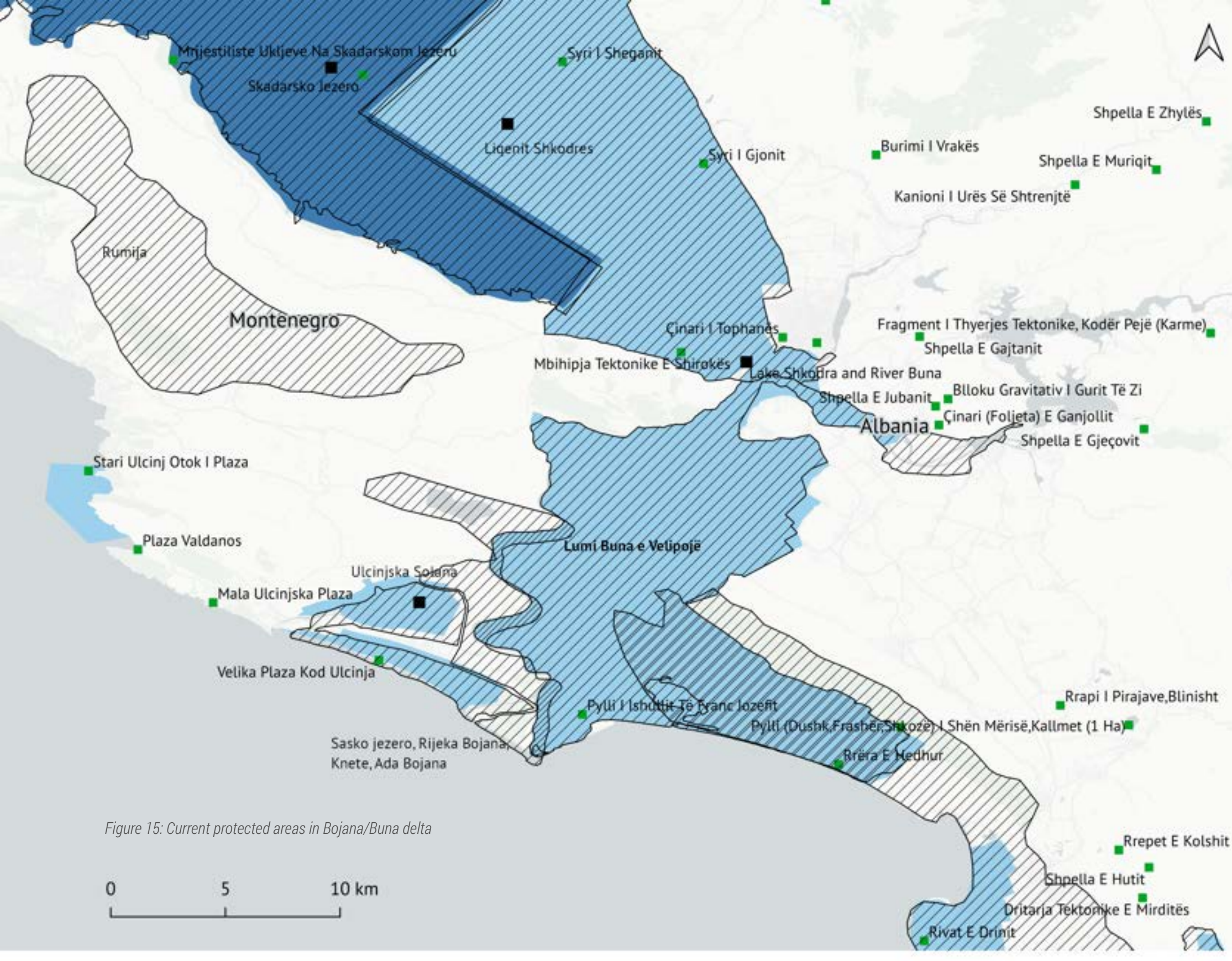



*Figure 15: Current protected areas in Bojana/Buna delta*

## Legend

- Monument of nature
- Nature park
- National park
- Ramsar site
- Potential EMERALD site

Data:
protected areas - UNEP-WCMC and IUCN (2021), Protected Planet: The World Database on Protected Areas (WDPA) and World Database on Other Effective Area-based Conservation Measures; GEF Adriatic project (Ministry of ecology and spatial planning. 2021);
basemap - Carto DB Positron

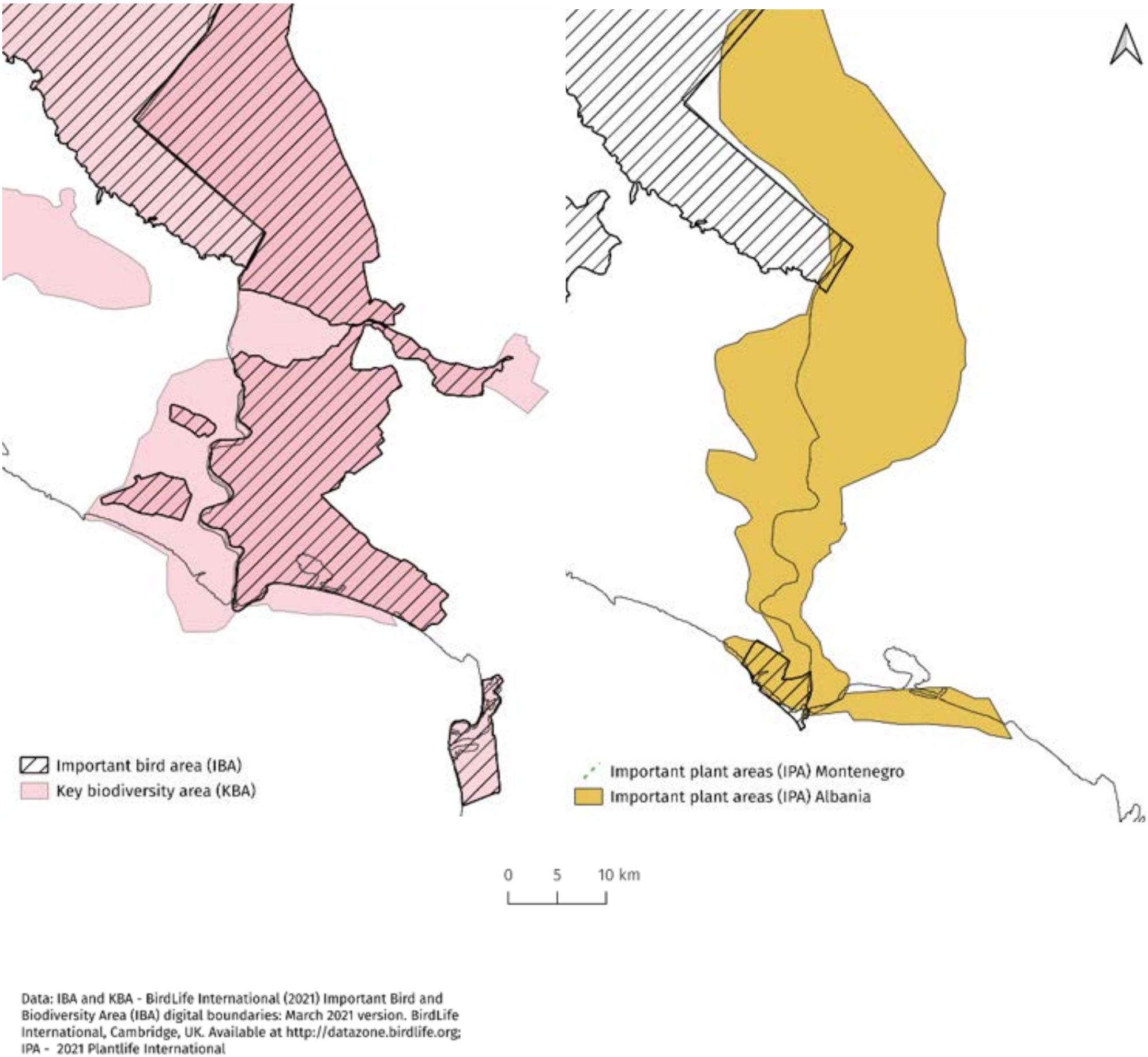
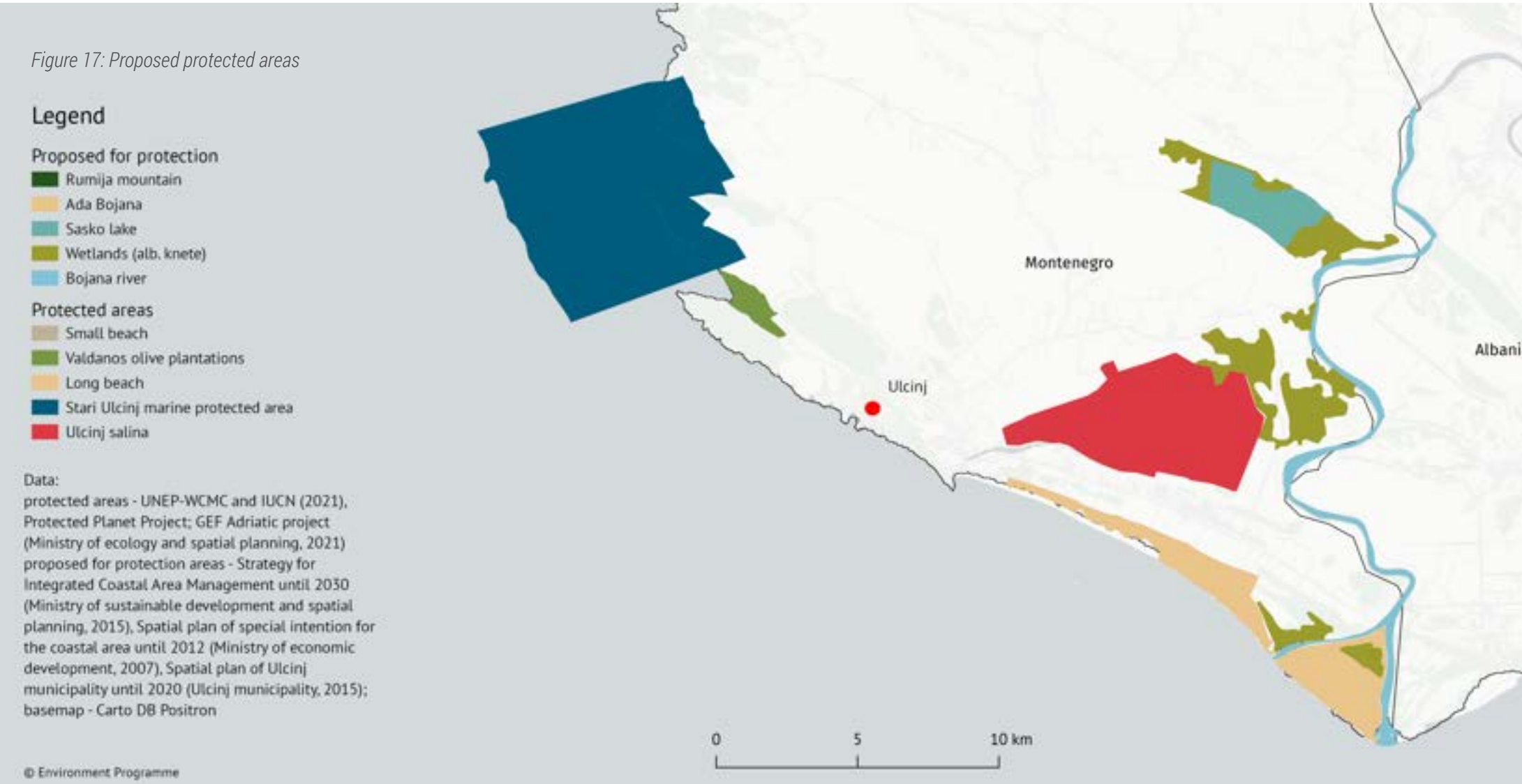



*Figure 16: IBA and IPA areas in Bojana and Buna delta*

Next to many levels of established designation in the area, there is still much potential for achieving a fully functional and representative protected area system. Many national level strategic and policy documents state the value of the Bojana basin and recommend new formal designations. The Spatial Plan of Montenegro 2008–2020 (Ministry of Economic Development, 2008) proposes to protect the Bojana Delta by "expanding the borders of the National Park Skadar/Shkodra Lake to the Regional Park Rumija or the area of Lake Šas/the River Bojana Delta". The Ministry of Sustainable Development and Tourism (2015) has agreed to follow the Strategy for Integrated Coastal Area Management until 2030 as follows: "Drafting of feasibility studies for putting under protection new protected areas at the coast (priorities: a. Marine areas, here relevant: a. Stari Ulcinj Island (protected recently); b. continental areas: Ulcinj Salina (protected recently), Lake Šas, Knete and Ada Bojana)." The National Biodiversity Strategy with Action Plan (2015–2020) (Ministry of Sustainable Development and Tourism, 2015a) propose the following localities to be protected under the category of nature monuments: Lake Šas and Ada Bojana. Local planning documents such as Municipal Flooding Protection Plan of Ulcinj as well as the current Spatial and Urbanistic Plan of Ulcinj (SUPU) (Municipality Ulcinj, 2016a, 2017) recognize the values of international and national importance, and the need for the protection of many areas in its administrative competence: Bojana River, Ada Bojana, Long Beach, Lake Šas, Ulcinj Salina, wetlands (Alb. knete), Valdanos. For many of these areas, the formal protection is still pending. Also, in some cases of designated protected areas, determining borders and zones, the studies for protection and management plans are stil missing (such as for long ago protected areas, e.g. Long Beach, Small Beach, Valdanos Beach, …) (Figure 17).

*Figure 17: Proposed protected areas*



# 6.2. OVERVIEW OF SECTORAL STRATEGIES AND PLANS

*Sunset view from Long beach © Isidora Ćalović*

# 6.2.1. TOURISM

The Spatial Plan of Montenegro until 2020 (SPM) (Ministry of Economic Development, 2007) envisages the construction of tourist facilities in the area of the Long Beach with its hinterland, Valdanos and specific tourist offers on Ada Bojana.

The Special Purpose Spatial Plan for Marine Zone, 2007 until 2020 (SPSPMZ) (Ministry of Economic Development and Coastal Management Facility, 2007), has the following sports locations and locations for active tourism proposed: windsurfing (several centres mainly on the open sea, e.g. Valdanos); water skiing, parachuting and jet skiing; sport fishing (fishing from a boat or spearfishing), which requires a good knowledge of local conditions (Bojana estuary, Milena Channel, Long Beach); swimming; water polo (Long Beach); tennis (Long Beach); golf (Long Beach); stables and horse races (Long Beach-Ada Bojana).

Special Purpose Spatial Plan for Coastal Zone from 2018 (SPSPCZ) (Ministry of Sustainable Development and Tourism, 2018) defines that the special areas for tourism are the Ada Bojana Island and Briska Gora as a golf course location. Key investments, state study locations (DSLs) and site studies are recognized to be needed for: Construction (brownfield and greenfield) of hotel resorts/ hotels on Long Beach and Ada Bojana; DSL sector 63 – old town Ulcinj; DSL part of sector 66 – tourist complex on Long Beach; General concept Long Beach (including the previous DSL). The final increase in accommodation capacity is stated to be in line with the basic methodological assumptions of the growth model budget and is reduced by about 15% compared to the ambitions expressed primarily in the General Concept of the Long Beach. This capacity is quite sufficient to meet the strategic goals of municipal tourism, but also for realistically feasible projects within the planning period.

The National Strategy for Sustainable Development until 2030 (NSSD) (Ministry of Sustainable Development and Tourism., 2015) indicates that plans for the development of large capacities (tourist and other) at a number of locations with valuable biodiversity and specific habitats have been adopted.

Strategic Development Plan for Ulcinj until 2020 (SDPU) (Municipality Ulcinj, 2016b) envisages in Valdanos: Project 6: the construction of a tourist center for excursions, entertainment, recreation and nature observation and revitalization of olive groves “olive grove Valdanos”; Project 7: creating conditions for the construction of the Medical Spa center.

Spatial and Urbanistic Plan of Ulcinj until 2020 (SUPU) (Municipality Ulcinj, 2016a) specifies the following: “At attractive locations on the coast – Long Beach, Ada Bojana and Mavrijan – the construction of tourism, sports and recreation of high category in significant capacities is planned.”

# 6.2.2. MARINE TRAFFIC

SPM (Ministry of Economic Development, 2008) envisages the following: standard marinas with capacities that meet the needs of boaters at key locations: Liman in Ulcinj. Specialized marinas refer to locations of great interest to boaters, however, due to certain environmental constraints, construction planning must be performed very carefully: Ada Bojana.

SPSPMZ (Ministry of Economic Development and Coastal Management Facility, 2007) provides the details on status and plans of marinas, but until 2020, with the current situation at Ulcinj city port as follows: non-commercial berths (mainly for smaller ships): 10; possibility to accept yachts – no. Four standard marinas are planned to meet the needs of boaters in other key locations where there is a presumed greatest interest in berths and there are possibilities for arranging marinas. The proposed location is Liman, near the old town (up to 300 berths). Further plans for special marinas are explained: three special marinas refer to the locations that are assumed to be of relatively high interest to boaters, but due to certain environmental constraints extreme caution is required when planning construction. This is especially true of the southernmost locations, and due to the uniqueness of the very attractive environment of Ada Bojana (up to 50 berths), and because the potential marina could endanger the rich bird fauna and the flow of the Bojana River. Commercial berths are provided in moorings, as specially built and arranged spaces for mooring vessels, along with tourist complexes and facilities. The planned locations are: Cape Đeran – Port Milena. In the next period, it is expected to establish a waterway on the Bojana River, which would create the connection of Skadar/Shkodra Lake–Adriatic Sea, as there existed before, but now with a strong tourist function. That implies finding a common interest with the Republic of Albania in the regulation of that route with the marking of navigable safety facilities and the establishment of appropriate services.

SPSPCZ (Ministry of Sustainable Development and Tourism, 2018) the newer planning document than the above indicated enables for the following spatial planning: anchorages – for larger and smaller ships – are planned to be near the St. Nikola Island, north of the Stari Ulcinj Island, near the chapel on the cliff of St. Neđelja; in Ulcinj, when the weather is nice and for storms, boats can anchor in front of the pier, during a storm on the part of the coast between Cape Mendra and Cape Đeran. Lake traffic is planned as follows: activation of the navigable connection: Bojana River, Port Milena system – channel (south of the salt plain) – Bojana River–Skadar/Shkodra Lake – which would activate and revitalize the lake traffic.

SUPU until 2020 (Municipality Ulcinj, 2016a) stipulates that: the construction of a new marina with accompanying infrastructure on the Liman in Ulcinj and new moorings in Valdanos, Port Milena and Ada Bojana will enable the development of coastal four nautical tourism facilities that will be built on the Ulcinj coast, as follows: marina in the city center, on the Liman, with 300 berths; mooring at Port Milena, with 100 berths; mooring at the Valdanos sports and recreation site, with 50 berths; mooring within the tourist complex Ada Bojana, with 50 berths.

# 6.2.3. FISHERIES

National Strategy for Integrated Management of Coastal Zone until 2030 (NSIMCZ) (Ministry of Sustainable Development and Tourism; UNEP; PAP/RAC, 2014) is planning berths for the needs of the fishing industry and sport-recreational fishing as well as communal berths of the local population that must be accomplished within the existing and planned port infrastructure, according to the requirements and needs of entities engaged in marine fisheries, all in accordance with applicable legislation. Registered catches of sea fish in Montenegro over the past few years have been modest, ranging from 700 tons to 800 tons per year. Due to the lack of comprehensive supervision and control at sea, illegal entry of foreign fishing vessels into the territorial sea of Montenegro is also evident, as well as examples of illegal and unregistered fishing within the national framework.

The SPSPCZ (Ministry of Sustainable Development and Tourism, 2018) establishes the following: Fisheries in the Mediterranean countries is an important economic activity, so Montenegro sees its chance in the sustainable development of marine fisheries and mariculture. For fisheries to develop in full function, logistical support must be provided on the coast, which means the establishment of infrastructure for fisheries on the coast. The Montenegrin fishing fleet has a small capacity (currently 131 vessels ), and in order to exploit the existing potentials in the future, a final fleet capacity of 223 vessels has been proposed, of which 85% of vessels would be vessels under 10 meters long. The designation, construction and equipping of the fishing port in Ulcinj (Cape Đeran), with the accompanying land infrastructure that includes catch management and the supply of vessels with fuel, water, electricity, ice, etc, and, if possible, places for dry hauling, overhaul, storage and processing facilities is recognized by the Plan.

The Fishing Strategy 2015–2020 (Ministry of Agriculture and Rural Development, 2015a) sets the strategic goal of connecting with tourism to be achieved primarily through the development of traditional coastal fishing whose product is high quality white fish, as well as the development of breeding.

# 6.2.4. MARICULTURE

The SPSPCZ (Ministry of Sustainable Development and Tourism, 2018) is proposing possible new zones for mariculture in Ulcinj, in Valdanos Bay and the surroundings of the Bojana River mouth. A potentially suitable area for the cultivation of marine organisms in extensive or strictly controlled semi-intensive type of cultivation is envisaged in the area of Ulcinj Salina.

[37] *Data from the development of the plan which was adopted in 2018. The vessel number has been lesser from 2018 and the following years.*

# 6.2.5. AGRICULTURE

The SPSPMZ (Ministry of Economic Development and Coastal Management Facility, 2007) gives an estimation of return to the previous agricultural capacities: Ulcinj field with 100 ha (revitalize olive trees plantation – 50 ha with a total of 10,800 trees; plan mandarin plantation – 50 ha with 35,000 trees or olive trees; renew irrigation system; renew wind protection belt of cypress – 3,500 trees; activate olive canning facility; activate the mandarin packing facility); Zoganj field with 110 ha (activate the already built amelioration system; activate the project on planting 60 ha of table olives; activate the project on planting 50 ha of mandarins); Štoj sands with about 1,000 ha (activate greenhouses for growing flowers 1 ha – bulbs; activate greenhouses 3 ha; activate extremely high quality and large areas for early and quality vegetables, seedlings, etc; achieve a minimum of 200 ha for growing early vegetables; plant 20 ha of aromatic herbs; plant 100 ha of medicinal plants – lavender, pyrethrum, rosemary; plant 300 ha of mandarins; plant 150 ha of table olives; introduce new fruit varieties like the avocado, etc. and constantly look for optimal varieties); Ada Bojana (Bojana mouth and the area along Bojana can be irrigated by open channels rich in fish; plant arable land with intensive crops of citrus, olives; along the Bojana develop cage fish farming in larger quantities); along Bojana 10 km lands up to Lake Šas (intensive livestock – meat, milk, eggs; activate the project for water abstraction from Bojana at 300 litres/sec near Sv. Đorđe for the irrigation of 1,000 ha).

The newer plan – SPSPCZ (Ministry of Sustainable Development and Tourism, 2018) – however, set for the following: Intensive agricultural areas (arable land) are flattened fields of alluvial and alluvial-colluvial lands of Ulcinj and Zoganj field, Štoj, Šas field and Anamalit field. On the land intended for "intensive agricultural area" it is not possible to expand the construction area or determine another purpose during further planning. There are two main goals of further improvement of agricultural production in the coastal area given within this plan: i) increasing the volume of production to the optimal use of available agricultural resources (use of available areas, and achieving optimal yields in crop and livestock production); ii) improving the quality of agricultural products and their better market valorization. Raising new olive groves in locations that are defined as attractive, such as terrains with 6–12% slope and terraces of southern exposure, at altitudes of 50–250 m (Valdanos, Ulcinj field – Zoganj, Bratice, Krute, and Šas field). These areas will be planted by filling existing and burned olive groves and new areas; iii) expand the area under citruses by raising new plantations in areas with favorable soil and climatic conditions, and thus try to substitute imports and provide certain quantities for export. The most suitable locations are flat areas or areas with a slope of 0 to 12%, up to 50 m above sea level, southern or southeastern exposure. Such terrains are in the area of Ucinj field, Štoj and around Bojana.

The NSSD (Ministry of Sustainable Development and Tourism., 2015) gives the indication that agricultural activities in areas with less potential for agricultural development or certain natural constraints are located mainly in the marginal areas of the field, terraces and plateaus on flysch and karst terrain – areas between Bar and Ulcinj – while the strategy NSIMCZP (Ministry of Sustainable Development and Tourism; UNEP; PAP/RAC, 2014)explains that the widest areas of great convenience for agriculture are located in the municipality of Ulcinj. That area contains flat alluvial and alluvial-colluvial soils – Ulcinj field, Štoj, Šas field and Anamalit field.

National Action Plan (NAP) for the Implementation of the Land Pollution Protocol (LBS) and its Regional Plans under the Strategic Mediterranean Action Plan (SAP-MED) to Achieve Good Environmental Status in Relation to ECAP Environmental Objectives, 2016 (NAP, 2016) (Ministry of Sustainable Development and Tourism, 2016a) estimates the following: olive growing is dominant in Ulcinj, citrus production in Ulcinj, and fruit production Tivat, Bar, Ulcinj, milk also in Ulcinj. It

further elaborates that in the process of transition, state-owned enterprises were closed (such as Agro Ulcinj), while there is a trend of intensive conversion of agricultural land into urban land. Today's agriculture is characterized by individual production. The amount of use of plant products is not known.

Strategy of Agricultural and Rural Development 2015–2020 (SARD) (Ministry of Agriculture and Rural Development, 2015b) assesses the situation as follows: Organic olive production in Montenegro is not developed, although there is a possibility for its development in certain isolated localities, e.g. Valdanos. Larger olive complexes exist in the Ulcinj–Valdanos area with 80,000 trees.

The SUPU (Municipality Ulcinj, 2016a) integrates the Agricultural Development Strategy directions: Agricultural land of the highest quality for olive groves and citrus orchards, which is located primarily in the coastal zone, and has regional and national significance, should be protected from construction activities.

# 6.2.6. EXPLOITATION OF MINERALS, OIL AND GAS

Potential spaces intended for exploration and exploitation of mineral deposits in the area Možura-Briska Gora is recognized by the SPSPCZ (Ministry of Sustainable Development and Tourism, 2018).

By the decision of the Government of Montenegro on determining the blocks for exploration and production of hydrocarbons (Official Gazette of Montenegro, No. 17/11, 51/14), the mainland and submarine are divided into blocks for exploration and production of about 300 km2. In accordance with the Law on Exploration and Production of Hydrocarbons (Government of Montenegro, 2010), the State has awarded several concession agreements for the production of hydrocarbons in the seabed of Montenegro.

# 6.2.7. WASTEWATERS

Wastewaters are considered as the most prominent and financially demanding problem in Montenegro, and also very prominent in Ulcinj area. The NSIMCZ 2015–2030 (Ministry of Sustainable Development and Tourism, 2014) provides for a situation analysis: pollution above the permitted limits (in relation to the prescribed quality classes) was recorded near the Bojana River. Bojana is already burdened with a significant input of pollution at the source, but due to the large amount of water quality parameters it remains within the prescribed limits (classes A2, C, II) until the lower course where (at Fraskanjel station) exceeding with certain pollutants occurs. Slowing down the flow and closure of the bed profile at the very mouth of Bojana (due to sediment deposits and relatively small depths) enhances the effect of pollution.

The NAP 2016 (Ministry of Sustainable Development and Tourism, 2016a) confirms that the Port Milena in Ulcinj is a hotspot location from the point of organic pollution, and it is an extremely eutrophic area. The results of water quality monitoring, and research conducted by the Center for Eco-Toxicological Research (CETI), show that the water in Port Milena is characterized as municipal wastewater (as the oxygen content is about <5.0 mg/l, HPK of 279 mg/l, BOD 5 of 7–9mg/l–125 mg/l, NH4 of 1.5–3.48mg/l, Pb–2.0 mg/l, NO2–0.073 mg/l). This was confirmed by the analysis of sludge from Port Milena, which can be classified as sewage sludge (CETI 2007–2013). Sediments at other sites, Ada Bojana and Port Milena, are contaminated with heavy metals and long-lasting organic pollutants in significant quantities compared to the European Union standards. There are no mandatory measures for the use of low-capacity wastewater treatment plants in houses and restaurants located on the banks of the Bojana River. Strict bans on the disposal of solid waste in the Bojana River are not prescribed.

The SDPU (Municipality Ulcinj, 2016b) plans for the sewage pipeline to consist of: primary sewage network (collectors), secondary sewerage network and submarine outlets. The Ulcinj sewage system consists of two systems: a) Ulcinj city sewerage system and b) sewage system Ulcinj Long Beach. Primary and secondary networks were built from 1960 to 2005. They are made of different materials: asbestos cement, concrete, ceramics and PVC. The total length of the network is 36,077 meters. Two submarine outlets were built: a) below Hotel Galeb, pipes are PEHD 0350/3.14 depth 1500 m and b) on the Long Beach, the pipes are PEHD 0.450/26.7, 1165 m long. The total amount of wastewater is 23.55 l/s, of which 85% is produced by households, and the rest by the industry. The main project for the construction of a 14.5 km seweage network in the settlements is currently under construction in Kodre, Totoši, Bijela Gora and the lower areas. Project financing is provided by the technical description of the Financial Arrangement "Wastewater and Water Supply in Montenegro" (WWSP) signed between the European Investment Bank and the State of Montenegro in the amount of 5.5 million euros. The beginning of the works was expected in 2016. The technical solution for the construction of the WWSP given in the Feasibility Study envisages the release of purified water into the Port Milena channel. Since this is a sensitive area, the Study is considering the construction of a device with a tertiary treatment system. Plant location for wastewater treatment is planned in the area of Ulcinj field. Considering the high level of treatment required, the construction of a plant in Ulcinj is an expensive investment, which is why the phased construction of the plant is planned. According to the Study, the value of the investment for phase I is €19.8 million. The beginning of Phase II was scheduled for the year 2021.

# 7

# ECOLOGICAL STRESSES, DRIVERS OF STRESS AND UNDERLYING FACTORS

**Ecological stress** is a response, or, more likely, an observed response (in medicine – a "symptom") of a threat in the Ecosystem that can be characterized by changes in the physical, chemical or similar state of the object.

A **driver of stress** is an introduced agent that causes, or will eventually cause, a response or change in the status of the Ecosystem if no measures are taken to reduce or eliminate the agent or its effects. If stress is a "disease", the triggers of stress are the causes of the disease – usually those that directly manipulate and change the environment, such as land use change, specific practices in land use (certain types of plowing, burning vegetation), etc.

Causal factors are the main causes of drivers of stress, often societal, political, economical, etc.

*High hinterland forest at micro level © Jelena Popović*

# 7.1. ECOLOGICAL STRESSES

The following ecological stresses were identified during the assessment phases described within the methodology chapter:

**Biodiversity decline** is a loss of diversity of terrestrial and aquatic species, loss of habitat diversity such as grasslands and forests, thus decreasing ecosystem functioning efficacy, allowing the increase of invasive species, etc. Biodiversity decline is primarily caused by the destruction and degradation of natural ecosystems (Pereira et al., 2010; Rands et al., 2010). It is assessed as present and important in the scope area, with an increase trend.

**Habitat fragmentation** is the division of a habitat into smaller and more isolated patches that become separated by land use. It implies the loss of area for certain species or loss of species abundance, decrease or disappearance of habitat connectivity and overall larger vulnerability to stohastic events of the fragmented habitat. Due to the occurrence of climate change, which is making many species migrate for survival, some species might not migrate, or be able to do so, due to fragmented habitats (Haddad et al., 2015). This stress is also assessed as important with an increasing trend in the project area.

**Community composition disorder** implies qualitative and quantitative changes within species populations, which means a change in the number of species in a certain community, their abundance, etc. It can also include changes of the patterns of interaction between different species in a community. Community composition disorder is caused by many factors, including abiotic factors, species interactions, and disturbance (Petchey & Gaston, 2002).

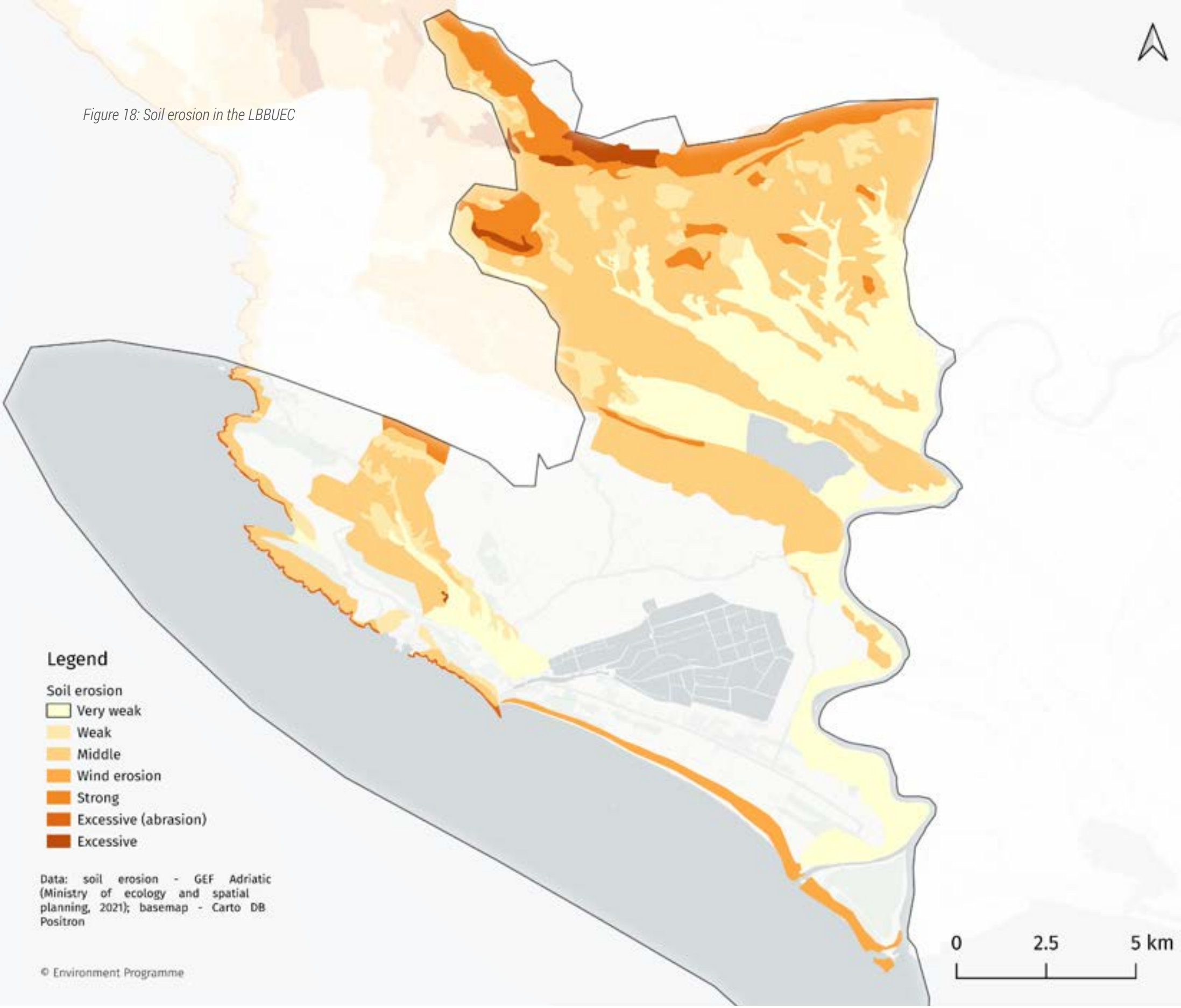
**Population isolation** can lead to species decline and populations to become extinct. Isolated populations may suffer from increased rates of genetic drift, reduced genetic diversity and inbreeding depression (Penuelas et al., 2004).

**Nutrient flow** refers to the transformation of nutrients from one chemical form to another, and/or the flux of nutrients between organisms, habitats, or ecosystems (Vanni, 2002). **Unstable nutrient flow** may disable the growth of algae and aquatic plants. On the other hand, nutrients overloading may affect water quality and cause eutrophication – the excess of nutrients in lakes, estuaries, streams and rivers. In this way, an increase in primary productivity that degrades water quality is evident. Nutrient instability can have multiple effects on the ecosystem, e.g. cause the loss of species – an increase in plant growth and or algal bloom can cause other organisms such as macro invertebrates and fish to die deprived of oxygen (Šundić D., 2021).

**The reduction in the quality of physio-chemical parameters of soil and water** has widespread effects, leading to the degradation of biodiversity, drinking water supply, eutrophication, reduction of food production etc.

**Erosion** has a significant impact on coastal ecosystems due to the destruction of soil surface layers. It also leads to groundwater pollution and reduction of water resources, desertification, and reduction of biological diversity (European Environment Agency & United Nations Environment Programme, 2006). The hydrologic and morphologic regimes of the Bojana River fluctuated overtime, and this river has a significant effect on the coastal area and its erosion (Petković & Sekulić, 2019). The Ministry of Ecology and Spatial Planning has collected soil erosion data for coastal areas through GEF Adriatic project. In Ulcinj municipality, highest soil erosion consequences are in the NW parts of the scope, where the lower parts of the Mountain Rumija are located (Figure 18).

*Figure 18: Soil erosion in the LBBUEC*




Additionally, there are several active torrent areas in Ulcinj (Table 18), whose erosive potential is increased by unregulated building in Ulcinj and Vladimir field, where the effects of their erosion potential are mostly seen (Martinović V., 2015).

*Table 18: Potential torrent areas in Ulcinj municipality (numbers are approximate)*[38]

| **Stream Name** | **Main Stream length** | **Tributaries Length** | **Catchment Area** | **Erosion Category** |
|---|---|---|---|---|
| Rastiški | 2 km | 1 km | 3 $km^2$ | III |
| Brajša | 5 km | 8 km | 10 $km^2$ | II |
| Sukobinski | 2 km | 1 km | 3 $km^2$ | III |
| Mide | 8 km | 15.5 km | 3 $km^2$ | II |
| Međreč | 25 km | 6 km | 25 $km^2$ | III |
| **Potential Torrent Areas** | | | | |
| Bratica | | | 2 $km^2$ | |
| Kravarski | | | 2 $km^2$ | |
| Valdanos | | | | |

**Habitat loss**. The loss and reduction of species' favorable living spaces and conditions poses one of the greatest threats to biodiversity globally. Before populations decline, their individuals may suffer in disturbed habitats, becoming more susceptible to other stressors. In the project scope, habitat changes (fragmentation and loss) are best studied in the Long beach of Ulcinj (Šilc et al., 2020).

**Changes in the hydrological regime.** The Bojana River deposition and erosion caused by sediment transport, gravel extraction, and hydropower plant (HPP) operations, lead to the degradation of biodiversity, fisheries (freshwater and marine), and tourism. The Bojana River hydrological regime presents a challenge to preservation of the Ada Bojana Island which is undergoing erosion, due to complex natural and anthropogenic factors influencing Bojana River's hydrological regime.

**Floods** are a major disturbance that impact aquatic ecosystems, as well as the services they provided. As the Drin River brought large amounts of sediment, significant degradation of the Bojana River occurred. The Bojana River bed raised and became an obstacle for the outflow of water from Lake Skadar into Bojana. This change consequently caused a permanent increase in the water levels of Bojana River. For this reason, floods in the Bojana River valley became more frequent and severe (Talbot et al., 2018; Verma & Singh, 2018).

[38] *Categories: II – Heavy erosion – milder forms of excessive erosion, III – Medium erosion (Gavrilović et al., 2008)*

# 7.2. DRIVERS OF STRESS

**Illegal landfills** (solid waste). Assumes primarily the smaller and medium sized illegal dumps of waste, mostly of communal and construction waste composition but sometimes also containing bulky waste. Most of the locals we collaborated with stated this driver of stress as one that is a burning issue due to both physio-chemical and visual pollution, and also because it is very repelling for tourists.

According to the Local Management Plan for Communal and Non-hazardous Construction Waste for the Period 2016–2020 (Municipality Ulcinj, 2016c) in the hinterland of the Long Beach and Ada Bojana, there are 11 smaller locations where illegally disposed waste is located, the volumes of which range from 10 to 100 m3 (6 locations), or from 100 to 1000 m3 (5 locations). A more detailed overview of the waste locations is provided by NGOs Green Life (Vuković A., 2020) and Association Ada Bojana (Čapunović S., 2020) which mapped the illegal landfills in the hinterland of the Long Beach and partly on Bojana Island (Figure 19). The reasons for such high number of illegal landfills existing in the hinterland of the Long Beach and Ada Bojana is discussed to be due to a dispute and lack of agreement of responsibilities between the Coastal Management Facility, which is in charge for the management of the Long Beach and Ada Bojana beach, and the Public Communal Company of Ulcinj.

Additional waste locations besides the Long Beach and Ada Bojana beach are: Gač (20 m3), Klezna (6 m3), Velike krute (50 m3), Vladimir (5 m3), Put Mide – Ostros – (10m3) and (Šas 10m3). Locations with waste of more than 1000 m3 are the former waste disposal area "Hije" and the former waste disposal area "Bratica" (Municipality Ulcinj, 2016c). According to the Local Management Plan for Communal and Non-Hazardous Construction Waste for the Period 2016–2020 (Municipality Ulcinj, 2016c) the quantity of collected waste for 2013 was 9,152 t; for 2014 9,595 t; and for 2015 10,332 t. On the territory of the Ulcinj municipality, only the mixed municipal waste is collected, disposed at Možura landfill. The waste is collected from 80% of the territory of the municipality according to the National Plan for Waste Management 2016–2020 (Ministry of Sustainable Development and Tourism, 2016b). We do not have the information on the status of these landfills now, as the new Waste Management Plan of the municipality or the country has not been published (for 2020 onward) but the information is based on the input from local SHs that stated that the number of illegal landfills has risen, without much previous intervention of the municipality and companies in charge of cleaning the existing ones.

Besides solid waste polluting the land, it also flows through the Bojana River to the sea and Bojana is the third river in the Mediterranean in terms of contribution of marine litter (575 ton/year -1 or 5.8 %) (Liubartseva et al., 2016).

*Waste in Ada Bojana island © Andrijana Mićanović*

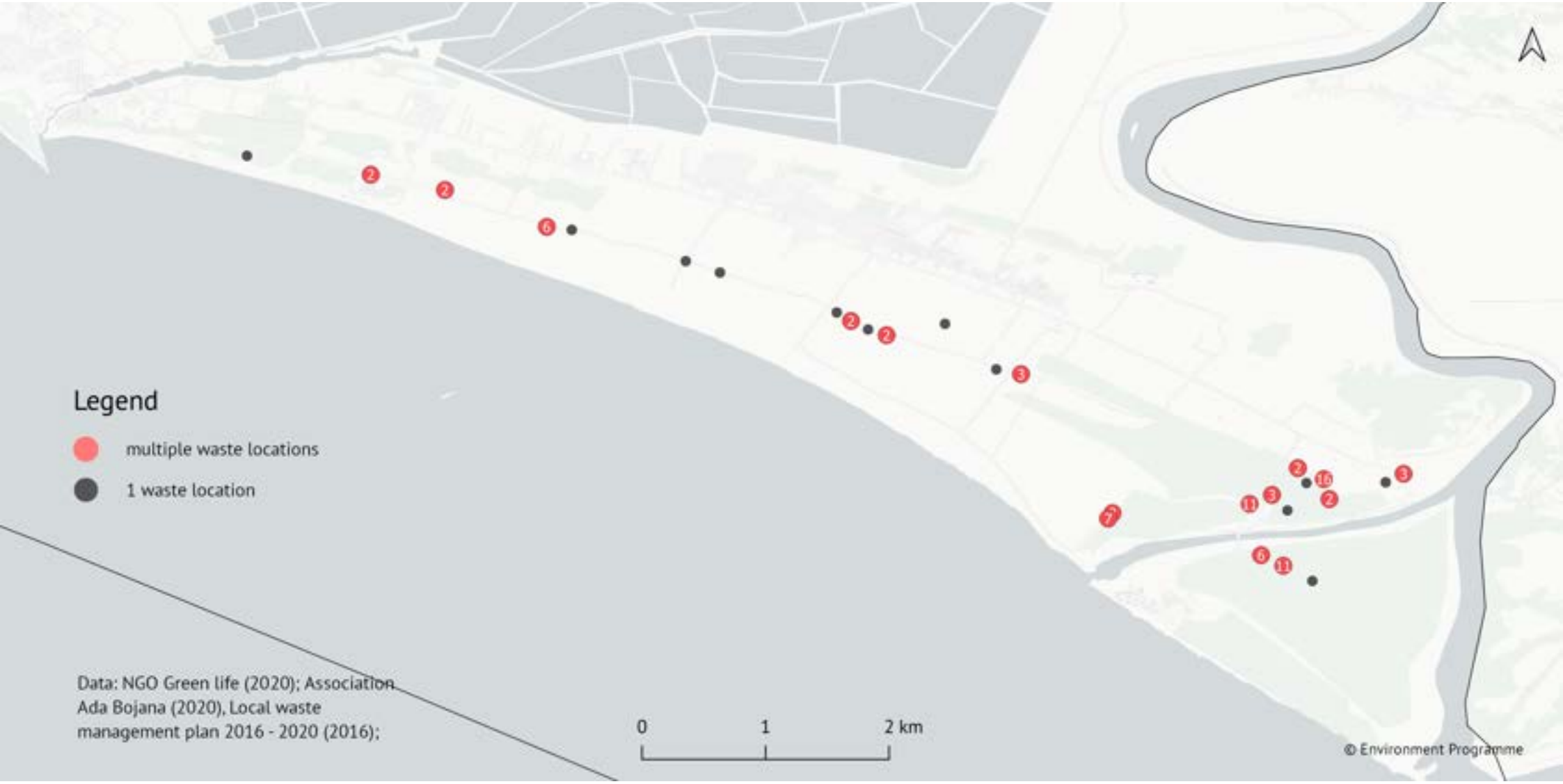



*Figure 19: Waste locations in the Long Beach, its hinterland and Ada Bojana*

**Municipal waste waters.** Ulcinj municipality lacks wastewater infrastructure, hence all communal and industrial wastewaters are unprocessed or lightly processed and end up in the Bojana River or the sea. The effects of this issue are especially tangible during the tourist season, when large amounts of wastewaters are disposed in the Bojana River near the Long Beach by temporary object residents. By law, all temporary object owners on the river should own a cesspit and properly take care of it, although the opinion of locals is that this is rarely the case. In addition, local authorities have plans to improve communal services in the wider area of Ulcinj, by extending the sewerage network and the construction of wastewater treatment plant. Several wastewater projects have been mapped so far and are part of Single Project Pipeline, national list of prioritized environmental projects. According to the National Strategy for Integrated Management of Coastal Zone until 2030, the lack of financing is the main obstacle for the implementation of these projects (Ministry of Sustainable Development and Tourism; UNEP; PAP/RAC, 2014) (Figure 20).

**Pollution from agriculture.** This refers to substances used in agriculture (e.g. pesticide, industrial fertilizer) that pollute the environment (air, soil or water bodies through run off). Ulcinj municipality is well known for its agriculture, considering the municipality biggest part is a floodplain, and overall has a good water supply due to the river and streams proximity and a lot of exposure to sunlight. However, this does not make it less prone to agriculture pollution, since modern practices of using natural non-harmful products are not common in Montenegro.

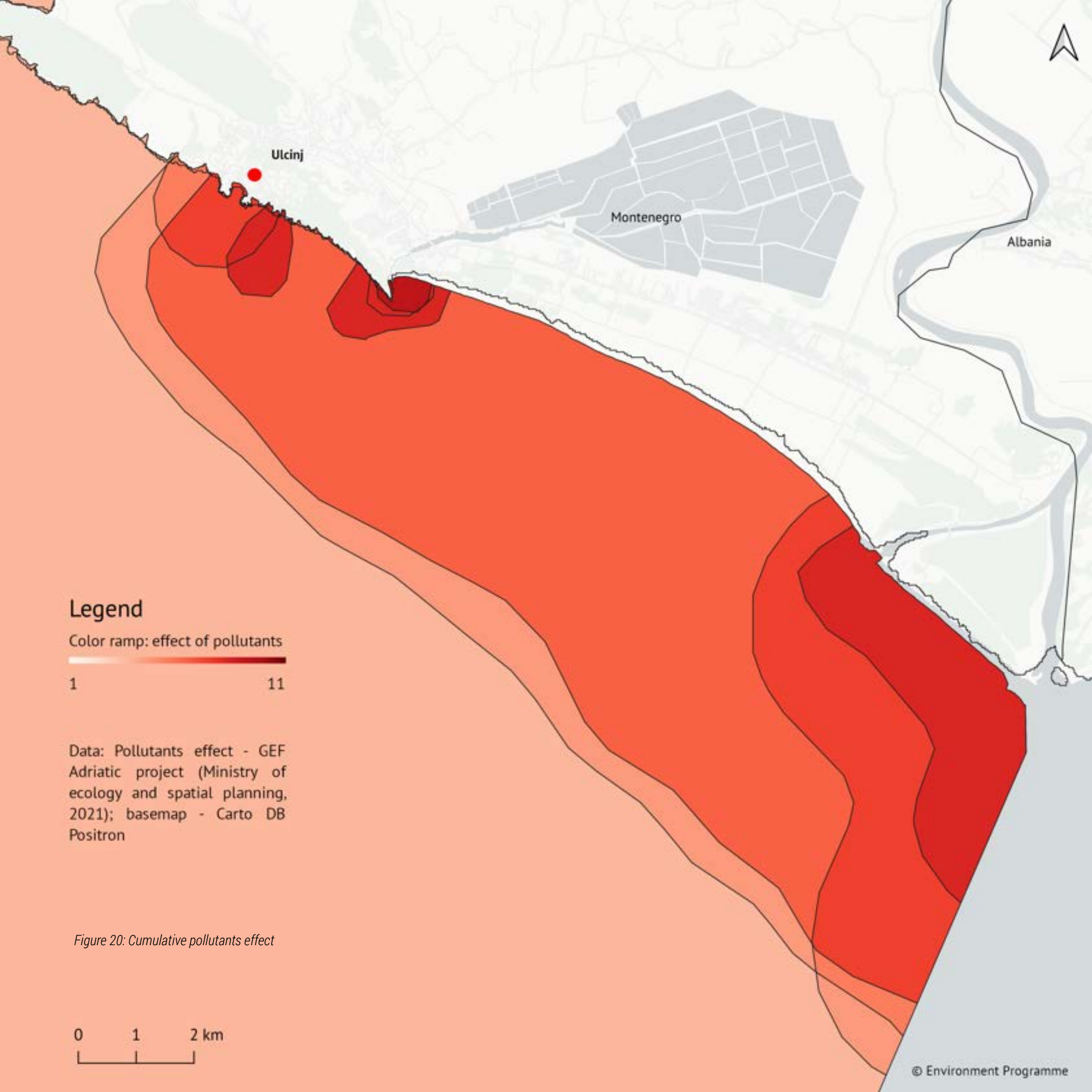



*Figure 20: Cumulative pollutants effect*

**Uncontrolled urbanization (legal and illegal).** Ulcinj municipality is undergoing, as is the trend in most parts of the country, urbanization with a lack of proper planning, often both illegal and involving different interests (Figure 21). According to the updated information from March of the current year, which Ministry of Ecology and Spatial Planning periodically receives from municipalities, who are leading the legalization process, since the entry into force of the Law on Spatial Planning and Construction, a total of 3,851 requests for legalization have been submitted. Of that number, only 4 legalization decisions have been issued and the procedure was suspended in 466 cases.

**Fires.** Fires in the area are common, happening almost every year. Every few years a fire of high magnitude appears and has immediate and devastating effects on the environment, often on agricultural fields, disturbing locals' economy and livelihoods. In Ulcinj the peak fire period typically begins in mid-July and lasts around 12 weeks. There were 0 VIIRS (Visible Infrared Imaging Radiometer Suite) fire alerts reported between 12th of April 2021 and 4th of April 2022 considering high confidence alerts only. This is normal, compared to the previous years going back to 2012. Between 8th of April 2019 and 4th of April 2022, Ulcinj experienced a total of 27 VIIRS fire alerts. The most fires recorded in a year was 2012, with 1.6 kha (Global Forest Watch, n.d.).

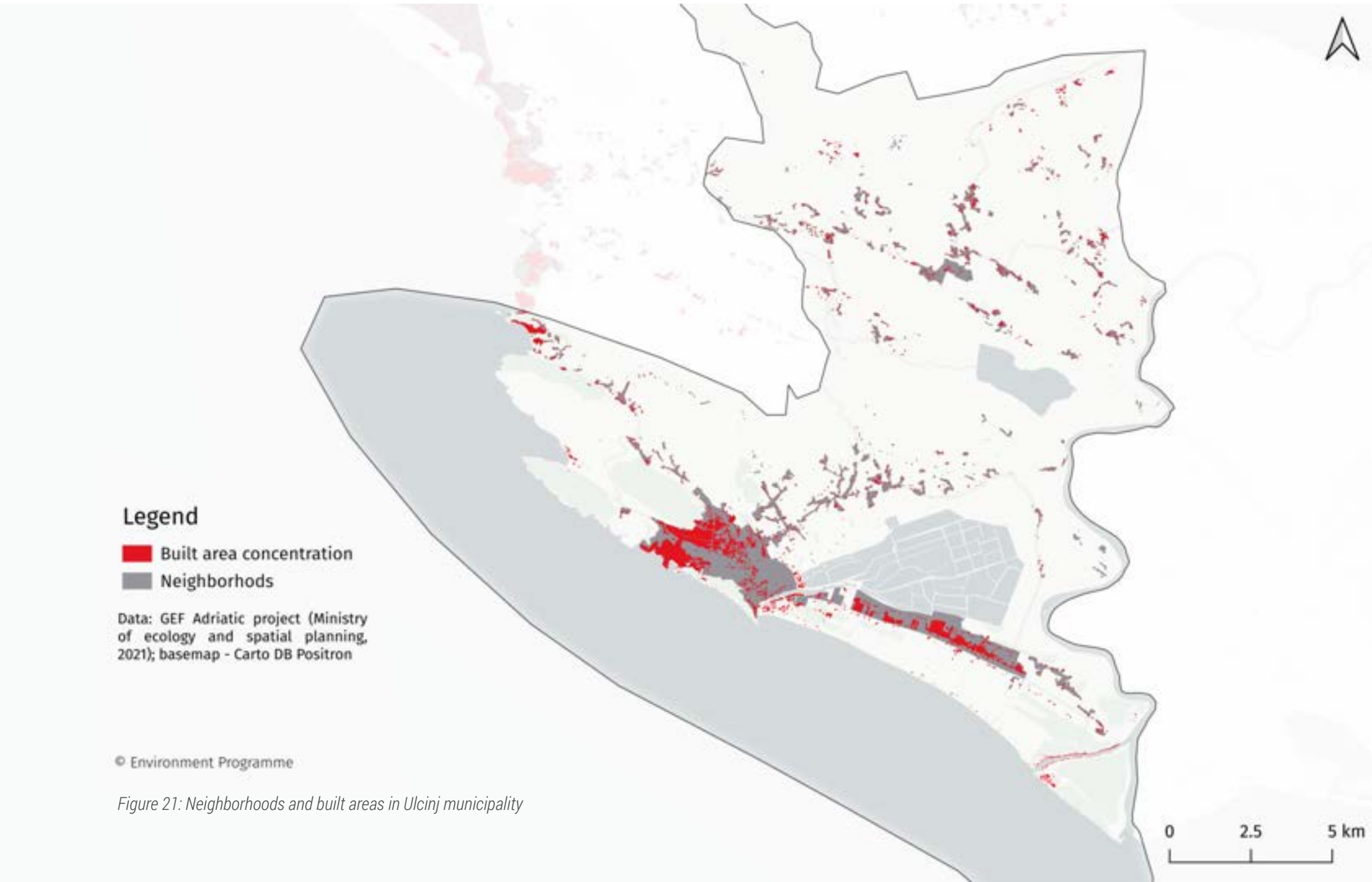



*Figure 21: Neighborhoods and built areas in Ulcinj municipality*

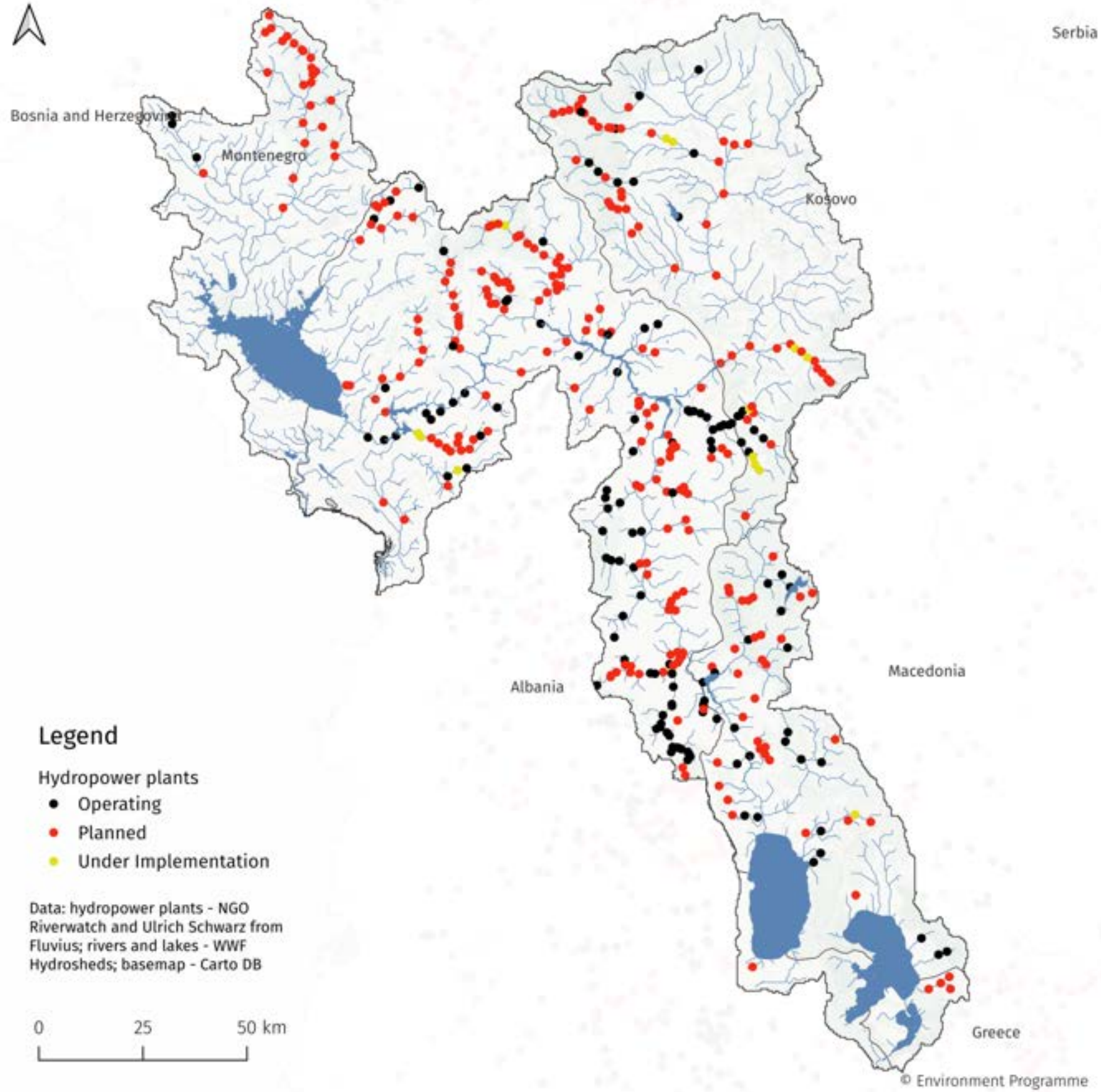



*Figure 22: Existing, in construction and planned hydro power plants planned in the Drin basin*

**Hydropower plants.**
Existing dams and reservoirs in the Drin (Bojana's largest tributary coming from Albania) and small hydropower plants that are planned and intensively built in small rivers and streams of the Lake Skadar basin in Montenegro (Figure 22) significantly affect the quantity of water going into Bojana, biodiversity, sediment transport and other physical and chemical properties. It is claimed by experts that these dams have a significant effect on the sediment transport in Bojana and that they affect its overall hydrological regime. They also have influence on flooding (Petković & Sekulić, 2019).

**Deforestation.**
Deforestation is often ill-planned or illegal, causing a rapid loss of tree and shrub cover and affecting key ecological attributes that the forest and shrub habitats provide. Most old growth forests were cut from the area decades ago, due to firewood needs or, in near-shore areas, due to urbanization which is common for Mediterranean cities (Caković D. & Milošević D., 2013). Nowadays, the dominating vegetation is maquis, which is a scrubland with pioneer trees and bushes, and occasional remnants of representative forests. However, deforestation is ongoing. Locals consider there has been a degradation in abiding the law regarding the deforestation of privately-owned forests and forestry in general in Ulcinj, compared to former times. In 2010, Ulcinj had 12.2 kha of tree cover, extending over 37% of its land area. In 2020, it lost 37.1 ha of tree cover. Between 2001 and 2020, forests in Ulcinj emitted 9.76 kt of CO2e/year, and removed -40.6 kt of CO /year. This represents a net carbon flux of -30.8 kt of CO e/year (Global Forest Watch, n.d.).

**Sand exploitation.**
Sand exploitation for the purposes of construction occurs primarily on the shores of Bojana River. It often happens in the areas further away from the Bojana estuary, where less inhabitants live and can spot any illegal actions, since the exploitation is often done without permission. No particular data on illegal extraction is available for showcasing here.

**Noise and other forms of intrusion.**
Noise, and other often accompanying behaviors of temporary objects residents (disrespect for the quiet zone law, inappropriate trash disposal etc.), is a big social issue and a threat to the ecosystem primarily at the very east of the Long Beach, at the Bojana estuary into the sea. During the tourist season, there are at minimum weekend parties with loud music, and very often loud noise during weekdays too, which present an obstacle for day-to-day life to local inhabitants and slow-tourism success they want to build in this biodiversity hotspot. Noise also represents a threat to birds (and possibly other organisms), as using singing to communicate during the breeding season is crucial.

**Climate change.**
The phenomenon of global warming influences local natural and social processes, which has been noticed by the locals through warmer summer temperatures and more frequent extreme events such as floods, fires, droughts. Although climate change is rarely researched in Montenegro, its effects on species and habitats, changes in seasonal temperatures and disturbances like floods and fires, are becoming more frequent. Climate change has very important effects on agricultural production, causing instability through increase in disturbances like fire and floods. It is also evident in marine ecosystems. In the Adriatic, a deep-seated basin sensitive to change, climate change is shifting heat and salt content of the sea, and thus the thermo haline circulation, threatening to permanently change the hydrographic properties of water. Positive trends in sea temperature have already been observed (Šolić et al., 2018). The GEF Adriatic project, conducted by the Ministry of Ecology, Spatial Planning and Urbanism, collected the data on the potential sea level rise, where it is visible that many coastal habitats, tourist zones and neighborhoods are under the threat of the rise (Figure 23).

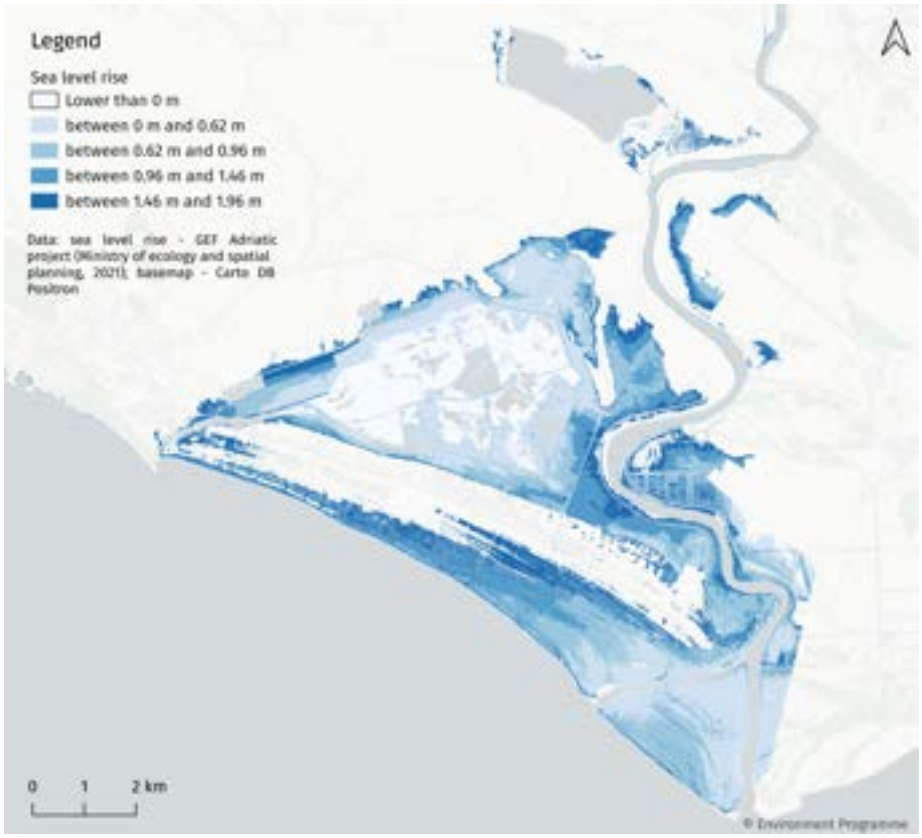



*Figure 23: Sea level rise*

**Oil (petroleum) drilling.**

In spring 2021, on the border of Bar and Ulcinj municipality, an oil platform was set for the purpose of investigating oil quantities in the Montenegrin sea and the potential for exploitation (CAU et al., 2014). It is considered that the exploration itself could cause damages to the nature environment in the sea. In the case of an accident, the threat has potential to cause a large amount of pollution to the sea and its biodiversity. Additionally, an oil spill may potentially cause regional engagement, since it would influence marine waters of neighboring countries and thus also their environment, economies, etc.

**Poaching and over hunting.**

Illegal hunting, known as poaching, as well as overhunting, are big threats to terrestrial and marine wild animals and ecosystem functioning connected to them. They are present in the sea, e.g. poaching of popular sea food date mussel (Lithophaga lithophaga), use of illegal fishing gear and overfishing, as well as on land, e.g. bird hunting in the Ulcinj Salina.

Ulcinj Salina is particularly vulnerable for bird hunting since it is home to a large bird diversity and abundance. The direct impact of hunting is shown through the number of dead birds, but often the bigger problem is the impact of explosive sound on surrounding birds, where one shot can scare away a whole flock of hundreds or even thousands of birds. This is particularly important during breeding, because it may cause the birds to leave their nests prematurely, exposing their eggs or young to predators, which can lead to a dramatic increase in the number of unsuccessful mating attempts. Also, in migration season, this disturbance of birds, which are tired of long migration flights, shoos them away from a stopover site and significantly increases the possibility of death due to fatigue. Another issue with hunting, especially in wetlands, is the accumulation of lead ammunition, which can lead to the poisoning of the living world as well as people, if some food production is associated with the area. An alarming data is that the highest concentration of lead ammunition in Europe was found in the Mediterranean wetlands (more than 300 grains/m2) (Sovinc A. et al., 2017).

In 2017, the Ministry of Agriculture declared that at some point Ulcinj Salina should become a protected area and a “no-hunting” zone. Therefore, the procedures and obligations of the municipality of Ulcinj and Public Company for Breeding, Protection and Hunting of Wild Animals is to transform the area into a zone without hunting. Currently, this company also owns a concession for hunting in the hunting grounds of Ulcinj with a validity period of April 1st 2012–March 31st 2022). This permit was granted according to the law and issued by the Ministry of Agriculture and Rural Development for the period of 10 years (Sovinc A. et al., 2017).

**Invasive species.**
Invasive species, plants such as false indigo-bush (Amorpha fruticosa) and common ragweed (Ambrosia artemisiifolia), and animal species such as mongoose (Mungos mungo), pose a threat to local biodiversity and species persistence, threatening to push out some species from their native habitats. Invasive plant species are ranked as one of the main threats to sand dune ecosystems (Janssen et al., 2016) here referring to the Long Beach, elaborated more in the work of Stešević, Caković and Šilc (e.g. Šilc et al., 2020). Invasive plants like the ones mentioned are not only a threat to species, draining the substances that prevent the germination of others into the ground, but some of them are also very strong pollen allergens. A preliminary list of invasive plant species produced by NGO Parks Dinarides (Popović M. & Mijović B., 2021) which identified 47 invasive species for Montenegro, shows most of them are present in the Ulcinj area.

**Intensive agriculture.**
It refers to all agricultural practices related to planting and tillage that are considered conventional and harmful for the soil, i.e. tractor mulching, single crops etc. Some consequences of intensive agriculture, as well as untreated wastewaters, are high trophic levels, which are present in the main areas of discharge into the sea (Tsiafouli et al., 2015) (Figure 24).

*Figure 24: Trophic effect levels in the sea*

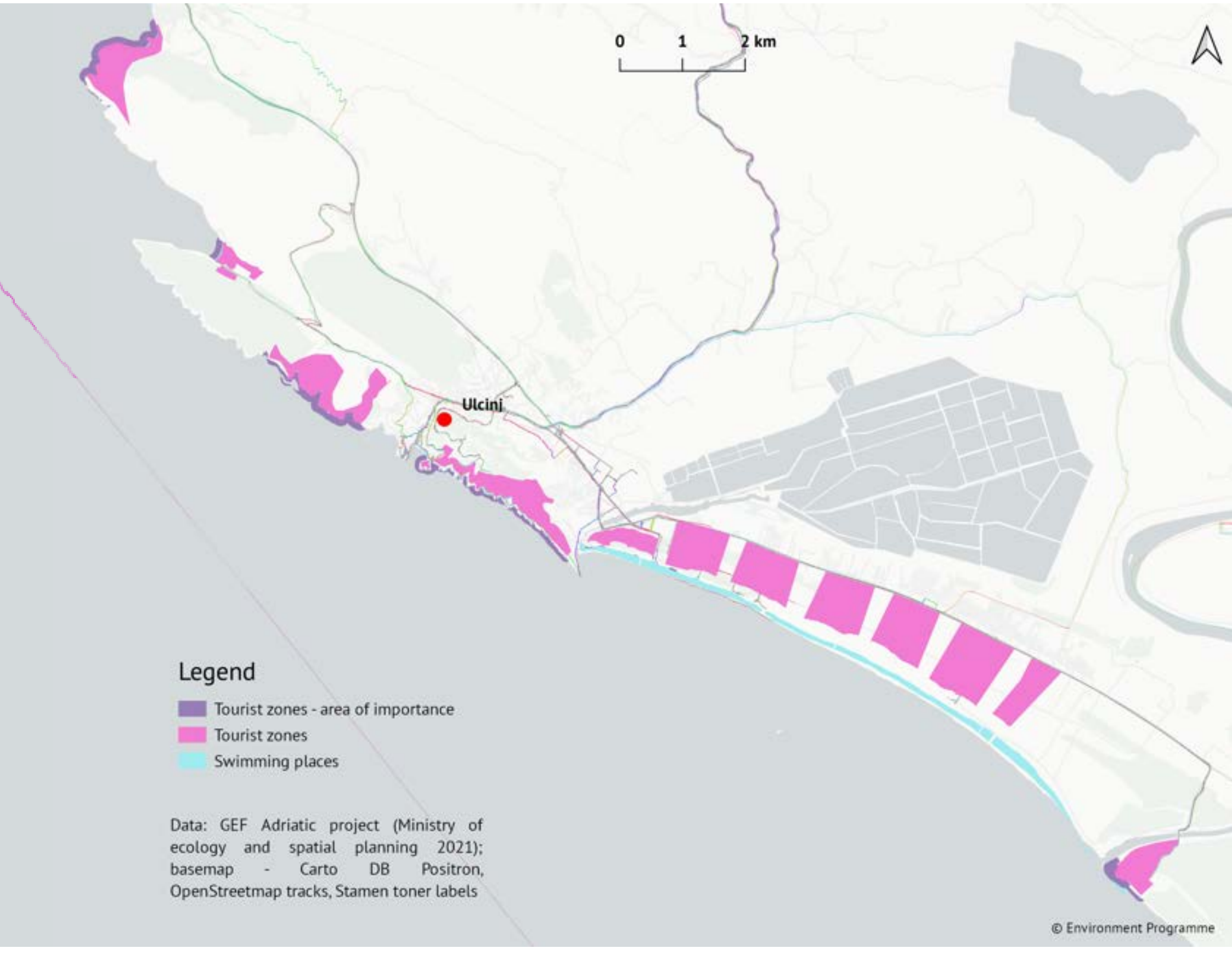



*Figure 25: Tourism focal areas in Ulcinj municipality*

**Intensive and commercial tourism.**
Refers to all the conventional tourist practices such as the building of grand resorts in natural hotspots, intense habitat management (cleaning, cutting, mowing, beach feeding – often with sludge, etc.), that put the local environment in danger. Unsustainable tourism practices are evident in the area, especially pressuring coastal habitats, through the construction of roads, intense traffic, noise, building of tourist facilities, etc. (Figure 25).

**Water management (Ulcinj salina).**
Water, by its presence or absence, dictates the structure of the biodiversity of the Ulcinj salina, and most significant species and habitat types in the Ulcinj saltworks require stagnant waters. Sovinc A. et al., (2017) prescribe a water level regime for the Ulcinj Salina pools (Figure 26) for a part of the Salina, while the water regime for the remaining parts should be determined upon the decision on the continuation of salt production or not.

**Spraying against mosquitoes.**
Spraying chemicals to restrain the spread of mosquitoes that are dominant in the hot and humid summers of Ulcinj has negative effects on other insects. This driver of stress was pointed out by the local SHs as very important since it causes many significant negative consequences for local bee keepers.

**Illegal construction.**
Illegal construction refers to construction without adequate permits, on land/parcels predetermined for other use. It is practiced widely in the area and the country. It is not adequately sanctioned. On the contrary, legalisation of illegal objects is enabled.

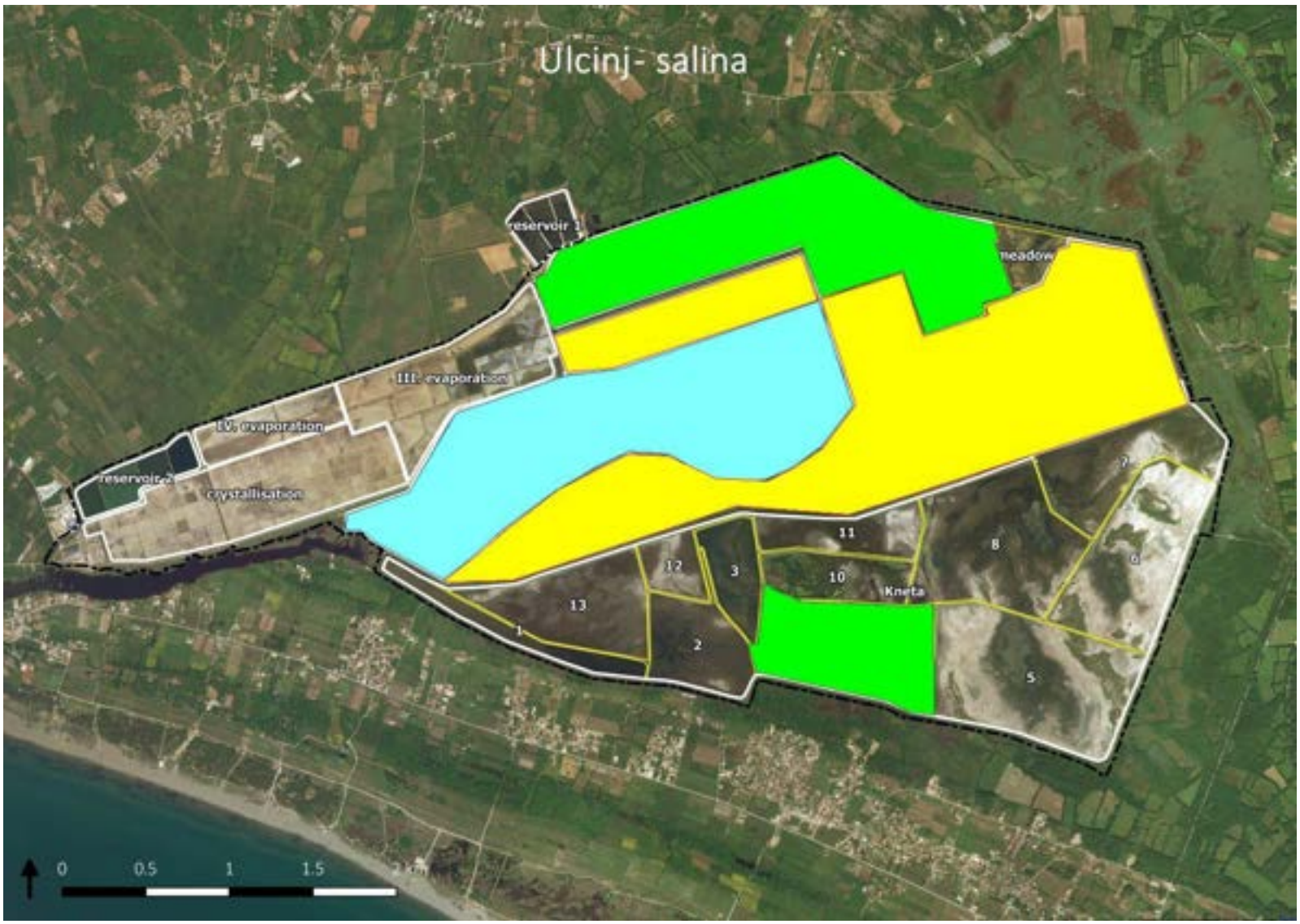



*Figure 26: Proposed water regime in Ulcinj Salina (from Sovinc et al., 2017)*

Sunset from Ada Bojana © Isidora Ćalović

# 7.3. UNDERLYING CAUSES AND FACTORS

## 7.3.1. POLITICAL FACTORS

### POLITICAL INSTABILITY ON THE COUNTRY AND MUNICIPAL LEVEL

The lack of constructive engagement of all parliamentary actors is preventing meaningful political dialogue. The ruling majority has been from one political party for three decades on a country level, and has now changed, bringing both opportunities and risks for democratic reforms and institutional advancement. For some time already, the political situation on the municipal level has not been stable and is often influenced externally. Both levels now face transition and instability period with locally perceived focus on election processes.

### STRONG POLITICAL INFLUENCE

Political system influence is very prominent in all spheres, with often criticized independence of in-stitutions and the overall state. According to the Freedom house report from 2022, Montenegro is classified as partly free with 67/100 score.[40]

### LACK OF POLITICAL WILL FOR LONG-TERM PROCESSES

Frequently initiated or passed legislation through the fast-track procedure, without necessary public consultations and without duly taking into account the EU accession or other international and local requirements is observed. Local and state officials are often unwilling to use their mandates for sustainable development, sticking rather to existing practices and processes inherited, which most often do involve short term mandate results and publicity, rather than long term strategic institutional strengthening, change and progress. The Parliament is yet to demonstrate in practice its commitment to Montenegro's EU reform agenda and improve coordination with the government on legislative initiatives. The Parliament should strengthen the professional and expert capacity of its administrative staff, according to the opinion of local representatives.

### CORRUPTION

Corruption has been continuously reported as one of the stagnating fundamental factors for the EU accession, with limited progress made so far: recommendations are partially met with regard to further results on track records on repression and prevention of corruption (European Commission, 2021). Corruption Perceptions Index for Montenegro[41] ranks Montenegro as 64th out of 180 countries, with the score 46/100, and slightly improving. The locals' feeling is that strong political will to effectively address this perpetuating issue is lacking, in both small criminal and high-level corruption domains.

[40] *https://freedomhouse.org/country/montenegro/freedom-world/2022*
[41] *https://www.transparency.org/en/cpi/2021/index/mne*

# 7.3.2. INSTITUTIONAL FACTORS

## INADEQUATE LEGISLATION

Inadequate legislation is identified at the levels of legal compliance, gaps, overlapping or inadequate mandates, lack of equality and equity principles. This was very much stressed in the domain of urban planning, construction, state and private interest regulation, environmental damage control, etc.

## INADEQUATE PLANNING

Planning processes and policies either do not take into account the biodiversity and natural values of the area (sufficiently for its sustainable use), or do not create an enabling environment for cross sectoral planning. They rather put everybody's interests together and the power of influence prevails. Plans are very often made without clear strategic directions and vision, and often based on interests. The municipality's rapid urbanization including apartment buildings, hotels and potential resorts is regularly not supported by satisfactory planning documentation.

## POOR WASTE MANAGEMENT

Refers to the poor to non-existing waste water treatment facilities and infrastructure, existence of small illegal landfills in the hinterland of the Long Beach and on the Ada Bojana Island, and the lack of cooperation and proper logistics of the institutions in charge for the cleanup (locally identified).

## LACK OF COMMUNAL INFRASTRUCTURE AND SYSTEM

Settlements outside the city of Ulcinj and central tourist areas lack basic communal infrastructure such as waste containers. The city also exports its waste to the landfill "Možura", but reported by the locals, private companies, such as bars, restaurants etc. are often reluctant to pay the fees needed to transport the waste.

## LACK OF PREVENTION MEASURES IN PLANS

It is perceived by the locals that the approach taken to problem solving or planning is often very reactive, not taking into account potentials and risks. Therefore, research, monitoring, adjustments and similar are not yet integral elements of the policy and planning process, or is not sufficiently taken in consideration.

## LACK OF MONITORING AND PENALTY POLICY

It has been assessed that, for the so perceived relatively good legislation in place, there is often a lack of enforcement, due to poor regulatory capacities that should ensure the implementation of the law.

## LACK OF MULTIDISCIPLINARY AND CONTEMPORARY APPROACH IN EDUCATION

The education system is based on conservative methods. Subjects are strictly divided, while multi-disciplinary, cross-sectoral, lifelong, practical learning, and/or learning by doing, creativity and innovation are lacking to be part of the educational and capacity building system.

## LACK OF EXPERTISE

Overall, there is a lack of human resources in the country and locally with adequate expertise in certain fields important for sustainable planning and development in the institutions. This is caused by many factors (lack of specialized education possibilities, poor demand for specialized staff, brain drain, etc.).

## INADEQUATE STRATEGIC PRIORITIES AND VISION

It has been concluded that the local and state decision makers lack clear vision, development goals and commitment, which are based on adequate situation analyses and participative processes.

## INSTITUTIONAL IMMATURITY

Encompasses several underlying causes already presented, leading to an overall conclusion that the local and state institutions are not mature enough, in terms of policies and their implementation, expertise, budget resources and planning, etc.

## LACK OF AN INTEGRATED APPROACH TO STRATEGIC PLANNING

Strategic planning is commonly sectoral. Problem solving is often focused on symptoms of the problem, rather than dealing with the causes which are often complex and require multi sector collaboration. This is again very connected to the above presented situation.

## LACK OF CROSS-BORDER COOPERATION

Since Bojana River itself is transboundary, belonging to Albania and Montenegro, and is part of the Drin river basin which additionally encompasses three countries, Kosovo*[42], North Macedonia and Greece, cross border cooperation for the management of the basin is crucial, but identified as lacking. The problems of water, energy, floods, sediments management and many others are very connected to this underlying cause.

*[41] All references to Kosovo, whether the territory, institutions or population, in this text shall be understood in full compliance with United Nations Security Council Resolution 1244 and without prejudice to the status of Kosovo.*

# 7.3.3. SOCIO-ECONOMIC FACTORS

## UPPER MIDDLE INCOME COUNTRY TRANSITION

It is a general feeling that after being more in the socialism domain, Montenegro is exposed to transition towards a more capitalistic society, focused on the maximization of profit and rapid use of resources. This is seen as done without much regard for the long term social-economic perspective. The immature sustainable development concept is inter-connected with many of the above presented challenges and presents ground for short profit gain as common business mode.

## SHORT-TERM PROFIT GAIN

Aligned with the underlying cause above, many local and national level entrepreneurs are using the immaturity of the institutional setup to focus on attaining short term goals primarily profit-oriented, without environmental and socio-economic impact and future generations aspects ensured. As it is becoming common practice, there is not enough societal and institutional pressure to ensure equity, equality and benefits sharing system. The locals are arguing that the system of values and ethics is in collapse.

## LACK OF FINANCES

Many assessed threats are deemed to be a direct consequence of the lack of finances in the country, on the municipal and private sector level. Some of the major areas of negative influence is the lack of adequate infrastructure, which usually requires high public investments.

## LACK OF KNOWLEDGE (IN THE COMMUNITY)

Underpinning all other causes for the local perspective is an overall lack of awareness, of individuals, organizations, institutions and society as a whole regarding sustainability and growth/ development in general.

# 03

# STRATEGY FORMULATION

*Detail from freshwater wetland © Nina Lončarević*

# 8.1. PRIORITY SETTING AND STRATEGIC RELEVANCE

Using participative rating, as explained in the Chapter 2. Methodology and available in the MARISCO guide book (Ibisch & Hobson, 2014) the strategic relevance of identified ecological stresses, drivers of stress, and underlying causes and factors has been assessed.

The most strategically relevant ecological stresses assessed at a rate of high strategic relevance (score four) are: habitat fragmentation, community composition disorder, population isolation, and erosion (Table 19).

*Table 19: Strategic relevance rating of ecological stresses*

| | ECOLOGICAL STRESS | Past Criticality | Current Criticality | Trend of Change | Future Criticality | Systemic Activity (Level of Activity) | Systemic Activity (Number of Elements It Influences) | Systemic Activity | Strategic Relevance (Value) | Strategic Relevance (Final) |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | Biodiversity Decline | 2 | 3 | 3 | 4 | | | | 10 | 3 |
| **2** | Habitat Fragmentation | 1 | 3 | 4 | 4 | | | | 11 | 4 |
| **3** | Composition Disorder | 1 | 3 | 3 | 4 | | | | 11 | 4 |
| **4** | Population Isolation | 1 | 3 | 4 | 4 | | | | 11 | 4 |
| **5** | Unstable Nutrient Flow | 1 | 2 | 4 | 3 | | | | 9 | 3 |
| **6** | Reduction of Quality of Physical and Chemical Parameters | 1 | 2 | 3 | 2 | | | | 7 | 2 |
| **7** | Erosion | 2 | 3 | 4 | 4 | | | | 11 | 4 |
| **8** | Habitat Loss | 1 | 2 | 4 | 4 | | | | 10 | 3 |
| **9** | Changes in the Hydrological Regime | 2 | 3 | 4 | 3 | | | | 10 | 3 |
| **10** | Floods | 4 | 2 | 2 | 3 | | | | 7 | 2 |

The most strategically important drivers of stresses (threats) assessed to be of highest, extreme relevance (score four) for the area are: climate change, intensive tourism and invasive species.

The following drivers of stress are considered both important and feasible to address in light of the capacities (knowledge and manageability) of the NGOs and the local stakeholders gathered within the informal Local Action Group (LAG): noise and other similar disturbances (where local stakeholders have both knowledge and capacities to deal with the problem, and have been successful in

implementing initiatives for resolving this issue at the Bojana River tourist area), pollution from agriculture, uncontrolled urbanization (legal and illegal), fires, poaching, excessive overfishing of species, invasive species, intensive agriculture, intensive and commercial tourism. Table 20 below presents a detailed rating that underpins overall strategic relevance, and here the important knowledge and manageability, too. On the other hand, hydropower plants (HPP), deemed important are assessed not to be in the sphere of manageability of local stakeholders. Apart from this, to be highlighted is that some of the biggest drivers of stresses, such as waste waters, climate change, exploitation of sand, oil drilling and illegal construction, are not in the direct knowledge or manageability reach of the local SHs, and could be address only involving other, larger groups, actors and funds. In general, the SHs are most vividly and accurately able to describe and create steps for overcoming the problem for the drivers of stress – compared to ecological stresses and underlying causes and factors which are commonly outside of their sphere of acting.

*Table 20: Strategic relevance, knowledge and manageability rating of the drivers of stress*

| | ***DRIVERS OF STRESSES*** | ***Past Criticality*** | ***Current Criticality*** | ***Trend of Change*** | ***Future Criticality*** | ***Systemic Activity (Level of Activity)*** | ***Systemic Activity (Number of Elements It Influences)*** | ***Systemic Activity*** | ***Strategic Relevance (Value)*** | ***Strategic Relevance (Final)*** | ***Manageability*** | ***Knowledge*** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | Illegal Landfills (Solid Waste) | 1 | 4 | 3 | 1 | 2 | 4 | 3 | 11 | 3 | 3 | 3 |
| **2** | Municipal Waste Waters | 1 | 3 | 3 | 1 | 2 | 4 | 3 | 10 | 2 | 3 | 3 |
| **3** | Pollution from Agriculture | 3 | 2 | 3 | 3 | 2 | 4 | 3 | 11 | 3 | 2 | 2 |
| **4** | Uncontrolled Urbanization (Legal and Illegal) | 1 | 4 | 4 | 1 | 2 | 4 | 3 | 12 | 3 | 2 | 2 |
| **5** | Fires | 1 | 3 | 3 | 3 | 2 | 3 | 3 | 12 | 3 | 2 | 2 |
| **6** | Hydropower Plants | 1 | 4 | 4 | 2 | 2 | 4 | 3 | 13 | 3 | 4 | 3 |
| **7** | Deforestation | 1 | | 4 | 2 | 2 | 3 | 3 | 9 | 2 | 2 | 3 |
| **8** | Exploitation of Sand | 2 | 2 | 2 | 1 | 2 | 4 | 3 | 8 | 2 | 3 | 3 |
| **9** | Noise and Other Forms of Disturbance | 1 | 1 | 1 | 1 | 2 | 3 | 3 | 3 | 1 | 1 | 1 |
| **10** | Climate Change | 1 | 3 | 4 | 4 | 2 | 4 | 3 | 14 | 4 | 3 | 3 |
| **11** | Oil Drilling | 1 | 2 | 3 | 3 | 2 | 4 | 3 | 11 | 3 | 3 | 3 |
| **12** | Poaching and Overhunting | 4 | 3 | 2 | 1 | 2 | 4 | 3 | 9 | 2 | 2 | 2 |
| **13** | Invasive Species | 1 | 3 | 4 | 4 | 2 | 4 | 3 | 14 | 4 | 2 | 2 |
| **14** | Intensive Agriculture | 1 | 1 | 3 | 3 | 2 | 4 | 3 | 10 | 2 | 2 | 2 |
| **15** | Intensive and Commercial Tourism | 1 | 4 | 4 | 3 | 2 | 4 | 3 | 14 | 4 | 2 | 2 |
| **16** | Water Management (Solana) | 1 | 3 | 3 | 1 | 2 | 4 | 3 | 10 | 2 | 2 | 2 |
| **17** | Mosquito Dusting | 3 | 3 | 2 | 1 | 2 | 4 | 3 | 9 | 2 | 3 | 3 |
| **18** | Illegal Construction | 2 | 3 | 4 | 1 | 2 | 0 | 1 | 9 | 2 | 3 | 3 |

The most strategically relevant underlying causes and factors (score three) for the area are: lack of finances and interest of business/ capital/short term gain. Very close to it by rating, meaningfully relevant are: inadequate planning, poor waste management, lack of communal infrastructure, lack of planning documentation, unconscious action, lack of political will, lack of monitoring and penal policy. From the aspect of manageability and knowledge, stakeholders share the opinion that these elements are outside of their reach and that for addressing them appropriately, both more actors, knowledge and larger funds support is needed. Due to the time limitation, they have not been assessed on these criteria but would mostly fall under the rating score three. The detailed rating for strategic relevance is presented in Table 21 below.

*Table 21: Strategic relevance rating of the underlying causes and factors*

| | UNDERLYING CAUSES AND FACTORS | Magnitude | Current Criticality | Trend of Change | Future Criticality | Systemic Activity (Level of Activity) | Systemic Activity (no. of Influenced Elements) | Systemic Activity | Strategic Relevance (Value) | Strategic Relevance (Final Stadium) |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | Lack of Cross-Border Cooperation | 4 | 3 | 1 | 1 | 2 | 4 | 3 | 8 | 2 |
| **2** | Inadequate Legislation | | 3 | 1 | 1 | 2 | 4 | 3 | 8 | 2 |
| **3** | Lack of Expert Knowledge | 3 | 3 | 1 | 1 | 4 | 4 | 4 | 9 | 2 |
| **4** | Inadequate Planning | 2 | 4 | 2 | 1 | 1 | 4 | 3 | 10 | 2 |
| **5** | Poor Waste Management | 4 | 3 | 2 | 1 | 1 | 4 | 3 | 9 | 2 |
| **6** | Lack of Communal Infrastructure | 2 | 2 | 2 | 1 | 1 | 4 | 3 | 8 | 2 |
| **7** | Lack of Planning Documentation | | | 3 | 1 | 2 | 4 | 3 | 7 | 1 |
| **8** | Capital Interest | 1 | 4 | 4 | 2 | 2 | 4 | 3 | 13 | 3 |
| **9** | Unconscious Action | 2 | 4 | 2 | 1 | 3 | 4 | 4 | 11 | 3 |
| **10** | Lack of Finances | 1 | 3 | 3 | 3 | 4 | 4 | 4 | 13 | 3 |
| **11** | Lack of Multidisciplinary Approach in Education | 2 | 3 | 1 | 2 | 3 | 4 | 4 | 10 | 2 |
| **12** | Lack of Political Will | 2 | 4 | 2 | 1 | 3 | 4 | 4 | 11 | 3 |
| **13** | Lack of Monitoring and Penal Policy | 2 | 4 | 2 | 1 | 1 | 4 | 3 | 10 | 2 |
| **14** | Lack of an Integrated Approach to Problem Solving | 2 | 3 | 1 | 1 | 3 | 4 | 4 | 9 | 2 |
| **15** | Disturbed Social Values, Strategic Priorities and Vision | 2 | 4 | 1 | 2 | 1 | 4 | 3 | 10 | 2 |
| **16** | Ad-Hoc Performance and Short-Term Profit | 2 | 3 | 4 | 2 | 4 | 4 | 4 | 13 | 3 |
| **17** | Institutional Immaturity | 2 | 4 | 4 | 1 | 3 | 4 | 4 | 13 | 3 |
| **18** | Corruption | 2 | 3 | 2 | 2 | 2 | 4 | 3 | 10 | 2 |
| **19** | Lack of Prevention | 2 | 4 | 3 | 1 | 3 | 4 | 4 | 12 | 3 |
| **20** | Lack of Knowledge (in the Community) | 3 | 4 | 1 | 1 | 3 | 4 | 4 | 10 | 2 |

# 8.2. BROADER LOCAL STAKEHOLDERS' PERCEPTIONS

As the project embedded a participative and bottom-up approach, we conducted interviews with the local stakeholders to get an idea of the local conditions, gather the locals' knowledge and guidance, as well as explore the possibilities for future cooperation in the project. Responses are summarized below, presenting their views on the values and threats of the area as well as the opportunities.

The respondents were most passionate and vocal when it came to describing what areas/objects they feel should be protected and conserved, and when it came to listing drivers of stress and their underlying causes and factors.

In most cases, the local SHs identified the well-known biodiversity areas of the LBBUEC such as Bojana River and Ada Bojana Island, Lake Šas and Šas Old City, Ulcinj Salina, Valdanos olive plantations. Some pointed to conservation of less known areas/conservation objects (outside of the municipality) such as Port Milena, Cape Đerane, the autochthonous freshwater fish of the basin, mountain Suma in the high hinterland which is rich with springs and wetlands. Some respondents also took into account the cultural heritage, such as hotels Jadran and Mediteran which they thought of as the "jewels of Ulcinj", and also the music school, church, old cinema hall and legends about Šas, Port Milena and Ulcinj Salina about which the locals learned as pupils in school or through sea tales or fisherman tales. Some participants also described the traditions they cherished and felt should be brought back to use. For instance, a tradition and way of gathering of the community used to be "open-air fish places/restaurants", where, during the summer in the Long Beach, guests gathered around a big fire while fish was prepared in front of them. Another tradition which the locals explained is the community olive gathering, undertaken by locals of all ages, which used to be anticipated as a very important part of the year. A notion (nowadays withheld mainly by older inhabitants of Ulcinj) is that "olive is like a mother", referring to its plentiful bearing of fruits without any or much care for the plantation, as compared to other cultures such as grapevine, etc. (Geci R., 2020). Some local SHs felt very strongly about conserving the local gastronomy of Ulcinj, and emphasized that very few local restaurants offer guests local traditional recipes. The fishermen we interviewed were keen on preserving sport fishing considering only few youngsters are interested in this activity.

The interviewees were very knowledgeable and mainly agitated by drivers of stress existing to various natural and cultural wealth of the area. The majority of them included as the drivers of stress: waste (including illegal landfills from coffee shops and construction, waste waters from Montenegrin and Albanian side and lack of waste water infrastructure, lack of waste containers etc.), excessive hunting and poaching (including dynamite use, unconscientious hunting of birds, fish, big fishing pressure on "Hladna Oka", freshwater sources of Lake Šas where fish gathers abundantly etc.), erosion of Bojana Island (a "hot topic" at the time of the project and interviews with locals) and illegal and excessive construction. More specific drivers of stress that the respondents mentioned were the lack of the regulation of vessels speed and overall too many vessels on the water, cows without owners on streets (causing car or motor accidents), lack of Bojana River management, lack of Ulcinj Salina management and allochthonous (fish) species.

As the root causes of drivers of stress, most participants see the decision makers, whether for their inefficiency, corruption, lack of laws implementation, lack of human resources and similar. The second main root cause perceived by respondents is the unconscientiousness of citizens, perceived also as laziness, lack of care and civilization, lack of culture, lack of awareness, etc.

# 8.3. PRELIMINARY LOCAL ACTION GROUP (LAG) PROPOSED ACTIONS

The concept of the Local Action Group (LAG) has been introduced to local SHs in the 3rd workshop, "Actions for the Conservation of Bojana Basin and Ulcinj Area", and built upon afterwards, as a viable bottom-up concept suitable for strengthening the local SHs strategic and proud action.

The informal LAG, consisting of NGO Martin-Schneider Jacoby Association, NGO Mogul, small business Reborn by Adventures, and NGO Association of Restaurants of Ada Bojana, held their first discussion on the 3rd workshop. The group has confirmed the vision identified at the 2nd project workshop, namely: Proud of a community that lives in harmony with nature and from nature! The approach identified by the local SHs as best to use for the pursuit of the vision is: power of joint actions through leadership. Informed by a MARISCO-based analysis conducted at the workshop, the LAG proposed activities whose implementation they would lead or support. These are presented in Annex 3 and focus on the drivers of stress (threat) level.

# 8.4. STRATEGIC FRAMEWORK

From the MARISCO-based analysis of the challenges, a structured and hierarchical framework of objectives can also emerge, which is ideally developed in a participatory and iterative way. This needs to be done in the future, but the initial analysis allows the identification of the larger strategic lines that are needed here.

The nature of the project and the geographical area, as well as the identified problems themselves, make it clear that isolated conservation measures are likely to have only a very limited chance of success in the long term (as is ultimately true worldwide). It is also abundantly clear that in this biologically and ecologically very valuable space, it is out of the question to plan or implement conservation without strong participation of the people. The successful implementation of the participatory workshops – although carried out under difficult conditions – has proven the potential to not only involve the population or civil society, but to empower them to play the leading roles themselves.

In this region, it cannot be a matter of merely "ordering" state nature conservation measures and conventional nature conservation instruments. Rather, it is about an ongoing and necessarily open-ended as well as adaptive process of sustainable regional development. This is also clearly reflected in the initial vision and the very first objectives of the actors involved. It can thus also be taken as a given that this is not only about concrete management goals and strategies, which would have to represent more or less intensive interventions in ecological and social systems, but above all about the creation of a suitable governance situation.

The starting point of all strategic efforts in the project region must be **human well-being** and the **functioning of ecosystems**, which are very closely linked to each other through **ecosystem services.** At this level, the appropriate goals must be further specified and coordinated in the future.

The next step is to define and implement strategies at all levels of the socio-ecological system under the study.

Actually, the most serious stresses in ecosystems need to be reduced. The most important ecological stresses include biodiversity loss, habitat fragmentation and pollution. Here it is clear that merely combating the symptoms will not help in the long term. Nevertheless, it is always an important option to examine whether certain valuable ecosystems and ecosystem components can be better and more strictly protected, at least provisionally. However, the necessary measures, such as the establishment of additional protected areas, usually mean a complex socio-political intervention. In the end, more or less legitimate stakeholder interests are affected – here especially from the field of land use. Land users must be shown and given opportunities to manage in an ecosystem-compatible way. This can be tackled through the usual **technical advice**, but ultimately also requires structural changes as well as economic and technical offers.

At the same time, the lack of financing opportunities for sustainability projects and the driven nature of development by capital interests and by investments aiming at short-term profits are clear evidence that the project region needs governance that significantly improves the framework conditions for sustainable development. The workshop participants identified some problems related to e.g. insufficient knowledge or corruption, but also to the immaturity of institutions. This reinforces the **need to improve governance**, which clearly does not only concern the state level, but also includes all contributions and options of civil society.

The complexity of the biodiversity crisis in the project area is great and in this case can only be managed on site with restrictions due to the great openness of the system. As in the case of all downstream landscapes, a relevant part of the problems is generated outside the area (e.g., substance inputs/pollution, hydrological regime). In addition, the border situation comes into play, so that sustainable

successful management basically only seems possible within the framework of an **internationally coordinated approach.**

On top of this, there is the gigantic challenge of **climate change** with all its complex and increasing future effects on the ecosystems, which are only insufficiently recorded and understood by the actors involved in the project area.

Extreme events with catastrophic consequences for humans and nature such as heavy rainfall and flooding, heat waves or fire, loss of primary productivity with the dieback of wild and cultivated plants or the local loss of species unfortunately will mean a dynamic change in the future rules of the game and management needs.

In this respect, **low-regret strategies for ecosystem-based climate change adaptation** need to be systematically discussed and implemented – here, the priority is to slow down the warming of the landscape by promoting vegetation (along the river and in the entire catchment area) and also to reduce the desiccation and flammability of vegetation, which must essentially be done by promoting the water storage and infiltration capacity of the soils.

The restoration of shrubs and forests is just as much an urgent task in the open landscape as a change in agriculture towards soil-conserving or soil-building practices. In any project for regional development in the 21st century, the best possible adaptation to climate change must be considered as an integral part of the project, or rather as an umbrella over all strategies. The region is very well suited to systematically integrate **nature-based solutions for climate change mitigation and adaptation into sustainable development.** This requires in-depth analyses and corresponding strategy development.

The dynamically changing and presumably intensifying ecological problems, the insufficient knowledge, the uncertainty regarding future developments and also the immaturity and weakness of the institutions, which so far, have also placed too little emphasis on prevention and proactive planning of development, suggest that an appropriately continuous and open-ended learning process is needed for the Bojana ecosystem complex. The problems cannot be eliminated with short-term projects or with supposedly "perfect management plans", but only within the framework of an adaptive process with the widest possible participation of diverse stakeholders. This process should ideally be designed as institutional learning and as a search for building blocks and paths towards sustainable development. The here presented study can be a starting point.

In the context of what has been presented, the idea, which has existed in the region for some time, to strive for the **creation of a UNESCO biosphere reserve** is relevant. Here, the priority should not be the usual associated goals such as better publicity for tourism marketing or the expectation of greater attractiveness for funding. These aspects are undoubtedly important, but even more so, the process of participatory creation and development of a biosphere reserve can provide an inspiring framework for the search process addressed.

In addition, there would be ideal docking opportunities for **cross-border initiatives**. A transboundary biosphere reserve can provide a technical and socio-political motivating impulse. Perhaps, a hitherto often underestimated 'side effect' of the creation of biosphere reserves is – if it is done well – the **contribution to a regional, ecosystem-based and goal-oriented identity.** The whole endeavor is then also linked to the inclusion into a worldwide larger whole, the community of similarly oriented areas and regions.

In this respect, this appears to be an interesting option for the next strategic steps at the present time:

1. Feasibility analysis for the creation of a modern UNESCO biosphere reserve with special emphasis on the

2. Creation of governance structures that empower the relevant civil society and state institu-tions, as well as the

3. Concept for mobilizing the potential of ecosystem-based climate change adaptation and all nature-based solutions for climate change mitigation, which integrates ecosystem-based sec-toral change opportunities, as well as enriched by the

4. Presentation of transnational cooperation and development opportunities.

The strategic path proposed here deliberately starts not at the level of measures for the conservation of individual threatened species or habitats, but at the institutional level. The underlying hypothesis is that many of the institutions active in the area are able to agree on common goals, which clearly also relate to the best possible integrity and functionality of the socio-ecological systems, as well as wanting to move things forward together.

The process should be designed in such a way that the possible creation of a UNESCO biosphere reserve can be an important milestone in the regional search and development process, but not the condition for success.

The above-mentioned steps 1 and 2 can be taken in parallel, but if necessary it would even be innovative to go ahead with the creation of a new governance structure.

An important strategic step could be the **establishment of a purpose-oriented and regional association for the promotion of sustainable and ecosystem-based as well as climate change robust development of the Bojana/Buna catchment area**, which would allow both the state/municipal actors to become members and, of course, non-governmental organizations and enterprises as well.

Such a development society would have to set strategic goals for itself that are linked to the current analysis and vision, guided by the self-commitment to improve the situation of the social and ecological systems in the area. It would have to function democratically like an association with an elected, institutionally mixed board and regular meetings. It would be crucial that state actors in particular understand such a community as a reinforcement of their resources and not as competition.

As an inter-institutional development corporation with a regional identity, access to national and, above all, international financing opportunities could be improved. In other countries, development corporations are part of the regular institutional landscape, especially with the aim of promoting business. It is certainly worthwhile to carry out a preparatory study of the potential that exists internationally to find out what kind of structures exist that could serve as a model and function in accordance with the national legislation.

# ANNEXES

*Annex 1: List of workshops held*

| no. | Workshop title | Date |
|---|---|---|
| 1 | Assessment of the Bojana Basin, Montenegro, for Developing an Adaptive, Ecosystem-Based Risk Management | 2nd and 3rd of October, 2020 |
| 2 | Ecosystem Based Assessment of Values and Threats to Bojana Basin | 4th and 5th of June + 6th of June facultative, 2021 |
| 3 | Actions for Preservation of Bojana Basin | 18th and 19th of December, 2021 |

| | |
|---|---|
| 1 | Which area or species or other characteristic of this area do you consider most important in terms of natural/cultural/ traditional heritage wealth and why?<br>(The aim of this question is to identify the elements that are important for conservation in this area – natural objects important for people and wildlife such as beautiful landscapes, animal species, cultural, traditional, etc.) |
| 2 | How does the nature of the Bojana River basin contribute to your life, i.e. how do you use its assets/resources, and which ones exactly?<br>(e.g. fishing or taking other river or seafood for your house and/or for sale, cutting firewood, taking water from the river for irrigation or using fertile land for agriculture in general, diving or boating, leisure kayaking, with tourism on the river/sea/ lake, doing projects through NGOs or institutions etc.) |
| 3 | To use these natural goods, i.e. ecosystem services (which you have listed/talked about, e.g. fish, wood, etc.), what are the preconditions – natural preconditions but also the role of man – in their maintenance? |
| 4 | Do you think that there are threats to the natural resources you use or to the nature in which they are located? |
| 5 | Why do you think there are threats you have listed (what are the causes)? |
| 6 | Additional questions |
| 7 | Do you know any influential people or groups of people in your environment, community representatives or similar? If YES, can you help us get in touch with them: |
| 8 | Do you know any families, groups of people or individuals who live exclusively from a natural asset (e.g. exclusively from fishing and similar activities, etc.)? If YES, can you help us get in touch with them: |
| 9 | Do you think there are individuals or groups of people who would benefit from our project? If YES, who are they and can you help us contact them: |
| 10 | Do you think there are individuals or groups of people who would mind the project; Who are against our activities, possible negative effects, etc.? If YES, who are they and can you help us contact them? |
| 11 | Is there something you would like to add to the project, something you would like to have, or something you think should be taken away? |
| 12 | Do you know any organizations, local institutions or parts/sectors of local government that are responsible for the process of spatial planning and implementation of environmental protection, sustainable development, etc., which you would recommend? |

*Annex 3: LAG top 3 priorities for action*

| Ideas | Description | Points |
|---|---|---|
| Eco Tourism | The potentials for developing ecotourism all year round in the LBBUEC are enormous, and locals, for start, identified some elements important to establishing it:<br>- health tourism – would require mapping of health-related resources in the LBBUEC (medicinal plants, recipes – e.g. cooking pomegranate peel, etc., creation of "health trails" etc.)<br>- immersion in old customs (demonstration of tradition to tourists through direct experiences, such as cooking traditional food with housewives etc.)<br>- ecological facilities – locals identified an important element of eco tourism is sustainable use of resources and consumption, with one of their main ideas being using restaurant bio waste to create compost on farms or to use as feed to animals<br>- promotion – through use of information boards, websites, marketing using social media etc. | 10 |
| Wild Bees Preservation | Locals emphasized wild bees preservation as an important ecological stress they want to take action on. They recognize pollination as an important ecosystem relevant especially in the many agriculture areas, pastures and other landscapes present in the LBBUEC. This action would be best approached through conducting research necessary to evaluate the state of bee diversity, abundance and assess the decline, with a strong educational and promotional campaign, and possibly inclusion of conservation measures. | 3 |
| Deforestation | Locals felt very strongly about deforestation that is taking place, emphasizing that there is a visible degradation from previous times when the law was observed more by forest owners. The plan for action here is a strong educational campaign, call to action for reporting "forest-thieves" and advocacy on the institutional (national and local) level. | 2 |

# REFERENCES


- Ajtić, R., Tomović Lj., & Crnobrnja-Isailović J. (2004). Checklist of Reptiles of Montenegro. *Institute for Nature Protection Belgrade and Institute for Zoology.*
- Akkay A., Awbery T., Brouwer S., Rudd L., Goossens C., Nikpaljević N., & Varda D. (2020). *Turning Research to Conservation Outputs for Cetacean Protection in Montenegro.*
- Arnold, E. N., & Ovenden, D. N. (2002). *Field Guide: Reptiles & Amphibian in Europe & Great-Britain. Collins & Co., London.*
- Awbery T., Akkaya, A., Clark, H., Nikpaljević, N., Abbiss, L., Clarkson, J., Hardy, J., Guimard, E., Beqiri, K., Konomi, A., Rudd, L., Basmaci, M., & Bakiu, R. (2019). The Identification of Critical Habitats for Cetaceans in the Southern Adriatic Sea. *World Marine Mammal Conference.*
- Awbery, T., Nikpaljević, N., Clarkson, J., Abbiss, L., van der Pouw Kraan, D., Liebig, P., Todorović, S., & Baş, A. A. (2019). *Bottlenose and Striped Dolphins of Montenegro: An Insight Into Sighting Variations, Behavioral Patterns, Photo-Identification, Core Habitats, Marine Traffic and Conservation Initiatives (2017-2018).*
- Aylin Akkaya. (2021). *Narrative report - Marine Mammals and Marine Turtles in Ulcinj sea waters.*
- Bas, A. A., Affinito, F., Martin, S., Vollmer, A., Gansen, C., Morris, N., Nikpaljević, N., & Vujović, A. (2018). *Bottlenose Dolphins and Striped Dolphins: Species Distribution, Behavioral Patterns, Encounter Rates, Residency Patterns and Hotspots in Montenegro, South Adriatic.*
- Bibby, C. J., Burgess, N. D., & Hill, D. A. & M. S. (2000). *Bird Census Techniques.* Academic Press, London.
- BirdLife International. (2021). World Database of Key Biodiversity Areas. Developed by the KBA Partnership (BirdLife International, International Union for the Conservation of Nature, American Bird Conservancy, Amphibian Survival Alliance, Conservation International, Critical Ecosystem Partnership Fund, Global Environment Facility, Global Wildlife Conservation, NatureServe, Rainforest Trust, Royal Society for the Conservation of Birds, Wildlife Conservation Society and World Wildlife Fund). In Available at *www.keybiodiversityareas.org.* [Accessed 16/08/2021)]. *BirdLife International.*
- Boudouresque C. F., Bernard G., Bonhomme P., Charbonnel E., Diviacco G., Meinesz A., Pergent G., Pergent-Martini C., Ruitton S., & Tunesi L. (2012). Protection and Conservation of Posidonia oceanica Meadows. *RAMOGE and RAC/SPA Publisher, 1–202.*
- Bubanja N. (2016). *Geobotanical Characterization of Vascular Flora of Long Ulcinj Beach and Its Hinterland in Montenegro.* University of Belgrade.
- Caković, D., Dragićević, S., Karaman, M., Kasom, G., Mrdak, D., Rakočević, J., Saveljić, D., & Šundić, D. (2016). *Annex to Study of Protection of Šas Lake and Surrounding Area.*
- Caković D., & Milošević D. (2013). *Biodiversity Study of Montenegro Coastal Area.*
- Čapunović S. (2020). *Illegal Waste Locations at Ada Bojana.*
- *Cartagena Protocol on Biosafety to the Convention on Biological Diversity.* (2000). United Nations.
- CAU, ELARD, & ITI. (2014). *Strategic Environmental Assessment (SEA) of Hydrocarbon E&P Activities in Offshore Montenegro.*
- Center for Research and Protection of Birds, & EuroNatur. (2021). *Bird monitoring data for Ulcinj salina, years 2003 - 2020.*
- Ćetković I. (2020). *Composition and Abundance of Shark (Superordo: Selachimorpha) By-Catch in Montenegrin Commercial Fisheries.* University of Montenegro.
- Conservation Measures Partnership. (2020). *Open Standards For the Practice of Conservation, Version 4.0.*
- *Convention on Biological Diversity.* (1993). United Nations, Secretariat of the Convention on Biological Diversity.
- *Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).* (1975). International Union for Conservation of Nature (IUCN).
- *Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention).* (1982). Council of Europe.
- *Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention).* (1983). United Nations.
- *Convention on Wetlands of International Importance (Ramsar).* (1976). United Nations Educational, Scientific and Cultural Organization (UNESCO).
- Crnobrnja-Isailović, J., & Džukić, G. (1997). Diversity of Amphibian and Reptile Fauna in the Lake Skadar Region and Importance of Its Conservation. *In Natural Values and Protection of Skadar Lak*e (pp. 42–51). Montenegrin Academy of Sciences and Arts.
- Crnobrnja-Isailović, J., Polović, L., Ljubisavljević, K., Čađenović, N., Čubrić, T., & Haxhiu, I. (2018). Diversity and Conservation Status of Batrachofauna and Herpetofauna in the Lake Skadar Region. *In The Skadar/Shkodra Lake Environment* (pp. 383–414). Springer, Cham.

- Davies, C. E., Moss, D., & Hill, M. O. (2004). *EUNIS Habitat Classification Revised.*
- Dhora D., & Beqiraj S. (2012). *Regional Importance of the Fauna of the Cross-Border River Buna.*
- Dhora D., Dhora D., & Dhora A. (2016). *Liqeni i Shkodres.*
- Díaz-Almela E., & Duarte C.M. (2008). *Management of Natura 2000 Habitats, 1120 *Posidonia Beds (Posidonion oceanicae).*
- Dijkstra, K. D. B., & Lewington, R. (2006). *Field Guide to the Dragonflies of Britain and Europe: Including Western Turkey and North-Western Africa* . British Wildlife Publishing.
- Directorate of Democratic Participation EU. (2021). *List of Officially Nominated Candidate Emerald Network Sites (December 2021).*
- Dömpke Stephan. (2008). *Detailed Study for Establishing a Regional Park for Bojana Delta.*
- Dudley, N., & Stolton, S. (2008). Defining Protected Areas. *IUCN Summit on Protected Area Management Categories.*
- Duffy, J. E. (2021). *Ocean Ecology: Marine Life in the Age of Humans*. Princeton University Press.
- Đurović M. (2019). Rediscovery of Jošova Cave and Newer Bat Survey Results of Sumporna Cave - Two Important Bat Summer Roosts in Montenegro. *Hypsugo, IV(1).*
- Đurović M, Rajković Batinić N, Vukadinović M, Nikolić J, Ivanović B, Stanković A, Vorotović B, Ćatović E, Lješković Mitrović S, Šaranović M, Petković Sava, & Dabović Aleksandar. (2020). *Detailed Location Study "Cape Đeran - Port Milena", Ulcinj Municipality.*
- Environment Protection Agency. (2021). *Study for Protection for Protected area "Stari Ulcinj."*
- European Commission. (1992). Council Directive 92/43/EEC on the Conservation of Natural Habitats and Wild Fauna and Flora. *Official Journal of the European Communities, L(206/7).*
- European Commission. (2021a). *EU Montenegro Country Report.*
- European Commission. (2021b). *European Marine Observation and Data Network (EMODnet)*. European Commission.
- European Commission, D.-G. for E., Rodwell, J., García Criado, M., Gubbay, S., & et al. (2016). *European Red List of Habitats. Part 1: Marine Habitats.*
- European Environment Agency. (2018). *Common International Classification of Ecosystem Services (CICES) Version 5.1.* . European Environment Agency.
- European Environment Agency. (2022a). *EEA Reference Grid. European Environment Agency.*
- European Environment Agency. (2022b). *EMERALD Network Data.* European Environment Agency.
- European Environment Agency, & United Nations Environment Programme. (2006). *Priority Issues in the Mediterranean Environment.*
- Franchi, G. G., & Pacini, E. (1996). Types of pollination and seed dispersal in Mediterranean plants. *Giornale Botanico Italiano,* 130(2–3), 579–585. *https://doi.org/10.1080/11263509609430327*
- Franetović-Bure D. (1960). *Maritime and Fishing History of Montenegro Until 1918.* Historical Institute of the Republic of Montenegro.
- Geci R. (2020). *Olive Growing in Ulcinj: A Study of Economic and Social Transformations in Postsocialism.* University of Zagreb.
- Gergely P. (2021). *Butterflies of Central Europe & Britain: A Photographic Identification Guide.* De Vlinderstichting/Dutch Butterfly Conservation.
- Gerovasileiou, V., Akyol, O., Al-Hosne Z., Alshikh Rasheed R., Ataç, E., Bello, G., Ćetković, I., Corsini-Foka, M. ., Crocetta, F. ., Denitto, F. ., Guidetti, P. ., Gül, B. ., Insacco, G. ., Jimenez, C. ., Licchelli, C., Lipej, L. ., Lombardo, A. ., Mancini, E. ., Marletta, G. ., … Zava, B. (2019). New records of rare species in the Mediterranean Sea 2020. *Mediterranean Marine Science*. *https://doi.org/10.12681/mms.22148*
- Gligorović B. (2021). *Report on Macroinvertebrates of Bojana Basin and Ulcinj Area.*
- Global Biodiversity Information Facility. (2021). *GBIF Occurrence Download.* Global Biodiversity Information Facility.
- Global Forest Watch. (n.d.). *Global Forest Watch Database.* Global Forest Watch.
- Government of Montenegro. (2007). *Constitution of Montenegro.* Government of Montenegro.
- Government of Montenegro. (2010). *Law on Exploration and Production of Hydrocarbons* (Vol. 41). Official Gazette of Montenegro .
- Government of Montenegro. (2015a). *Law on Forests* (Vol. 47). Official Gazette of Montenegro .
- Government of Montenegro. (2015b). *Law on Game and Hunting* (Vol. 48). Official Gazette of Montenegro .
- Government of Montenegro. (2016a). *Law on Strategic Environmental Impact Assessment* (Vol. 52). Official Gazette of Montenegro .
- Government of Montenegro. (2016b). *Law on Waste Management* (Vol. 39). Official Gazette of Montenegro .
- Government of Montenegro. (2018a). *Law on Environmental Impact Assessment* (Vol. 75). Official Gazette of Montenegro .
- Government of Montenegro. (2018b). *Law on Freshwater Fisheries and Aquaculture* (Vol. 17). Official Gazette of Montenegro .
- Government of Montenegro. (2018c). *Law on Waters* (Vol. 84). Official Gazette of Montenegro .
- Government of Montenegro. (2019a). *Law on Nature Protection* (Vol. 18). Official Gazette of Montenegro .
- Government of Montenegro. (2019b). *Law on the Environment* (Vol. 73). Official Gazette of Montenegro .

- Government of Montenegro. (2019c). *National Plan for Protection From Flooding.* . Government of Montenegro.
- Govers, L. L., de Brouwer, J. H. F., Suykerbuyk, W., Bouma, T. J., Lamers, L. P. M., Smolders, A. J. P., & van Katwijk, M. M. (2014). Toxic effects of increased sediment nutrient and organic matter loading on the seagrass Zostera noltii. *Aquatic Toxicology, 155*, 253–260. https://doi.org/10.1016/j.aquatox.2014.07.005
- Griffiths H. I., Krystufek B., & M. Reed J. (2004). *Balkan Biodiversity* (Vols. 978-1.). Kluwer Academic Publishers.
- Gvozdenović, S., Đurović, M., Ikica, Z., & Mandić, M. (2021). Sea Turtles in Montenegrin Adriatic Coastal Waters. In *The Montenegrin Adriatic Coast* (pp. 471–496). Springer, Cham.
- GWP-Med, PAP/RAC, & UNESCO-IHP. (2015). *Integrated Resources Management Plan (IRMP) for the Buna/ Bojana Area.*
- Haddad, N. M., Brudvig, L. A., Clobert, J., Davies, K. F., Gonzalez, A., Holt, R. D., Lovejoy, T. E., Sexton, J. O., Austin, M. P., Collins, C. D., Cook, W. M., Damschen, E. I., Ewers, R. M., Foster, B. L., Jenkins, C. N., King, A. J., Laurance, W. F., Levey, D. J., Margules, C. R., … Townshend, J. R. (2015). Habitat fragmentation and its lasting impact on Earth's ecosystems. *Science Advances, 1(2). https://doi.org/10.1126/sciadv.1500052*
- Haines-Young R., & Potschin M. (2018). C*ommon International Classification of Ecosystem Services (CICES) V5.1 - Guidance on the Application of the Revised Structure.*
- Ibisch, P. L., & Hobson, P. R. (2014). MARISCO: *Adaptive MAnagement of Vulnerability and RISk at COnservation Sites. A Guidebook for Risk-Robust, Adaptive and Ecosystem-Based Conservation of Biodiversity.* Centre for Econics and Ecosystem Management.
- Janssen, J. A. M., Rodwell, J. S., Criado, M. G., Gubbay, S., Haynes, T., Nieto, A., Sanders, N., Landucci, F., Loidi, J., Ssymank, A., Stešević D., Küzmič F., Milanović Đ., Stanišić-Vujačić M., Šilc U., Tahvanainen, T., Valderrabano, M., Acosta, A., Aronsson, M., … Valachovič, M. (2016). *European Red List of Habitats. 2. Terrestrial and Freshwater Habitats.* .
- Karaman M.G., Dragićević S., Polović L., Marić D., Ćetković I., Vuksanović S., Bubanja N., Biberdžić V., Knežević B., Malidžan S., Burzanović K., Čađenović N., Vizi A., Ivanović Č., & Marić S. (2012). *Report on Biodiversity Monitoring.*
- Katnić A., Jovićević M., & Iković V. (2016). *Ecosystem-Based Assessment of Biodiversity Values and Threats of Buljarica Cove.* NGOs Montenegrin ecologists society and Environment Programme.
- Kryštufek, B., & Reed, J. M. (2004). Pattern and Process in Balkan Biodiversity — An Overview. In *Balkan Biodiversity* (pp. 1–8). Springer Netherlands. *https://doi.org/10.1007/978-1-4020-2854-0_1*
- Lehner, B., & Grill G. (2013). *Global River Hydrography and Network Routing: Baseline Data and New Approaches to Study the World's Large River Systems (*Vol. 27, Issue 15). Hydrological Processes.
- Lehner, B., Verdin, K., & Jarvis, A. (2008). New Global Hydrography Derived From Spaceborne Elevation Data. *Eos, Transactions American Geophysical Union, 89(10), 93. https://doi.org/10.1029/2008EO100001*
- Lika Z. (2021). *Mapping of Housing Objects in the Surroundings of Šas Lake.*
- Liski, J., Lehtonen, A., Palosuo, T., Peltoniemi, M., Eggers, T., Muukkonen, P., & Mäkipää, R. (2006). Carbon Accumulation in Finland's Forests 1922–2004 – an Estimate Obtained by Combination of Forest Inventory Data with Modelling of Biomass, Litter and Soil. *Annals of Forest Science,* 63(7), 687–697. *https://doi.org/10.1051/forest:2006049*
- Liubartseva, S., Coppini, G., Lecci, R., & Creti, S. (2016). Regional Approach to Modeling the Transport of Floating Plastic Debris in the Adriatic Sea. *Marine Pollution Bulletin,* 103(1–2), 115–127. *https://doi.org/10.1016/j.marpolbul.2015.12.031*
- Ljubisavljević K., & Iković V. (2020). *Protection and Conservation of Endangered Lake Skadar Frog and its Habitats in Bojana River Delta.* NGO Montenegrin ecologist society.
- Marine Mammal Research Organization. (2021). *Dolphin Occurence in Bar and Ulcinj Municipalities.* Marine Mammal Research Organization.
- Martinović V. (2015). *Land Erosion in Montenegrin Coastal Area.* Montenegrin academy of sciences and art .
- Milanović, Đ., Caković, D., Hadžiablahović, S., Vuksanović, S., Mačić, V., Stešević, D., Stanišić-Vujačić M., Biberdžić V., & Lakušić, D. (2021). Manual for Identification of Habitat Types in Montenegro of Importance for the European Union with the Main Indicator Species. *Environment Protection Agency of Montenegro and University Banja Luka, Faculty of Forestry.*
- Millennium Ecosystem Assessment (Program). (2005). *Ecosystems and Human Well-Being.*
- Ministry of Agriculture and Rural Development. (2015a). *Fishing Development Strategy of Montenegro 2015 - 2020.* Ministry of Agriculture and Rural Development.
- Ministry of Agriculture and Rural Development. (2015b). *Strategy of Agricultural and Rural Development 2015-2020.* Ministry of Agriculture and Rural Development.
- Ministry of Agriculture and Rural Development. (2017). *Strategy on Water Management of Montenegro.* Government of Montenegro.

- Ministry of Ecology and Spatial Planning. (2022). *GEF Adriatic Project Database.* Ministry of Ecology and Spatial Planning.
- Ministry of Economic Development. (2007). *Spatial Plan of Montenegro 2010 - 2020.* Ministry Of Economic Development.
- Ministry of Economic Development. (2008). *Spatial Plan of Montenegro 2008 - 2020.* Ministry of Economic Development.
- Ministry of Economic Development and Coastal Management Facility. (2007). S*pecial Purpose Spatial Plan for Marine Zone 2007 - 2020.* Ministry of Economic Development and Coastal Management Facility .
- Ministry of Sustainable Development and Tourism; UNEP; PAP/RAC. (2014). *National Strategy for Integrated Management of Coastal Area of Montenegro.* . Ministry of Sustainable Development and Tourism; UNEP; PAP/RAC.
- Ministry of Sustainable Development and Tourism. (2015). *National Strategy for Sustainable Development 2015 - 2030.* Ministry of Sustainable Development and Tourism. .
- Ministry of Sustainable Development and Tourism. (2014). *National Strategy for Integrated Management of Coastal Zone 2015 - 2030.* Ministry of Sustainable Development and Tourism.
- Ministry of Sustainable Development and Tourism. (2015a). *National Biodiversity Strategy with Action Plan 2015-2020.* Ministry of Sustainable Development and Tourism.
- Ministry of Sustainable Development and Tourism. (2015b). *Strategy for Integrated Coastal Area Management 2015 - 2030.* Ministry of Sustainable Development and Tourism.
- Ministry of Sustainable Development and Tourism. (2016a). *National Action Plan for the Implementation of the Land Pollution Protocol and Its Regional Plans in the Framework of Strategic Mediterranean Action Plan (SAP-MED) with the Aim to Achieve Good Environmental Status for Pollution-Related ECAP Ecological Objectives.* Ministry of Sustainable Development and Tourism.
- Ministry of Sustainable Development and Tourism. (2016b). *National Plan for Waste Management 2016-2020 .* Ministry of Sustainable Development and Tourism.
- Ministry of Sustainable Development and Tourism. (2018). S*pecial Purpose Spatial Plan for Coastal Zone 2018 - 2030.* Ministry of Sustainable Development and Tourism.
- Ministry of Sustainable Development and Tourism with IBI Group, W. and G. (2012). *Study of Valorization of Space With the Aim of Producing Energy From Renewable Solar Sources.* Ministry of Sustainable Development and Tourism.
- Municipality Ulcinj. (2016a). *Spatial and Urbanistic Plan of Ulcinj 2016 -2020.* Municipality Ulcinj.
- Municipality Ulcinj. (2016b). *Strategic Development Plan for Ulcinj 2016 - 2020.* Municipality Ulcinj.
- Municipality Ulcinj. (2016c). *Ulcinj Municipality Waste Management Plan.* Municipality Ulcinj.
- Municipality Ulcinj. (2017). *Municipal Flooding Protection Plan of Ulcinj 2017 - 2021.* Municipality Ulcinj.
- National Statistics Agency - Monstat. (2016). *Deforestation per Municipality.* National Statistics Agency - Monstat.
- NGO Environment Programme. (2021). *Strategic Plan of Organizational Development 2022 - 2025.* NGO Environment Programme, unpublished.
- Open Knowledge Foundation. (n.d.). *Open Definition - Defining Open in Open Data, Open Content and Open Knowledge.*
- Ouellet Dallaire, C., Lehner, B., Sayre, R., & Thieme, M. (2019). A Multidisciplinary Framework to Derive Global River Reach Classifications at High Spatial Resolution. *Environmental Research Letters,* 14(2), 024003. *https://doi.org/10.1088/1748-9326/aad8e9*
- Penuelas, J., Gordon, C., Llorens, L., Nielsen, T., Tietema, A., Beier, C., Bruna, P., Emmett, B., Estiarte, M., & Gorissen, A. (2004). Nonintrusive Field Experiments Show Different Plant Responses to Warming and Drought Among Sites, Seasons, and Species in a North?South European Gradient. *Ecosystems*, 7(6). *https://doi.org/10.1007/s10021-004-0179-7*
- Pereira, H. M., Leadley, P. W., Proença, V., Alkemade, R., Scharlemann, J. P. W., Fernandez-Manjarrés, J. F., Araújo, M. B., Balvanera, P., Biggs, R., Cheung, W. W. L., Chini, L., Cooper, H. D., Gilman, E. L., Guénette, S., Hurtt, G. C., Huntington, H. P., Mace, G. M., Oberdorff, T., Revenga, C., … Walpole, M. (2010). Scenarios for Global Biodiversity in the 21st Century. *Science,* 330(6010), 1496–1501. *https://doi.org/10.1126/science.1196624*
- Pešić, V., & Dhora, D. (2001). Invertebrates. *In Biodiversity Database Of The Škodra/Lake Skadar. REC Office.*
- Pešić, V., Gadawski, P., Gligorović, B., Glöer, P., Grabowski, M., Kovács, T., Murányi, D., Płóciennik, M., & Šundić, D. (2018). The Diversity of the Zoobenthos Communities of the Lake Skadar/Shkodra Basin. In *The Skadar/Shkodra Lake Environment* (pp. 255–293). Springer International Publishing . *https://doi.org/10.1007/698_2017_234*
- Pešić, V., Karaman, G., & Kostianoy, A. G. (2018). *The Skadar/Shkodra Lake Environment* (Vol. 80). Springer International Publishing. *https://doi.org/10.1007/978-3-319-99250-1*
- Pestorić, B., Lučić, D., & Joksimović, D. (2011). Cladocerans Spatial And Temporal Distribution In The Coastal South Adriatic Waters (Montenegro). *Studia Marina,* 25, 101–120.

- Petchey, O. L., & Gaston, K. J. (2002). Functional Diversity (FD), Species Richness and Community Composition. *Ecology Letters,* 5(3), 402–411.
- Petković, S., & Sekulić, G. (2019). Erosion and Sedimentation Processes in the Bojana River Delta at the Adriatic Sea. *Journal of Coastal Conservation,* 23(1), 39–47. *https://doi.org/10.1007/s11852-018-0634-9*
- Petović S. (2020). Protection of Coastal and Marine Areas of Montenegro.
- Plantlife International. (2021). Plantlife Important Plant Areas (IPA) Database. Plantlife International.
- Polović, L., & Čađenović, N. (2014). The Herpetofauna of the Great Ulcinj Beach Area Including Ada Island (Montenegro). Turkish Journal of Zoology, 38, 104–107. *https://doi.org/10.3906/zoo-1303-7*
- Popović J., Mićanović A., Iković V., & Muhović I. (2021). *Report on Herpetofauna and Natura 2000 Habitat Classification for Ulcinj Municipality.*
- Popović M., & Mijović B. (2021). *Determination Of Presence and Distribution Of Alien and Invasive Foreign Plants On the Territory Montenegro.*
- Puzović, S. (2002). B*irds of Ulcinj Coast (Montenegro) in 1988 and 1991 with Special Concern to Long Beach, Island Ada, Delta of R. Bojana, Stojsko and Zoganjsko Mudflats*.
- QGIS.Org. (n.d.). *QGIS Geographic Information System.* QGIS Association.
- Radujković, B., & Šundić, D. (2018). Parasites Of Lake Skadar. In *The Skadar/Shkodra Lake Environment* (pp. 325–337). Springer International Publishing .
- Rakaj M. (2012). Performing the Integrated Environmental Management Plan at Local Level . In *Shkodra Lake Ecosystem - EMA PLAN.* Cross-Border Cooperation Programme (IPA Albania-Montenegro).
- Rakočevič-Nedović, J., & Hollert, H. (2005). Phytoplankton Community and Chlorophyll A as Trophic State Indices of Lake Skadar (Montenegro, Balkan). . *Environmental Science And Pollution Research, 12*(3), 146–152.
- Rakočević-Nedović J., & Rakaj M. (n.d.). Algae. In Biodiversity Database Of *The Shkodra/Lake Skadar. Checklist Of Species.* The Regional Environmental Center For Central And Eastern Europe, Szentendre.
- Rakočević, J. (2018). The Phytoplankton and Trophic State of Lake Skadar/Shkodra. In *The Skadar/Shkodra Lake Environment* (pp. 153–167). Springer International Publishing .
- Ramsar Convention On Wetlands. (2022a). *Annotated List Of Wetlands Of International Importance - Albania.* Ramsar Convention On Wetlands.
- Ramsar Convention On Wetlands. (2022b). *Annotated List Of Wetlands of International Importance - Montenegro.* Ramsar Convention On Wetlands.
- Rands, M. R. W., Adams, W. M., Bennun, L., Butchart, S. H. M., Clements, A., Coomes, D., Entwistle, A., Hodge, I., Kapos, V., Scharlemann, J. P. W., Sutherland, W. J., & Vira, B. (2010). Biodiversity Conservation: Challenges Beyond 2010. *Science*, 329(5997), 1298–1303. *https://doi.org/10.1126/science.1189138*
- Rubinić, B., Sackl, P., & Gramatikov, M. (2019). *Conserving of Wild Birds in Montenegro. The First Inventory of Potential Special Protection Areas in Montenegro.* AAM Consulting.
- Santos, R., Silva, J., Alexandre, A., Navarro, N., Barrón, C., & Duarte, C. M. (2004). Ecosystem Metabolism and Carbon Fluxes of a Tidally-Dominated Coastal Lagoon. *Estuaries*, 27(6), 977–985. *https://doi.org/10.1007/BF02803424*
- Saveljić, D., & Jovićević, M. (2015). *Bird List of Montenegro with Bibliography.*
- Schneider-Jacoby, M., Schwarz, U. P., Sackl, P., Dhora, D., Saveljić, D., & Stumberger, B. (2006). *Rapid Assessment of the Ecological Value of the Bojana-Buna Delta (Albania/Montenegro).*
- Schwarz, U. (2021). *Hydropower Plants in the Balkans.* NGO Riverwatch.
- Shumka, S., Špoljar, M., & Tasevska, O. (2018). The Zooplankton of Lake Skadar/Shkodra: Species Diversity and Abundance. In *The Skadar/Shkodra Lake Environment* (pp. 239–254). Springer International Publishing . *https://doi.org/10.1007/698_2018_237*
- Šilc, U., Stešević, D., Luković, M., & Caković, D. (2020). Changes of a Sand Dune System and Vegetation Between 1950 and 2015 on Velika Plaža (Montenegro, E Mediterranean). *Regional Studies in Marine Science,* 35, 101139. *https://doi.org/10.1016/j.rsma.2020.101139*
- Slobodna Evropa. (2022). *Nije Pronađena Nafta U Crnogorskom Podmorju.*
- Šolić, M., Grbec, B., Matić, F., Šantić, D., Šestanović, S., Ninčević Gladan, Ž., Bojanić, N., Ordulj, M., Jozić, S., & Vrdoljak, A. (2018). Spatio-Temporal Reproducibility of the Microbial Food Web Structure Associated with the Change in Temperature: Long-Term Observations in the Adriatic Sea. *Progress in Oceanography,* 161, 87–101. *https://doi.org/10.1016/j.pocean.2018.02.003*
- Sovinc A., Tome D., & Hosek M. (2017). *Study Of Protection For Ulcinj Salina.* AGRECO & CEU Consulting.

- Stešević, D., Küzmič, F., Milanović, Đ., Stanišić-Vujačić, M., & Šilc, U. (2020). Coastal Sand Dune Vegetation of Long Beach (Montenegro). *Acta Botanica Croatica,* 79(1).
- Stumberger, B., Schneider-Jacoby, M., Schwarz, U., Sackl, P., Dhora, D., & Saveljić D. (2005). The Ornithological Value of the Bojana/Buna Delta. *Bul. Shk., Ser. Shk,* 55, 136–158.
- Šundić, D. (2007). *Diversity and Bioindicator Potential of Oligochaeta From the Skadar Lake.* University Of Montenegro.
- Šundić D. (2021). *Report on Assessment of Biodiversity Values and Threats in Bojana Drainage Basin.*
- Šundić, D., & Radujković, B. M. (2012). Study on Freshwater Oligochaeta of Montenegro and Their Use as Indicators in Water Quality Assessment. *Natura Montenegrina,* 11(2), 117–383.
- ŠUNDIĆ, D., RADUJKOVIĆ, B. M., & KRPO–ĆETKOVIĆ, J. (2011). Catalogue of Aquatic Oligochaeta (Annelida: Clitellata) of Montenegro, Exclusive of Naidinae and Pristininae. *Zootaxa*, 2985(1), 1. *https://doi.org/10.11646/zootaxa.2985.1.1*
- Šundić, D., & Rakočević, J. (2017). Investigation of Phytoplankton and Macrozoobenthos of Lake Skadar and Bojana River. In *Unpublished Own Data.*
- Talbot, C. J., Bennett, E. M., Cassell, K., Hanes, D. M., Minor, E. C., Paerl, H., Raymond, P. A., Vargas, R., Vidon, P. G., Wollheim, W., & Xenopoulos, M. A. (2018). The Impact of Flooding on Aquatic Ecosystem Services. *Biogeochemistry*, 141(3), 439–461. *https://doi.org/10.1007/s10533-018-0449-7*
- Telesca, L., Belluscio, A., Criscoli, A., Ardizzone, G., Apostolaki, E. T., Fraschetti, S., Gristina, M., Knittweis, L., Martin, C. S., Pergent, G., Alagna, A., Badalamenti, F., Garofalo, G., Gerakaris, V., Louise Pace, M., Pergent-Martini, C., & Salomidi, M. (2015). Seagrass Meadows (Posidonia oceanica) Distribution and Trajectories of Change. *Scientific Reports,* 5(1), 12505. *https://doi.org/10.1038/srep12505*
- Théou, P., Radonjić, M., Loçe, E., Stojanov, A., & Ralević, S. (2020). New Data on Bats from the Shkodër/Lake Skadar-Buna/Bojana River Transboundary Area (Albania And Montenegro). *Hypsugo* , V(1).
- Tranvik, L. J., Downing, J. A., Cotner, J. B., Loiselle, S. A., Striegl, R. G., Ballatore, T. J., Dillon, P., Finlay, K., Fortino, K., Knoll, L. B., Kortelainen, P. L., Kutser, T., Larsen, S., Laurion, I., Leech, D. M., McCallister, S. L., McKnight, D. M., Melack, J. M., Overholt, E., … Weyhenmeyer, G. A. (2009). Lakes and Reservoirs as Regulators of Carbon Cycling and Climate. *Limnology and Oceanography,* 54(6part2), 2298–2314. *https://doi.org/10.4319/lo.2009.54.6_part_2.2298*
- Tsiafouli, M. A., Thébault, E., Sgardelis, S. P., de Ruiter, P. C., van der Putten, W. H., Birkhofer, K., Hemerik, L., de Vries, F. T., Bardgett, R. D., Brady, M. V., Bjornlund, L., Jørgensen, H. B., Christensen, S., Hertefeldt, T. D., Hotes, S., Gera Hol, W. H., Frouz, J., Liiri, M., Mortimer, S. R., … Hedlund, K. (2015). Intensive Agriculture Reduces Soil Biodiversity across Europe. *Global Change Biology,* 21(2), 973–985. *https://doi.org/10.1111/gcb.12752*
- UNEP-WCMC, & IUCN. (2021). P*rotected Planet: The World Database on Protected Areas (WDPA) and World Database on Other Effective Area-based Conservation Measures (WD-OECM)* . UNEP-WCMC and IUCN.
- UNESCO. (2017). *A New Roadmap for the Man and the Biosphere (MAB) Programme and its World Network of Biosphere Reserves.*
- Vanni, M. J. (2002). Nutrient Cycling by Animals in Freshwater Ecosystems. *Annual Review of Ecology and Systematics,* 33(1), 341–370. *https://doi.org/10.1146/annurev.ecolsys.33.010802.150519*
- Verma, K. K., & Singh, M. (2018). Flooding Stress in a Changing Environment. *Asian Journal Of Botany,* 1, 1–12.
- Vuković A. (2020). *Illegal Dumps in Long Beach Area.*
- Wetlands International, D. E. by A. V. (2021). *IWC Online Database.* Wetlands International.
- Wilke, T., Schultheiß, R., Albrecht, C., Bornmann, N., Trajanovski, S., & Kevrekidis, T. (2010). Native Dreissena Freshwater Mussels in the Balkans: In and Out of Ancient Lakes. *Biogeosciences*, 7(10), 3051–3065. *https://doi.org/10.5194/bg-7-3051-2010*
- Zeković B. (2021). *Narrative Report on Avifauna of Bojana Basin*.
- Zvizdojević J., Popović B., Peković D., Vojinović N., Aprcović J., Krstičević S., Raičević B., Radinović T., & Šišević R. (2010). *Livestock Fund, Structure of Agricultural Farms.*

*Yellow-legged sea gull (Larus michahellis) © Robert Janković*

ENVPRO

Centre for Econics and Ecosystem Management

BirdLife INTERNATIONAL

Partnership for nature and people

CRITICAL ECOSYSTEM PARTNERSHIP FUND