



HUTOVO BLATO

Identification and assessment of the
main coastal tourism-related issues
concerning climate change mitigation
and adaptation

The Consortium:



Project Information	
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Project Overview

The Mediterranean region is one of the most vulnerable hotspots in the current biodiversity and climate crises, warming 20% faster than the global average and being the second biodiversity hotspot in the world. The increase of severe climate events are also likely to influence the choice of destinations and time to travel for its over 510 million inhabitants. The effects of climate change will put additional pressure on already strained ecosystems and vulnerable economies and societies, with Tourism being one of the most affected economic sectors.

The recent Transition Pathway for Tourism and the Glasgow Declaration are building a global momentum for Climate Action in Tourism, but policymakers and destinations need support to better develop efficient climate mitigation and adaptation policies using ecosystem-based approaches and improved multi-level governance structures, including robust planning and ensure the long-term engagement of the private sector and citizens. Indeed, ecosystem-based management is considered a good practice to effectively deal with these threats as it considers the different stakeholders and factors affecting ecosystems and the mechanisms involved, in order to find solutions.

NaTour4CChange builds on and capitalises on successful experiences at the Mediterranean and global level to test solutions for increasing the resilience of coastal destinations in the Mediterranean. The project will aim to set common methods to allow participating regions to assess their tourism-related climate adaptation and mitigation priorities, and take climate action via plans and strategies, supported by cooperative governance.

In coastal destinations, cross-sector teams will deliver specific tourism climate Action Plans, focusing on climate adaptation, where Nature-based Solutions (NbS) will be tested to ensure their feasibility. At the same time, innovative destination marketing and communication approaches will engage private stakeholders, visitors, and residents in climate action.

The project will also ensure cross-fertilisation among participating regions and destinations, to achieve common methods and to compare the different tested plans and solutions, leading to lessons, best practices, and policy.



Glossary

Climate Change Adaptation (CCA) means anticipating the adverse effects of climate change and taking appropriate measures to prevent or minimise the damage they may cause, or to take advantage of the opportunities that may arise.

Climate Change Mitigation (CCM) means making the impacts of climate change less severe by reducing the sources of emission of greenhouse gases (GHG) into the atmosphere or by improving the storage of these gases.

Ecosystem Services (ES) are the benefits that an ecosystem brings to society and that improve people's health, economy, and quality of life.

Ecosystem-based Approaches (EbA) focus on managing biodiversity and ecological systems in a holistic way to maintain and enhance ecosystem services benefits and functions.

Nature-based Solutions (NbS) encompasses all actions that rely on ecosystems and the services they provide to respond to various societal challenges such as climate change, food security, resource management, or disaster risk.



1. INTRODUCTION

The report on the identification and assessment of the main issues related to Mediterranean and sub-Mediterranean tourism in relation to climate change mitigation and adaptation for the Hutovo Blato Nature Park is an integral part of the project "Governing sustainable tourism in territories with high environmental value: reconnecting tourism and nature for addressing the climate crisis with an ecosystem-based approach" (acronym NaTour4CChange), which is financed by the Interreg Euro-MED program, the Ministry of Agriculture, Forestry and Water Management of HNŽ participates as a project partner. The main theme of this project is the management of sustainable tourism in areas with high ecological value. The goal of the project is to connect tourism and nature and ensure coexistence that benefits both tourists and the preservation of natural resources.

Challenges associated with climate change, such as heat waves, fires and floods, increasingly emphasize the need for the tourism industry to adapt. The summer of 2023 recorded the highest average temperatures since 1940, when weather records began. Extreme temperatures and weather patterns are particularly noticeable in Mediterranean destinations. These effects are expected to change seasonal tourism patterns over time, shape travelers' destination decisions, and likely reduce the appeal of warmer tourist destinations while increasing the appeal of cooler regions in summer.

This document presents the impact of climate change research results on the tourism sector and proposes measures to mitigate their potential negative effects. The methodology of the work includes an analysis of available documents and sources related to Hutovo blato, in particular statistical and other data related to the general characteristics of the area, hydrological and climatic conditions, tourism and attraction base, as well as current development and planning documents and other relevant available information.

The analysis of the state of tourism and the impact of climate change on tourism in a particular area, in addition to general characteristics, demographics and economy, also includes strategic documents that are key in the process of planning and predicting future management steps related to the impact of climate change on the future development of sustainable tourism. In the preparation of the report, key elements of existing strategic, planning and legal documents relevant to the HNC were also analyzed and include:

- SPATIAL PLAN OF THE AREA OF SPECIAL FEATURES FOR THE AREA OF SIGNIFICANCE FOR THE HERZEGOVINA-NERETVA COUNTY "HUTOVO BLATO NATURE PARK" (2013 to 2023), 2013.
- SPATIAL PLAN AND MANAGEMENT PLAN FOR THE HUTOVO BLATO NATURE PARK, 2013.
- ACTION PLAN: Revitalization of the Hutovo Blato wetland ecosystem, WWF, 2015
- Rules on internal order in the HUTOVO BLATO NATURE PARK
- LAW ON NATURE PROTECTION OF BiH



- Tourism Development Strategy of the HNC 2011-2021
- Development Strategy of the Herzegovina-Neretva County for the period 2021-2027, Government of Herzegovina-Neretva County
- Small Business Development Strategy of Herzegovina-Neretva County/Canton for the period 2023-2027
- Rural Development Strategy of Herzegovina-Neretva County 2021-2027, Ministry of Agriculture, Forestry and Water Management of HNŽ, 2021
- Climate Change Adaptation and Low-Emission Development Strategy for Bosnia and Herzegovina
- Climate Change Adaptation Plan of Bosnia and Herzegovina – NAP with proposed measures, UNDP BiH, September 2021
- Water Management Plan for the Adriatic Sea River Basin in the Federation of BiH (2022-2027). Adriatic Sea River Basin Agency in Mostar, 2022
- European Union documents (Green Agenda for the Western Balkans, Fit for 55).
- National and regional environmental protection programs (e.g. NATURA 2000, Neum Coastal Zone Management Plan)
- Spatial Plan of the City of Čapljina 2023
- Assessment of the vulnerability of the HNŽ area to natural and other disasters, Civil Protection and Firefighting Directorate, 2016
- Law on Environmental Protection (Official Gazette of the Federation of Bosnia and Herzegovina; No. 15/21)
- Federal Hydrometeorological Institute of Bosnia and Herzegovina. (2023). Climatological analysis of 2023.
- Third National Report and Second Biennial Report on Greenhouse Gas Emissions in Bosnia and Herzegovina according to the United Nations Framework Convention on Climate Change, July 2016.
- The fourth national report of Bosnia and Herzegovina according to the United Nations Framework Convention on Climate Change, October 2022.
- WWF report: "The Climate Change Effect in the Mediterranean: Stories from an overheating sea" (The Climate Change Effect in the Mediterranean: Stories from an overheating sea) is available at: www.wwfmmi.org
- WWF's detailed work on ocean-climate policy: WWF's Blueprint for a Living Planet: Four Principles for Integrated Ocean-Climate Strategies (2021).

All of the above strategic documents recognize the issue of climate change impacts, while those that investigate the significance of tourism particularly emphasize the importance of valorization and diversification in tourism for the coming years, emphasizing the importance of responsible planning, management and improvement of the offer, extension of the season and development of specific forms of tourism while respecting the principles of sustainability.

The expected results in the researched issues relate to:

- Identification of priority climate risks.
- Recommendations for action plans and adaptation.
- Increasing stakeholder awareness of sustainable practices.



The purpose of the document is to strengthen the resilience of Hutovo Blato to climate change through the tourism sector.

2. BASELINE ASSESSMENT

2.1. Introduction

Hutovo Blato Nature Park is one of the most important wetlands in Southeast Europe and an area of great ecological importance, attracting visitors for its natural beauty, rich flora and fauna, and specific ecosystems. It is a natural oasis with ideal living conditions for more than 200 species of waterfowl and a large number of migratory birds that live here temporarily or permanently. Hutovo Blato is also considered one of the largest wintering grounds for birds in Europe, making it an important area for birdwatching. Visitors can enjoy boat rides through these waters, exploring nature and observing animal and plant species. The park's lakes are also home to 44 species of fish and eels, and more than 600 plant species.

The Hutovo Blato area is the last remaining wetland habitat in the Neretva River basin in Bosnia and Herzegovina. It is one of two nature parks in Bosnia and Herzegovina, along with Blidinje Nature Park, which is also located in Herzegovina-Neretva County. In 1998, the International Council for Bird Conservation (ICBP) included “Hutovo Blato” in the list of internationally important bird habitats. Then, in 2001, the “Hutovo Blato” Nature Park was included in the list of wetlands of international importance according to the methodology of the Ramsar Convention and was registered with the UNESCO Directorate in Paris.

Various tourist facilities, such as organized tours with guides that include hiking, boating, cycling or kayaking through the area, and an information center that offers educational materials about the flora, fauna and ecological features of Hutovo Blato. Also attractive are specialized platforms and observation posts set up at key locations so that visitors can observe birds in their natural environment without disturbance. Visitors can be educated about the importance of preserving wetland ecosystems and biodiversity, learn about the role of wetlands in regulating water flows, reducing floods, cleaning water and preserving the habitats of many species. In addition to touring the park by boat, visitors can enjoy planned hiking and cycling trails. Along the trails, it is possible to explore diverse ecosystems and enjoy nature. The best time to visit Hutovo Blato is during spring and autumn when birds migrate and nature is at its most active. Sailing along the Krupa River, and a series of lakes: Deransko, Drijen, Orah, as well as the canals and cuts that connect them, is interesting and significant from an ornithological, ichthyological, scientific, ecological and touristic aspect.

The Sun Channel is an artificial waterway 1100 meters long that connects Karaotok with the Krupa River. Although created artificially, a ride along the Sun Channel provides a unique impression of the natural habitats it passes through. The Krupa

River is naturally connected to Deransko Lake. Sailing along this lake, which is the shallowest and largest lake in Gornji Blato, is a unique experience, especially during the time when the water lilies are blooming.

The cultural, historical and traditional values of Hutovo Blato are as impressive as the natural features of the area. Numerous archaeological finds have been found in the vicinity of Hutovo Blato, including the remains of a Roman road, necropolises and medieval stećak tombstones, which testify to the long history of settlement of this area.

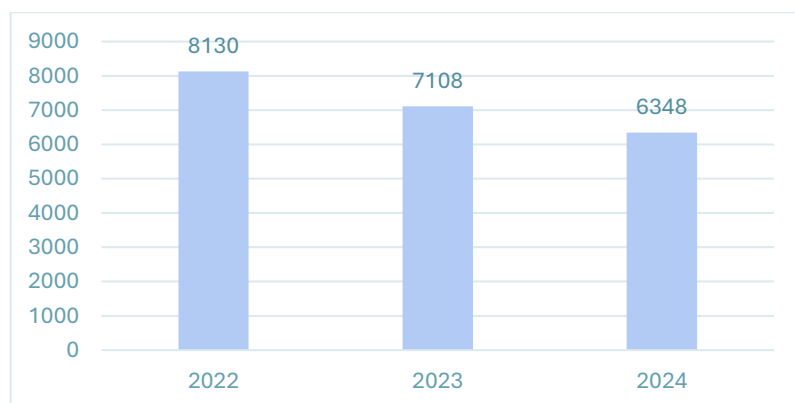
Hutovo Blato represents a living combination of natural and cultural heritage. Although it is best known for its ecological significance as a bird sanctuary and wetland ecosystem, one should not ignore the richness of its history, folk tradition and local culture, which together form an important part of the identity of this part of Herzegovina.

Thanks to its location, the Herzegovina-Neretva County is a very important transport and strategic route, connecting the continental central part of Bosnia and Herzegovina with the Adriatic Sea. The presence of various modes of transport, from air (Mostar International Airport), railway (Sarajevo-Ploče railway) to road (motorways, main roads) significantly contributes to the regional and international connectivity of Hutovo Blato and represents a comparative advantage in the transport of passengers and visitors to this area. Hutovo Blato is only 5 km from the nearest city, Čapljina. The Park is connected to the capital of Bosnia and Herzegovina, Sarajevo, by a 162 km main road. The Park is 35 km from the regional center of Mostar, the same distance from the Adriatic Sea.

Hutovo Blato is a popular destination for tourists, especially those looking for ecotourism, active holidays and authentic local experiences.

The following figure shows the number of tickets sold in the period from 2022 to 2024, where a certain downward trend is observed.

Figure 1. Number of tickets sold



Source: NP Hutovo blato



It is important to note that the figures do not reflect the actual situation, as there is no record of all actual entries into the Park, and only the number of tickets sold for organized boat trips on the lakes and the Sun Canal is shown.

For the future development of this area, it is necessary to develop sustainable tourism, which is crucial for the conservation of natural resources and the development of the local community. Sustainable tourism is an imperative in the modern tourism industry, especially when we are talking about a protected area, so all stakeholders involved in the development and management of tourism should strive to achieve the goals of sustainable tourism. In order for tourism in protected areas to develop in accordance with sustainable development, it must contribute to the long-term preservation of nature and ensure that there are no threats from inappropriate visits.

2.2. National climate change adaptation policy

The NaTour4CChange project is based on the need to strengthen the climate resilience of Mediterranean coastal destinations, with a focus on ecosystem-based management and cooperation. In the context of Bosnia and Herzegovina (BiH), the regulatory and policy framework is crucial for the implementation of climate action, but at the same time represents a significant challenge due to fragmented legislation and lack of coordination. A more detailed analysis follows:

1. International and national framework

- The UN Convention on Climate Change (UNFCCC) entered into force in 1994 and a total of 20 annual conferences (COPs) have been held. The Convention has been ratified by 186 countries.
 - The 1997 Kyoto Protocol represents a step towards reversing the global trend of increasing greenhouse gas emissions.
 - The 2015 Paris Agreement is an action plan to limit global warming. Limiting global warming, securing food supplies, strengthening countries' capacities to combat the effects of climate change, encouraging the development of "green" technologies, and helping weaker, economically less developed countries achieve their national emission reduction plans are the main objectives of this agreement.
- Integration with the European Union:
 - BiH is a candidate for EU membership, but delays in reaching an agreement on climate neutrality by 2050 are slowing down progress:
 - Stabilization and Association Agreement (SAA) signed in 2008, but implementation of EU environmental standards (e.g. Emissions Directive) has been slow due to political divisions.
 - Coordination problems - The Decision on the Coordination System for European Integration (2016) is not sufficiently operational to overcome entity differences.



- Bosnia and Herzegovina ratified the UN Framework Convention on Climate Change (UNFCCC) in 2000, thereby committing to reducing greenhouse gas (GHG) emissions and adapting to climate change. The First National Communication (INC) from 2009 identified vulnerabilities (e.g. floods, droughts), but the lack of updated reports and Nationally Determined Contributions (NDCs) with clear emission reduction targets leaves BiH behind regional partners (e.g. Serbia, Montenegro). The Kyoto Protocol (ratified in 2007) focused on mandatory emission reduction targets for developed countries, but BiH as a developing country had limited commitments. The Fourth National Communication (supported by UNDP and GEF) is crucial for monitoring progress and accessing finance.

BiH, as a state, does not have a single national climate change strategy. Environmental and climate change legislation is fragmented between the entities (Federation of BiH and Republika Srpska) and the Brčko District, which makes policy harmonisation difficult. For example:

- FBiH: Law on Environmental Protection (2013) does not explicitly mention climate change.
- RS: Environmental Protection Strategy (2016–2025) only marginally mentions adaptation.
- Brčko District: There are no special documents related to climate.
- Coordinating bodies: The contact institution for the UNFCCC is the Ministry of Spatial Planning, Construction and Ecology of the RS, which creates inequality in decision-making between the entities. Each entity makes its own regulations (eg FBiH has 10 counties with different approaches).

2.2.1. Constraints and Gaps in Climate Action Implementation in Bosnia and Herzegovina

- Institutional Constraints

BiH faces a complex institutional structure due to the Dayton Agreement, which makes it difficult to coordinate climate policies between entities (the Federation of Bosnia and Herzegovina and the Republika Srpska) and the Brčko District).

Key issues include:

- Unclear responsibilities: Lack of defined roles of ministries (e.g. the Ministry of Foreign Trade and the Inter-Entity Environment Authority established in 2006) and fragmented responsibilities (e.g. the UNFCCC focal point in BiH is the RS Ministry of Physical Planning).
- Weak coordination: Lack of vertical (between levels of government) and horizontal (between sectors) cooperation, and the absence of a unified system for collecting environmental data.
- Multi-sectoral challenges: Climate change is not integrated into tourism, agricultural or health policies, and inter-ministerial bodies for risk management are lacking.



- Limited coordination with the private sector and local communities: Current laws do not provide mechanisms for involving the tourism sector, local communities or NGOs in the development of climate plans. This is particularly problematic for the NaTour4CChange project, which requires multi-stakeholder cooperation in coastal destinations.

- Financial constraints

Key issues include:

- Insufficient funding: Current budgets do not cover the costs of mitigation and adaptation measures. Entity environmental funds (FBiH and RS) have limited resources, while the Brčko District does not have its own fund.

- Dependence on international aid: BiH relies on funds such as the Green Climate Fund or EU programmes (LIFE, Cohesion Fund), but access to funds is hampered by the lack of adaptation action plans.

- Ongoing reforms: The introduction of feed-in tariffs for renewable energy sources and the planned auctions for community energy projects only partially address the problems of decentralization of the energy system.

- Human resource constraints

- Lack of qualified personnel: Weak capacities in public administration, especially at local level, and insufficient education in critical sectors (e.g. agriculture, tourism).

- Health system: Data on the impact of climate change on health are lacking, and risk monitoring systems are unclear. Education: Higher education systems in tourism and agriculture are not adapted to modern challenges.

- Recommendations to overcome challenges

- Strengthening coordination: - Establishing a standardized data collection system and a single database for the environment. - Regular events for institutional networking (e.g. annual conferences).

- Legal reforms:

- o Revision of the Law on Occupational Safety and Health to include measures for work in extreme weather conditions.

- o Implementation of the Strategy for Alignment with the EU Acquis in the field of environment.

- Capacities and education:

- o Training of experts in climate risks and development of early warning systems.

- o Modernization of educational programs in tourism and agriculture.

- International cooperation:

- o Use of the UNDP National Adaptation Plan (NAP) project (2018-2021) to integrate climate risks into development plans.

- o Access to EU funds (e.g. Horizon 2020, ERDF) and the Green Climate Fund.

- Innovative financing:

- o Introduction of public-private partnership models and green bonds to mobilize funds.

- Legal gaps and needs for reform

- Lack of climate concepts in laws: Existing regulations (e.g. laws on spatial planning, waters, nature protection) do not contain concepts such as "climate change",



"nature-based solutions (NBS)" or "carbon footprint". This prevents the integration of climate criteria into tourism infrastructure planning or coastal zone management.

- Adaptation as a marginalized topic: There is currently no single methodology for assessing climate risks in tourism, nor a legal framework that imposes the obligation to develop adaptation action plans. This limits the ability of projects like NaTour4CChange to rely on existing standards.

- Key projects and initiatives

- UNDP NAP project: Focus on building capacity for adaptation, testing innovative financing in 4-5 municipalities and establishing a coordination system.

- Fourth National Report: The aim is to prepare a document compatible with UNFCCC standards and identify priority sectors (e.g. energy, agriculture, tourism...).

- Legislative reform: A state-level Climate Change Law is needed, which will integrate entity strategies.

- Energy sector reform: Introduction of renewable energy auctions and energy efficiency incentives in public buildings.

- Capacity building: Training of officials in writing NDCs and accessing funds (e.g. Horizon Europe).

Bosnia and Herzegovina needs to systematically integrate climate challenges into all sectors, relying on international support and improving domestic capacities through education, coordination and innovation. A single climate strategy needs to be urgently developed to overcome institutional divisions, access global funds and accelerate EU accession. Without it, the risks of extreme weather events and economic losses will continue to increase.

2.2.2. Integration into the NaTour4CChange project

The project can serve as a catalyst for strengthening the regulatory framework through the following steps:

- Promoting a multi-level governance structure:

- Adopting cooperative governance models (e.g. workshops for entity ministers, local authorities and tourism stakeholders) for policy harmonisation.

- Introducing mandatory climate assessments for tourism projects in coastal areas (in line with EU directives).

- Integrating NbS into legislation:

- Improving nature protection laws to explicitly support nature-based solutions (e.g. wetland restoration as flood protection).

- Defining NbS in entity strategies as key adaptation tools.

- Clear political commitment:



- Advocating for the adoption of a National Climate Change Strategy that will integrate tourism, water management and coastal protection.
- Connecting BiH to regional initiatives (e.g. Union for the Mediterranean) for access to financing and knowledge.
- Education and capacities:
 - Enable local authorities to use climate data in planning (eg GIS tools for monitoring coastal erosion).
 - Involve tourism chambers/communities in the development of standards for "green certificates" of destinations.

2.3. Recommendations for improving the framework

- Alignment with the EU acquis: Adopt climate neutrality legislation (e.g. the European Green Deal) to ensure compatibility with the future EU approach.
- Creation of a State Climate Council: A body that will coordinate the entities and the Brčko District in achieving common climate goals.
- Innovative financing: Introduce tax incentives for tourism companies investing in NbS or ecosystem restoration (e.g. VAT reduction for eco-accommodation).

BiH's regulatory and policy framework for climate change is currently inadequate to address challenges ranging from coastal erosion to declining tourism capacity. The NaTour4CChange project can play a key role in strengthening this framework through promoting cooperative structures, integrating NbS into legislation and building capacity.

The NaTour4CChange project is not only a framework for testing nature-based solutions, but also a laboratory for policy innovation. It can demonstrate how cooperation between countries and levels of government, education of local stakeholders and adoption of international standards can transform Bosnia and Herzegovina into a country that not only adapts to climate change, but also becomes a regional leader in sustainable tourism. However, this potential can only be realized if project activities are not understood as an isolated undertaking, but as the first step in a long-term process of institutional restructuring aimed at climate justice and environmentally sustainable growth.

2.4. Legislation and category of the Hutovo Blato Nature Park

Convention on Biological Diversity (CBD)

Bosnia and Herzegovina joined the CBD in 2002, accepting its objectives: conservation of biological diversity, sustainable use of resources and equitable sharing of benefits arising from genetic resources. For Bosnia and Herzegovina, this convention is essential for the protection of ecosystems, especially in Mediterranean coastal areas, where the NaTour4CChange project promotes resilience to climate change through nature-based management. The Convention on Biological Diversity



provides a framework for integrated habitat protection and sustainable tourism, which is essential for reducing the impact of climate change. Through cooperation and implementation of the work programme, BiH can strengthen the capacities of local communities and management structures. The project uses CBD guidelines to balance tourism development with nature conservation, supporting long-term sustainability.

· Ramsar Convention on Wetlands

Bosnia and Herzegovina ratified the Ramsar Convention in 2001, identifying three sites (Hutovo Blato, Bardača, Livanjsko Polje) as wetlands of international importance. This convention emphasizes the protection and sustainable use of wetlands, which are essential for water regulation, biodiversity and climate change mitigation (e.g. flood prevention, carbon sequestration). For the NaTour4CChange project, Ramsar sites represent a model of ecosystem management, where tourism can be developed in line with nature conservation. The convention encourages cross-sectoral cooperation, which is key to integrating climate strategies into local plans. The project uses these sites as examples for strengthening climate resilience through wetland protection, empowering communities to adapt to extreme weather conditions. Both these two conventions, as well as the UN Framework Convention on Climate Change (UNFCCC), provide a legal and strategic framework for ecosystem protection and sustainable development, which is the foundation of the project. The CBD and Ramsar provide international standards and cooperation mechanisms, enabling Bosnia and Herzegovina to more effectively implement climate change adaptation measures through habitat conservation and responsible resource management, contributing to the goals of sustainable tourism and coastal resilience.

Table 1. Legislation and category of PP Hutovo blato

	Year of proclamation	IUCN category	Legislation	Category according to the Law or Decision on Proclamation	Governing body
	1995	Va	Law on Nature Protection of the Federation of Bosnia and Herzegovina (Official Gazette of the	Nature Park	JP „Park prirode Hutovo blato”



NP Hutovo blato			Federation of Bosnia and Herzegovina, No. 66/13); Law on the Proclamation of the Hutovo Blato Nature Park (Official Gazette of the Croatian Republic of Herceg-Bosna, No. 13/95)		
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Source: Author's research

Protected areas in BiH are defined by entity laws with a precisely defined geographical area, recognized and intended to achieve long-term preservation of natural and cultural values. The establishment of protected areas in BiH is carried out with the consent of municipal councils in whose areas, according to the spatial plan, a potentially protected natural area is located.

According to the Law on Nature Protection of the FBiH (Official Gazette of the FBiH, No. 66/13), protected areas and other protected natural values are managed by public enterprises and public institutions. Public enterprises and institutions carry out the activities of protection, maintenance and promotion of protected areas and other protected natural values in order to protect and preserve the authenticity of nature, ensure the undisturbed development of natural processes and sustainable use of natural resources, and monitor the implementation of conditions and measures for nature protection in the area they manage. The management of a protected area is carried out on the basis of a management plan. The plan is adopted by the FBiH Government or the cantonal government for a period of ten years (with a planned revision after 5 years from its adoption), at the proposal of the Federal or cantonal ministry, depending on the territory in which the protected area is located.

2.5. AREA DESCRIPTION

2.4.1. GENERAL CHARACTERISTICS

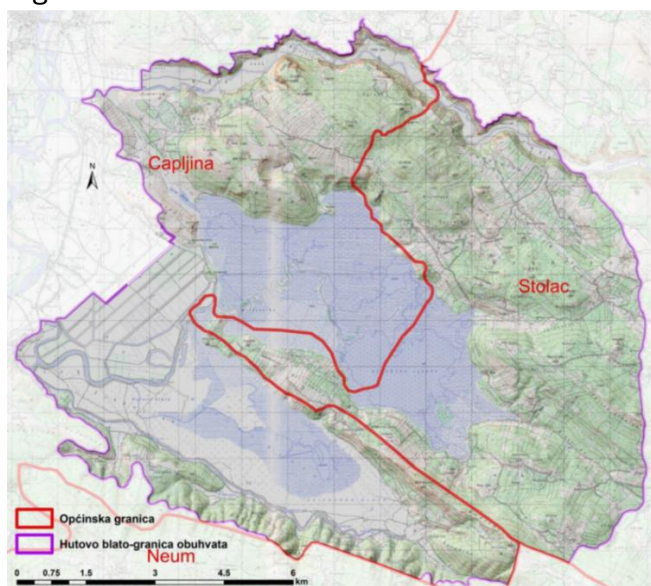
Hutovo Blato is located in lower Herzegovina, within the Mediterranean biogeographic region, this wetland is a natural bridge between the karst plateaus and

the fertile alluvial plains of the Neretva River. Its area encompasses two key ecosystems: the Svitavsko (Lower) and Deransko (Upper) blato.

Hutovo Blato is located at a geographic crossroads, where Mediterranean warmth meets continental mildness. Its location extends between approximately 43° north latitude and 17° east longitude. The northern point of the park (43°01'57" N, 17°46'58" E) rests on hills covered with macchia, while the southern (43°00'13" N, 17°48'40" E) sinks into marshy waters. The eastern edge (43°01'35" N, 17°41'27" E) follows the Trebižat River, while the western edge (43°01'41" N, 17°52'28" E) opens onto the wide alluvial plain of the Neretva River.

The boundaries of Hutovo Blato have never been static. Like a swamp that expands and contracts with water, the administrative features of this park have changed under the pressure of laws and ecological priorities. Today, legally defined, it extends to 7,971.4 ha, but this figure hides the layers of the past: the “old extent” that once included hunting grounds and the “modern extent” that strives for a balance between protection and sustainable use. (Figure 2.)

Figure 2. Administrative location of Hutovo blato.



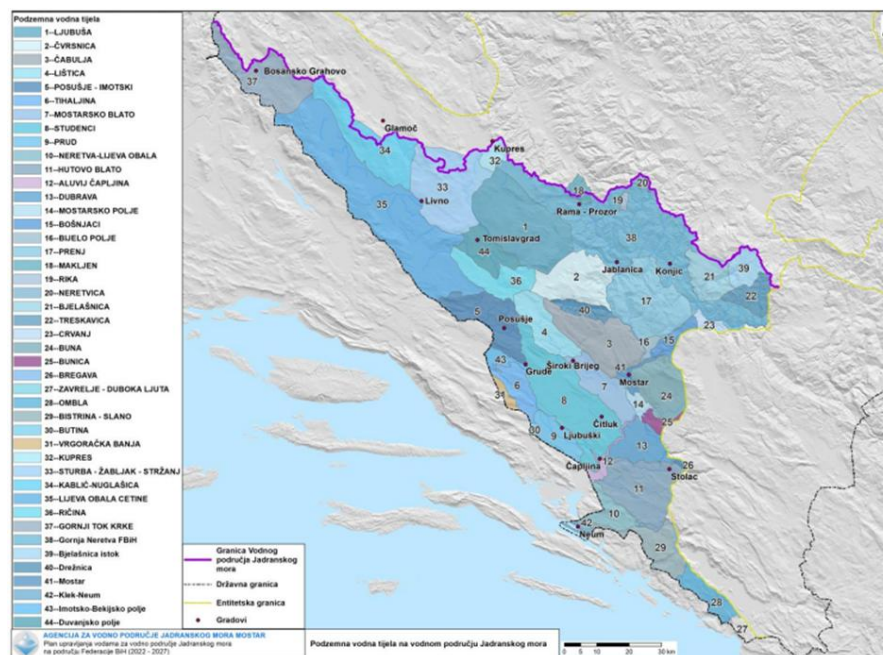
Hutovo Blato je podijeljeno između općina Čapljina (6.687 ha) i Stolac (4.869 ha) nalazi se uzduž lijeve strane rijeke Neretve u tipično krškom krajoliku, čija močvarna površina iznosi 3.552 ha.

2.5.2. HYDROLOGICAL FEATURES OF THE PILOT AREA

Hutovo Blato is surrounded by the Žab mountain and the Trebišnjica river, and is built of limestone deposits that are millions of years old. The water here travels through cracks and caves, to emerge to the surface in the Svitavska and Deranska

depressions. Although the water quality is still good, its flow has been disrupted: by the construction of the "Gornji Horizonti" hydroelectric power plant and excessive pumping from wells, which disrupts the natural balance. This underground lake, which once knew no borders, is now struggling with artificial barriers and increasingly frequent droughts, while silt and sediments from Popovo Polje are clouding its clarity.

Figure 3. Overview of groundwater bodies in the Adriatic Sea Water Area in the Federation of Bosnia and Herzegovina¹



Source: Water Management Plan for the Adriatic Sea River Basin District in the Federation of Bosnia and Herzegovina 2022-2027

Alluvial aquifers along the Neretva, Bregava and Trebižat rivers are like living organisms that breathe with the river. Upstream, near Grahovo, gravel terraces keep the water crystal clear, protecting it with the II sanitary protection zone for Čapljina. But the further down the river, the darker the story gets: gravel exploitation has turned the right bank of the Neretva into depleted water beds, while on the left bank, the Preduk and Svitava swamps are trying to compensate for the losses with muddy gifts. Downstream, near Čeljevo, salty seawater is invading, turning underground reserves into salt pools – the result of reduced river flow, too many dams and pumps. Digging pits and saline springs indicate the importance of the Neretva's underground water delta.

¹ Water management plan for the water area of the Adriatic Sea in the Federation of BiH 2022-2027. Appendix II - Identification cards of groundwater bodies.

2.5.2.1. The Neretva River

The Neretva River rises on the northwestern slopes of Mount Gredelj, from five springs located at an altitude of between 1,340 and 1,200 meters above sea level, four of which are permanent and one is temporary. The main course of the river is formed by the merging of smaller streams at an altitude of 1,050 meters above sea level, southeast of the settlement of Luka. The upper course of the river, from the source to Konjic, stretches through vast canyons and gorges, passing through untouched nature in almost uninhabited parts of Bosnia and Herzegovina. The middle course of the Neretva stretches from Konjic to Mostar, the lower course, from Mostar to the mouth of the Adriatic Sea, covers the NaTour4CChange pilot area in BiH. Two water bodies of the river are included in this area: the Neretva downstream of Čapljina (BA_NTRB_Ner_1) and the Neretva from the city of Čapljina to Mostar (BA_NTRB_Ner_2), both in the category of heavily modified water bodies (JIVT). This part of the river consists of a typical alluvial river course, with alluvial formations transferred from the upstream part of the river basin. According to research from 1958, the total annual transport of sediment was 47,500 m³. Due to the construction of upstream reservoirs, especially the Mostar HPP, the downstream transport of sediment has decreased, but it is still present from the Mostar HPP to Čapljina.

The Neretva, known as the coldest river in the world, is distinguished by its average temperature in the upper reaches, which is only 7°C in summer. In its 230-kilometer course, the river mostly passes through Bosnia and Herzegovina (208 km), while a smaller part, before entering the Adriatic Sea, flows through Croatia (22 km). Along the way, the river gradually raises its temperature, which significantly contributes to the warmth of the climate of Mostar, one of the warmest cities in Europe. Due to its great economic importance, the river is often called the Herzegovinian Nile.

2.5.2.2. The Krupa River

The Krupa River is the main watercourse of Hutovo Blato, connecting this wetland ecosystem with the lower reaches of the Neretva River. The Krupa does not have its own source, but rather flows from Lake Deransko, which is distinguished from other watercourses by its specific physical, chemical and biological characteristics. The Krupa River is 9 kilometres long, and its depth varies from 1 to 5 metres, while the width of the river is from 10 to 30 metres. The water level of the river can range from 89 to 208 cm.

Under normal conditions, the Krupa River flows towards the Neretva, but during high water the direction of the Neretva River can be reversed, so the Krupa flows towards the wetlands. Ten species of fish have been recorded in the Krupa River, five of which are endemic. The Krupa is also the main route of daily and seasonal migrations of fish species towards Hutovo Blato. The project includes two water bodies of the Krupa River: a natural water body (typology 12c) from Hutovo blato to the embankment



(BA_NTRB_Kru_2) and a heavily modified water body from the embankment to the confluence with the Neretva River (BA_NTRB_Kru_1)

2.5.2.3. The Bregava River

The Bregava River originates from the permanent spring Bitunja and the occasional springs Veliki and Mali Suhavić. After a course of about 35 km, it flows into the Neretva River. The Bregava River is fed by water flowing from the Dabarsko polje and precipitation from its own basin. The Bregava watercourse can be divided into three parts: the upper course, which is about 11.5 km long, the middle course 9.25 km long and the lower course 14 km long. The lower course, which is included in the project, is of particular importance for the natural water body of typology 12a (BA_NTRB_Breg_2), from the embankment to the mouth of the Neretva River.

The source of the water that the Bregava brings, together with its various flows, makes it not only a key ecological element, but also an indispensable part of the hydrological system of this region. The Bregava is an important factor in preserving the balance of the ecosystem, because its watercourses provide life force for many species of flora and fauna. In addition, its confluence with the Neretva River symbolizes the connection of two water systems, which allows the maintenance of natural cycles in the region, from the irrigation of agricultural areas to the supply of drinking water to local communities. For local communities, the Bregava River represents not only a source of life in everyday activities, but also an invaluable natural resource essential for survival. Maintaining natural flows and water quality is crucial for the long-term sustainability of local agricultural and fishing activities, but also for the protection of the ecological balance.

2.5.2.4. Wetland Habitats of Hutovo Blato

Hutovo Blato, located in the Dinaric karst of southeastern Herzegovina, is one of the most specific wetland habitats in the Balkans, and its hydrological characteristics reflect the complexity of the karst area. This area is extremely important for biodiversity because it is crossed by numerous water systems that support a wide range of ecosystems. The main water systems that form the core of Hutovo Blato are the Trebišnjica and Neretva rivers, whose waters, together with those from surrounding springs, shape this rich wetland area. The Trebišnjica River, which brings water from the Dabarsko Polje, and the Neretva River with its tributaries are the key watercourses that supply this ecosystem. The powerful waters that enter and exit Hutovo Blato create conditions for the preservation of biodiversity, including unique endemic species.

Hutovo Blato consists of six large karst lakes - Deransko, Svitavsko, Jelim, Orah, Drijen and Škrka - which are located at an altitude of 1.5 to 2.5 meters above sea level. Lake Deran, the largest of all, covers an area of 297 ha and has a key function of retaining water during high water levels, and also supplies water to the lower reaches of the Neretva River during dry periods. This lake is rich in fish species, including nine endemic species that find their home in the cooler marginal parts of the lake, where



water temperatures are lower. These endemic species, adapted to the specific conditions of Hutovo Blato, represent a unique ecological resource, and their presence further emphasizes the importance of this wetland for the biodiversity of the region.

The uniqueness of Hutovo Blato is that its ecosystem is not only important for local floristic and faunal diversity, but also for the regional balance of water resources. The Krupa River, which originates from Lake Deransko, is also hydrologically extremely important, as its bed is below sea level, which makes this area additionally sensitive to changes in the water level of the Neretva. The flow of the Krupa River in this karst area creates a unique dynamic of the watercourse, as during high waters of the Neretva it flows upstream towards Hutovo Blato, creating a natural reservoir of water for wetting wetlands.

These wetland habitats are of great importance for preserving the local ecological balance, as they provide habitat for numerous species of birds, fish and other aquatic organisms, and also have a key function in maintaining water quality in the region. The NaTour4CChange project covers the stagnant water body, in the category of heavily modified water bodies: Lake Deransko (BA_NTRB_DERJ).

2.5.2.5. Artificial water bodies - Vrutak and Svitava reservoirs

Artificial water bodies in this area, such as the Vrutak and Svitava reservoirs, play a key role in hydropower and the ecological balance of the region. The Čapljina HPP, located on the Trebišnjica River, is not only a source of electricity, but also a vital water management system, which uses natural water resources for pumped storage.

The upper compensation basin, Lake Vrutak, located in Popovo Polje, represents a significant accumulation area with a capacity of 7.2 hm³, while Lake Svitava, the lower compensation basin, is a large and ecologically significant artificial lake. With an area of 1,000 ha, Lake Svitava is a critical part of the hydropower system, but also an important element of environmental protection, as it is a protected area within the Hutovo Blato Nature Park. In addition, its water intake capacity allows for the preservation of the ecological balance in the Neretva Valley, the regulation of watercourses and the planning of excessive water accumulation in critical periods. This system not only helps reduce the risk of flooding, but also allows for the maintenance of stable conditions for local ecosystems, including wetlands, and protects the biodiversity that depends on these waters. Due to its specific function, Lake Svitava plays a key role in maintaining the balance between human needs for water resources and the preservation of natural habitats. However, despite all the benefits that this system brings, Lake Svitava's sensitivity to eutrophication makes it an area that needs to be carefully managed, in order to preserve water quality and the biodiversity that depends on this unique ecosystem. Eutrophication, the process of excessive accumulation of nutrients such as nitrogen and phosphorus, can lead to a decrease in oxygen in the water and changes in the structure of plant and animal communities. Therefore, it is important to constantly monitor water quality,



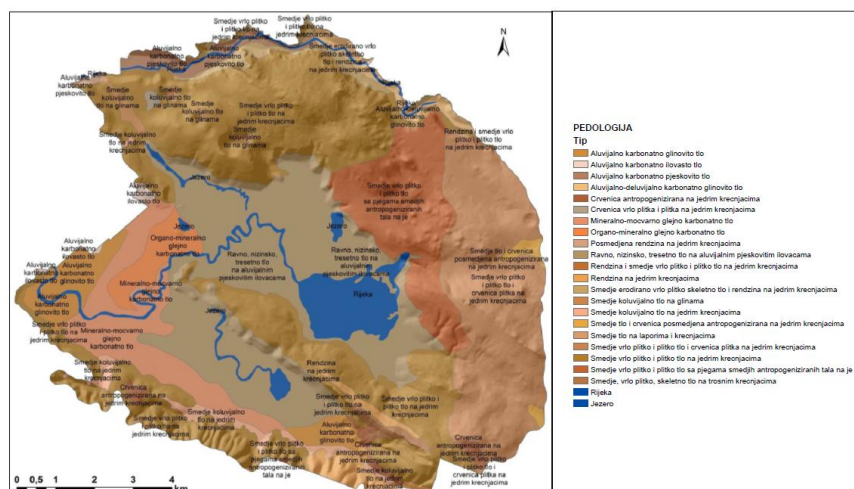
implement protection and management measures, and control sources of pollution that may threaten the sensitivity of this protected area. Sustainable water management of Lake Svitava is essential for preserving its ecological functions and protecting biodiversity, which is extremely important for maintaining the balance in the entire Hutovo Blato ecosystem. This task includes not only the control of eutrophication, but also the proper management of water resources, protection from overexploitation and the development of environmentally friendly agricultural practices in the surrounding areas. The preservation of biodiversity requires the synergy of all factors – from monitoring ecological parameters, through the involvement of the local community in the protection processes, to investments in infrastructure that supports the long-term sustainability of aquatic ecosystems. Lake Svitava, given its sensitivity, must be treated as a natural resource of particular importance for the region, in order to remain vital and rich in biodiversity.

2.5.3. HUTOVO BLATO PEAT: A NATURAL PROTECTOR AGAINST CLIMATE CHANGE

Hutovo Blato, a rare peatland in Bosnia and Herzegovina, plays a vital role in the fight against climate change through “carbon storage”. Hutovo Blato hides in its depths precious peat – organic matter formed over millennia of decomposition of plant remains in conditions of moist isolation. This dark, dense layer is not only an archive of past geological epochs but also a living system that plays a key role in the modern fight against climate turbulence. Hutovo Blato peat, like a natural sponge filter, absorbs and retains huge amounts of carbon, preventing its release into the atmosphere as CO₂, making it an invaluable ally in reducing greenhouse effects. Recent research² has revealed that this habitat, in addition to providing a refuge for endemic species and migratory birds, also functions as a driver of climate stability. Using geographic information systems (GIS), its spatial and ecological profile has been mapped in detail, allowing for monitoring of changes in peat structure and sensitivity to external influences – from fluctuations in groundwater flows to the effects of droughts caused by global warming. This digital footprint of the peatland serves as the basis for sustainable management strategies, including preventing erosion and aligning with spatial plans that emphasize the preservation of natural heritage.

² Project: Mainstreaming Ecological Restoration of freshwater-related ecosystem in a Landscape context: Innovation, upscaling and transformation – MERLIN. Analysis of the state and definition of the sequestration potential of the peat deposits of the Deran mud, in accordance with the basic guidelines on preserving air quality contained in the first, second and third national reports of Bosnia and Herzegovina in accordance with the framework convention of the United Nations on climate change. Project research is based on the results of the latest scientific research related to emission scenarios, mitigation potentials and mitigation measures that have been achieved at the international and national level.

Figure 4. Pedogeographical characteristics of the Hutovo Blato Nature Park



The importance of Hutovo Blato goes beyond the local context. As one of the few remaining peatlands in the region, it is crucial for achieving European and global climate goals, especially in the context of emissions reduction commitments. Its capacity to sequester carbon not only makes it a natural carbon sink, but also places it at the center of green transition policies. However, this ecosystem faces two threats: on the one hand, climate stresses that disrupt the hydrological balance, and on the other – human impacts such as unplanned agriculture or deforestation.

Conservation projects aim to strike a balance between conservation and sustainable use of resources, emphasizing the role of the "green economy" in peat conservation. The educational aspects of the research raise awareness among the community – from high school students to political decision-makers – about the necessity of preserving these fragile ecosystems. Although significant progress has been made, the future of Hutova Blato peat depends on continued scientific monitoring, innovations in the restoration of damaged areas, and political support that recognizes peat not only as a local treasure, but also as a global symbol of resistance to the climate crisis.

2.4.4. POPULATION

According to the data of the Spatial Plan of the Municipality of Čapljina and the Spatial Plan of Hutovo Blato, this pilot area can be said to be uninhabited, except for a part of the population in the area of the settlement of Svitava. It is estimated that the settlement has maintained the number of inhabitants compared to the situation in 1991, determined by the last census in BiH. According to the data of the competent municipal service in Čapljina, there are about 300 inhabitants.



Since there is no data on the demographic characteristics of these inhabitants, it can be assumed that these settlements are represented by an agricultural population. In smaller settlements, the majority is probably an older population, while in terms of the level of completed school, the percentage of highly educated people is negligible. According to the last official census from 1991, the municipality of Čapljina had 27,882 inhabitants, distributed in 32 settlements. According to the data of the competent municipal services, today the number of inhabitants of the municipality of Čapljina has decreased slightly compared to the last census, so the municipality has 24,363 inhabitants living in 35 settlements. Due to the post-war population migrations, three new settlements were formed: Modrič, Šuškovsko naselje and Bobanovo selo.

For the municipality of Stolac, the census from 1991 established a total number of 16,420 inhabitants, while the estimates of the Federal Bureau of Statistics today amount to 13,747 inhabitants.

According to the population census from 1991, the Neum municipality had 4,325 inhabitants, while the latest estimate by the Federal Bureau of Statistics shows a figure of 4,358 inhabitants. There are a total of 27 statistically registered settlements in the Municipality.

2.5. TOURIST RESOURCES

Čapljina boasts an exceptional cultural and historical heritage that includes significant cultural sites such as Mogorjelo and Počitelj, and is further enriched by the natural beauties and excursion sites of Hutovo Blato. These sites are not only witnesses of past times, but also attractive destinations for tourists who want to enjoy the peace of nature, history and cultural attractions.

Hutovo Blato, which has always been rich in vegetation, forests and wildlife, was densely populated even in Roman times. Throughout history, locals have found many objects, including ancient bricks, amphorae decorated with stone fragments, ceramics, dishes, remains of ancient buildings and tombstones. The found objects testify to the wealth of past civilizations that inhabited this area.

One of the most famous archaeological sites in this area is certainly the Desilo site, located in a protected bay suitable for creating a natural harbor. There is a castle above Desilo, and a necropolis, or cemetery, was found nearby, which further confirms the importance of this site in the historical context. The castle above Desilo offers a strategic advantage because it was a favorable position for defense and surveillance of the surrounding area. Archaeological research in this area has uncovered a wealth of material that testifies to the life and customs of people from various periods, especially the Illyrian and Roman influences. In addition, in the immediate vicinity of the Hutovo Blato Nature Park there are three national monuments declared by the Commission for the Preservation of National Monuments of Bosnia and Herzegovina. Among them are the Necropolis of Stećak



Tombstones I and II in Boljuni (town of Stolac), Most in Klepci and Villa rustica (town of Čapljina).

Necropolis of Stećci I and II - An area rich in history is located in Boljuni, 12 kilometers southwest of Stolac, along the Stolac - Hutovo Blato road. It is located in a valley below village houses, and is divided into two groups about 400 meters apart. There are traces of the Illyrians in the area (hill forts and tumuli), and nearby is the Crikvina site, probably from late antiquity, and the remains of a cemetery. Boljuni stećci have a number of common characteristics with the stećci of eastern Herzegovina, and are arranged in rows and oriented exclusively in the west-east direction or with a slight deviation from this direction. The necropolis consists of 82 slabs, 176 chests, 12 gabled ones and 4 crosses. Of these, 29 slabs, 57 chests and 6 gabled ones are decorated, which makes Boljuni one of the most decorated necropolises in Bosnia and Herzegovina. Common decorations are crosses and the motif of a winding vine with a trefoil. The inscriptions are written in the Croatian vernacular, in the Croatian Cyrillic script. Most of the tombstones date from the 15th and 16th centuries.

The Klepci Bridge, located near the Klepci settlement in the town of Čapljina, spans the Bregava River, 1 km north of the town. Located 200 metres upstream from where the Bregava flows into the Neretva, the site was probably the site of a Roman bridge. The current bridge was built in 1517 by the Sandžak-beg Mustafa-beg, and renovated about 150 years later by Šišman Ibrahim-paša. The bridge has an elegant arched structure reminiscent of the Old Bridge in Mostar, and has a span of 17.52 metres. It is known for its unique design, with the largest arch over a lowland river of its kind.

The Roman villa rustica at Kućište, located in the village of Višići near Čapljina, represents a significant Roman settlement, as evidenced by the remains of Roman buildings and numerous finds of ancient coins and imported ceramics. The growth of the settlement was greatly influenced by the proximity of Narona, a Roman colony on the southern Adriatic, as well as its favorable geographical position. This made the area an important trade and communication center in Roman times. The entire region, which stretches from Čapljina to Narona and Hutovo polje, was one of the most densely populated areas in Bosnia and Herzegovina in Roman times.

There are five sites on the list of national monuments of Bosnia and Herzegovina in the Neum municipality, and three more for which the procedure for their inclusion is underway. The list of national monuments of Bosnia and Herzegovina includes the necropolises of stećak tombstones in Brštanica and Glumina, some materials also mention the necropolis Crkvina near Hutovo as a special site, and there is a proposal to include the necropolis Toplica near the settlement of Vinine and the necropolis Vranjevo selo in the immediate vicinity of Neum. All of the listed necropolises currently have only local significance, which is confirmed by the fact that none of them is on the UNESCO list. Many visible archaeological sites from different historical periods testify to the diversity and richness of the cultural and historical heritage of the Neum hinterland. On the road from Neum to Stolac is the well-preserved old town of Hutovo (Hadžibeg - grad), which is still the site of the "salt road" from Ston to Bosnia.



In the interior of the Neum municipality, the Shrine of the Queen of Peace Hrasno stands out as a pilgrimage attraction, within which there is also the Museum of Antiquities, and the Way of the Cross leading to the statue of the Queen of Peace on Gradina Hill.

An increasingly recognized international tourist attraction is the 'Ćiro' cycling route, which runs along the route of the former narrow-gauge railway Gabela - Dubrovnik, and has already established itself as one of the most attractive cycling routes in Southeast Europe.

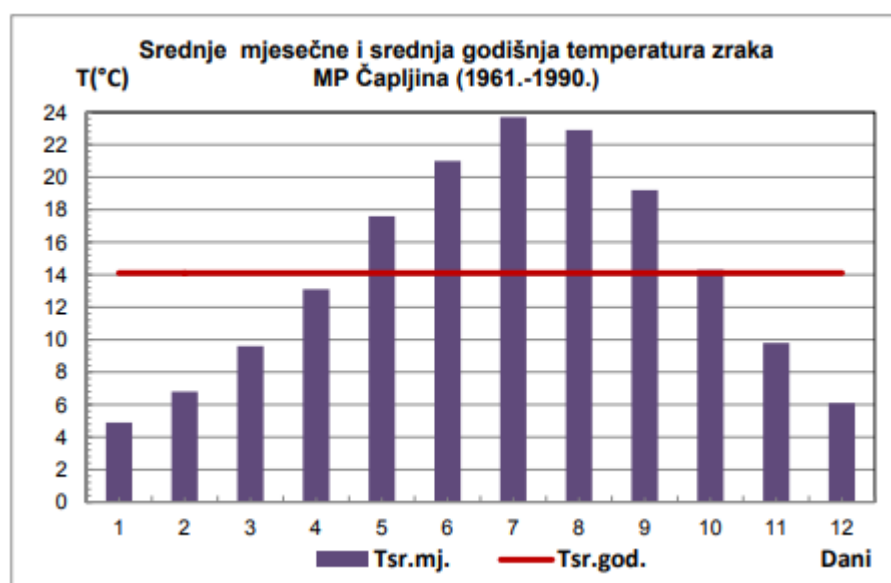
The municipality of Neum has great potential for the development of cyclotourism, as one of the acceptable sustainable forms of selective tourism. With the completion of the construction of the new Neum - Hutovo - Stolac road, the old narrow asphalt road will have significantly reduced motor vehicle traffic and may become extremely attractive for cyclotourists, which would greatly reduce the seasonality of the Neum destination and contribute to the development of sustainable selective tourism.

2.6. CLIMATE

The pilot area has specific climatic characteristics shaped by the influence of the Adriatic Sea and its winds, resulting in a Mediterranean climate with warm, dry summers and mild, wet winters. Geographically located between mountain ranges and the sea, this area is relatively isolated, but at the same time allows for good air circulation.

Climatic characteristics of the city of Čapljina. Summer temperatures often reach high values, with average temperatures from 28°C to 32°C, and in July and August they can exceed 35°C. Dry summer periods are mitigated by the maestral, a wind that comes from the Adriatic Sea and brings much-needed refreshment. Winters are mild, with average temperatures from 5 to 10°C, rarely below zero. The average July temperature is 23.7°C, while the highest recorded temperature is 41.0°C. The average annual temperature is 14.1°C, and the average temperature in January is 4.9°C, while the lowest measured temperature is -14.2 °C in the same month.

Figure 5. Distribution of mean monthly air temperatures - MP Čapljina (1961-1990)

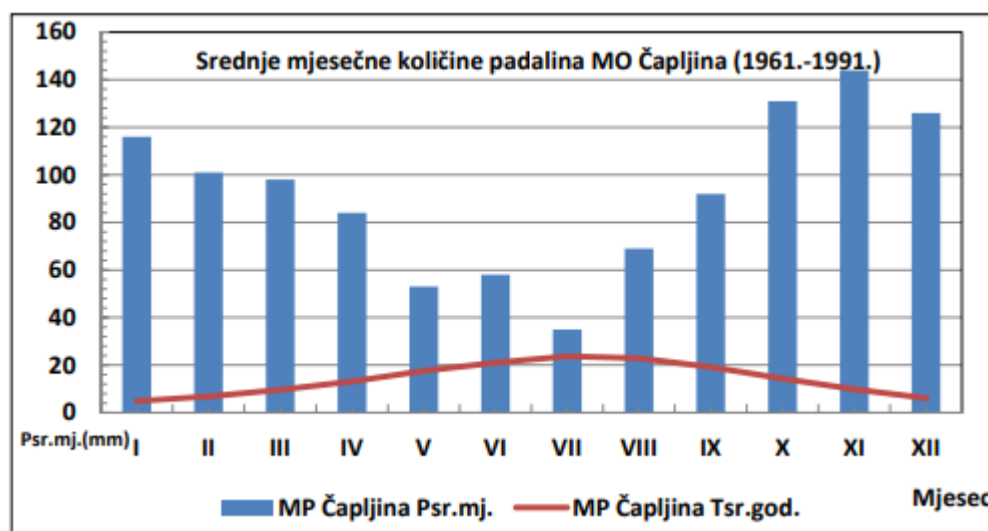


Source: Federal Hydrometeorological Institute

Snow is very rare, but precipitation can be heavy in winter, especially in November, December and January. Winter rains are crucial for replenishing water resources, while the dry summer months are suitable for growing vegetables, fruits and citrus. Precipitation is not evenly distributed throughout the year: Most precipitation occurs from October to April, while precipitation in summer is rare and in smaller quantities. Annual precipitation varies, but averages 1,100 to 1,500 mm. Due to the reduced amount of precipitation during the summer, dry periods are frequent, which can affect agriculture. However, the delta area, with its numerous rivers and water bodies, allows for irrigation, so farmers rely on water resources to irrigate crops during the dry months. The main atmospheric fronts that bring most of the precipitation are mainly associated with Mediterranean cyclones.

The average annual rainfall is 1107.0 l/m² (MP Čapljina in the period 1961-1990). Monthly rainfall in the colder part of the year ranges from 116.0 l/m² to 144.0 l/m² (the month with the most rainfall is November with an average amount of 144.0 l/m²). In the summer period, rainfall is minimal or non-existent, so droughts last on average from three to five months. Average rainfall in the summer months ranges from 35.0 l/m² to 69.0 l/m². In the driest month, July, the average rainfall is 35.0 l/m².

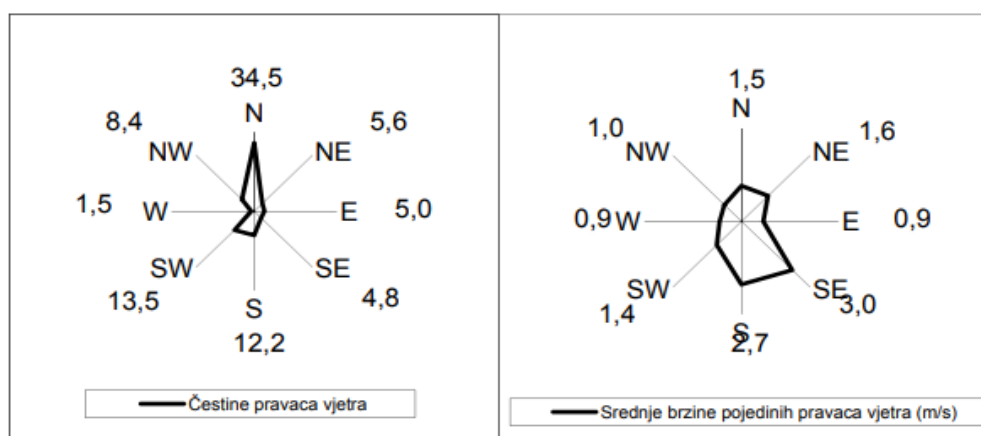
Figure 6. Distribution of average monthly rainfall - MP Čapljina (1961-1990)



Source: Federal Hydrometeorological Institute

The geographical position of this area, including the wider area of the Hutovo Blato Nature Park, makes it vulnerable to the influence of several key winds, the most prominent of which are the maestral, jugo and bora. These winds significantly shape the local climate and ecosystems. The maestral, the most common summer wind, comes from the Adriatic Sea and brings much-needed refreshment during hot days. It usually blows in the afternoon, lowering the temperature and relieving the heat. The jugo, a wind coming from the southeast, increases air humidity and brings precipitation, especially in the winter and autumn months. On the other hand, the bora is a cold wind that blows in winter, bringing cold and reducing humidity, thus affecting the microclimate of the area, agriculture, fisheries and biodiversity of the area.

Figure 7. Wind rose



Source: Federal Hydrometeorological Institute

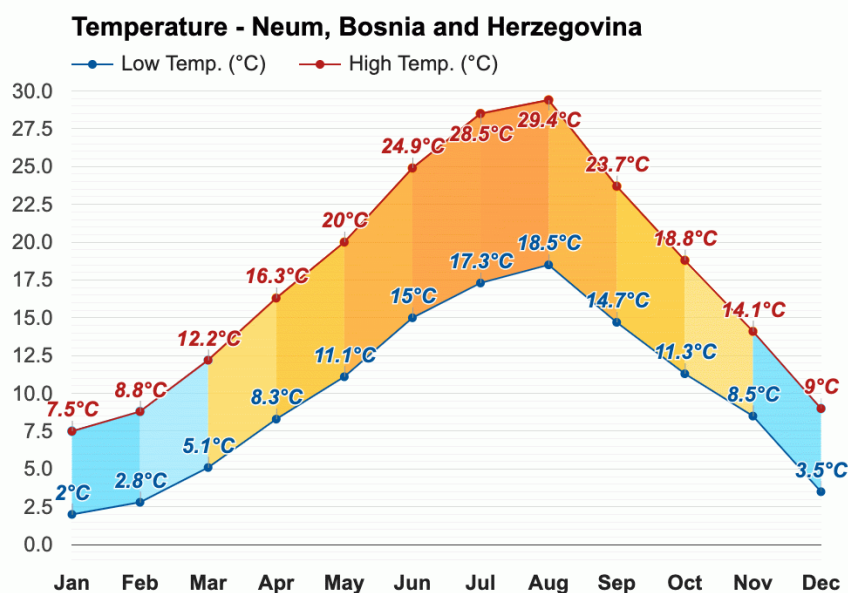
The climate characteristics of the municipality of Neum reflect the typical Mediterranean climate that is present on most of the Adriatic coast. Due to its specific geographical location, Neum enjoys long, dry and hot summers and short, mild winters, which makes it extremely attractive for tourism and agriculture.

The average annual temperature in Neum is around 16 °C, and this city is among the warmest in Bosnia and Herzegovina, along with Trebinje and Mostar. Snow in Neum is a real rarity, while the city has around 260 sunny days per year.

Typical climatic conditions for Neum include long and hot summers, with average summer temperatures reaching up to 32 °C, while in winter the temperature must average 13 °C. Due to its favorable climate characteristics, the tourist season in Neum lasts longer than in many other coastal cities.

The warmest month in Neum is August, when the average maximum temperature reaches 29.4 °C, while the coldest month is January, with an average maximum temperature of 7.5 °C. The large number of sunny days and stable climatic conditions make Neum extremely suitable for investments in renewable energy sources, especially investments in solar power plants.

Figure 8. Diagram of average air temperature for Neum.



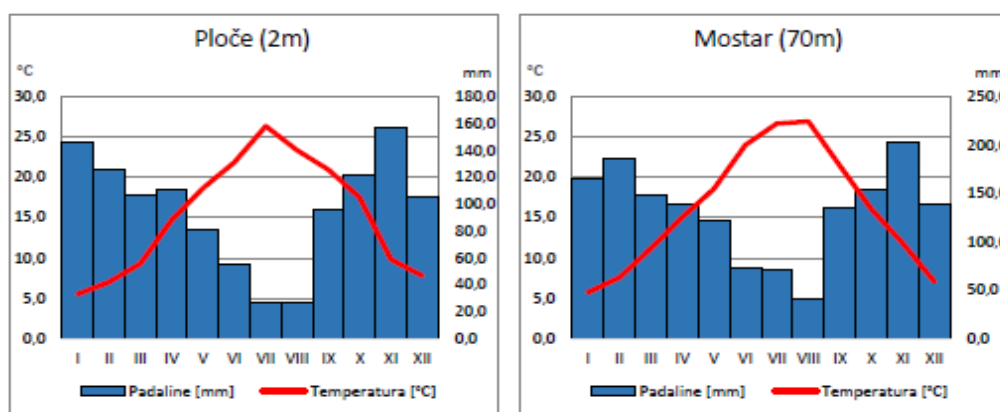
Source: Federal Hydrometeorological Institute

The analysis of the climate conditions of the pilot area was carried out according to the Köppen-Geiger classification, which is based on the analysis of annual temperatures and precipitation, with a focus on the limit (minimum and maximum) values during the reference period. Within the framework of the NaTour4CChange

project, the area belongs to the C-climate, more precisely a moderately warm rainy climate characterized by a regular change of seasons with an average monthly temperature that never drops below -3°C , while at least one month of the year has an average temperature higher than 10°C .

The predominant subtype of this climate in the pilot area is CSa, a Mediterranean climate with hot summers, defined by summer droughts (marked with "s"), where the month with the least precipitation has less than 40 mm of precipitation, and hot summers (marked with "a"), where the temperature of the warmest month exceeds 22°C . This climate subtype is dominantly represented in the narrow coastal area and the lower part of the Neretva River valley.

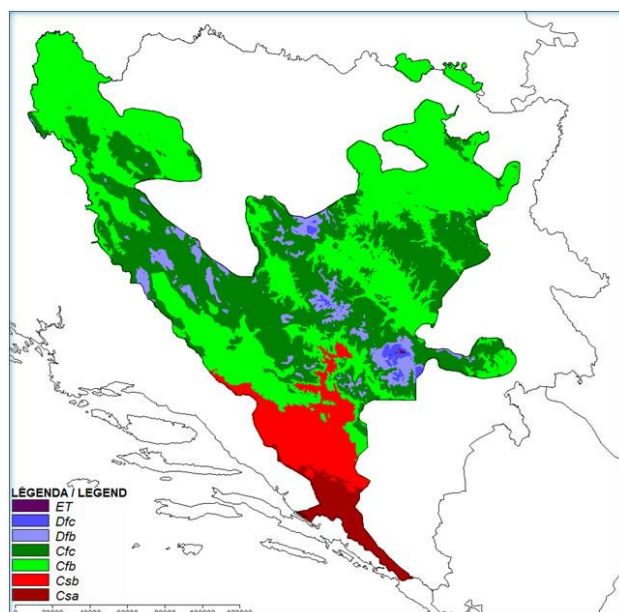
Figure 9. Distribution of mean monthly precipitation amounts and mean monthly air temperatures at meteorological stations in Ploče and Mostar.



Source: Federal Hydrometeorological Institute

The climatic conditions of this area have a significant impact on agricultural production, as wet winters and minimal precipitation during the summer create ideal conditions for growing specific crops such as vegetables, olives, vines and citrus. However, dry conditions in the summer months require the use of irrigation systems to ensure successful yields. Vegetation, which is adapted to dry summer conditions and regenerates during the wet winter months, reflects the specificity of the climatic conditions of this area, thus maintaining a balance between agricultural activities and the preservation of the natural ecosystem.

Figure 10. Climate types according to the Koppen climate classification for the FBiH.



Source: Federal Hydrometeorological Institute

Thanks to its specific geographical location and climate, this area offers exceptional conditions for the development of ecotourism, agriculture and the preservation of biodiversity. The synergy of these factors allows the survival of numerous indigenous plant and animal species, making this area ecologically rich and unique. Natural resources, such as wind, solar energy and water, are of key importance for sustainable development, as they enable adaptation to the Mediterranean environment and support various ecological and economic activities, not only ensuring the preservation of natural values, but also providing for sustainable development, creating a balance that enables long-term connectivity between human activities and the natural environment, thus contributing to the preservation of ecological stability and long-term sustainability.

3. CURRENT IMPACT ASSESSMENT

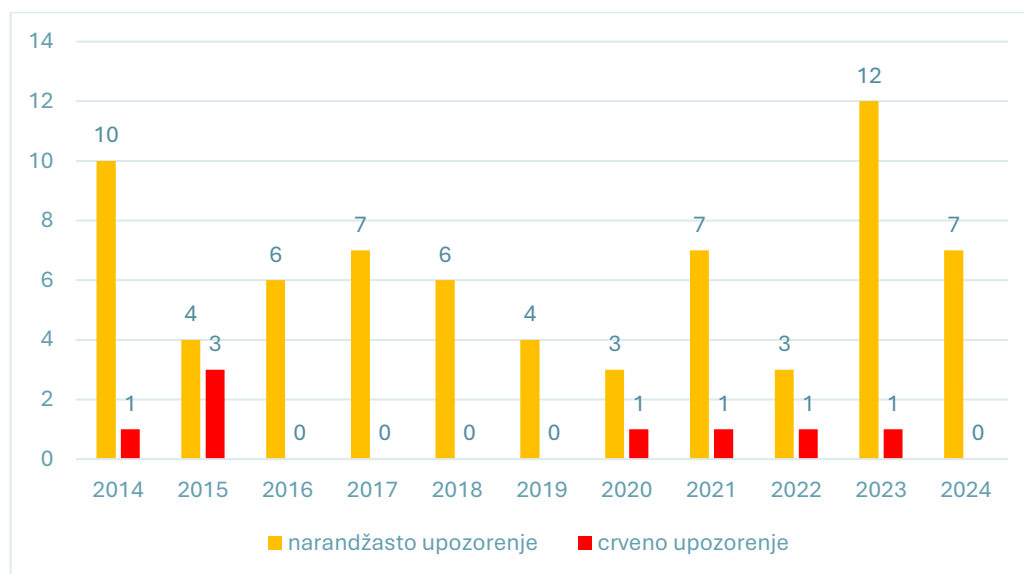
3.1 Meteorological stations

The following stations are located in the observed pilot area: the meteorological automatic measuring station Neum, Čapljina and Stolac, and the agrometeorological automatic measuring station Gabela. The available data are presented below.

3.2 Meteorological data

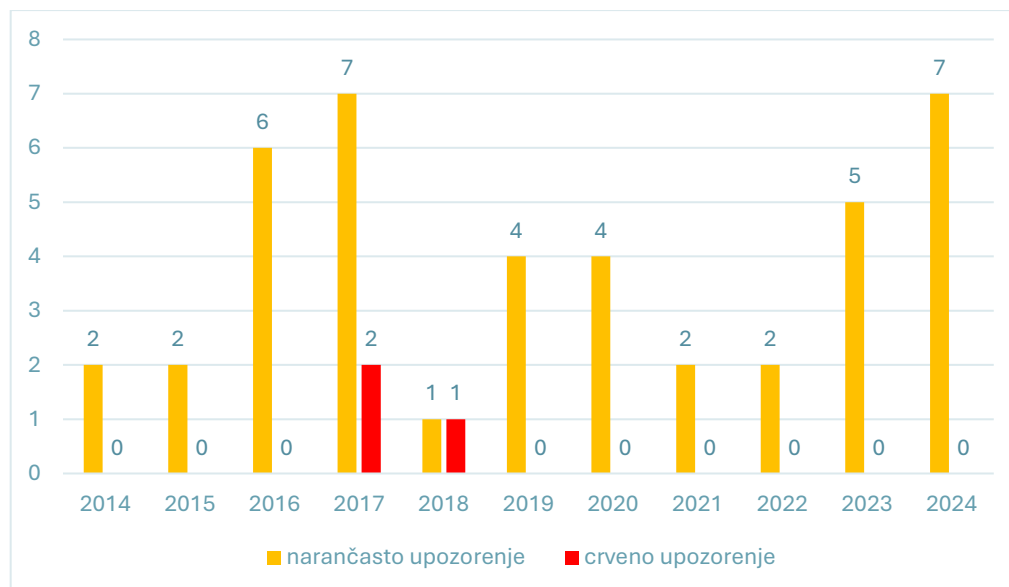
The issued warnings for extreme weather conditions relate to intense rainfall and wind gusts in the pilot area under study. Such weather phenomena can have a significant impact on the environment, infrastructure, economy and human lives. Heavy rainfall usually occurs in a short period of time and can cause flooding, landslides and damage to infrastructure. Strong storm winds such as the bora and jugo also cause damage to buildings, traffic communications and electricity distribution. The bora can reach speeds of over 150 km/h, especially in the winter months.

Figure 11. Issued warnings for extreme rainfall in the pilot area (2014-2024)



Source: Federal Hydrometeorological Institute

Figure 12. Warnings issued for extreme wind gusts in the pilot area (2014-2024)



Source: Federal Hydrometeorological Institute

3.2.1 Mean air temperature

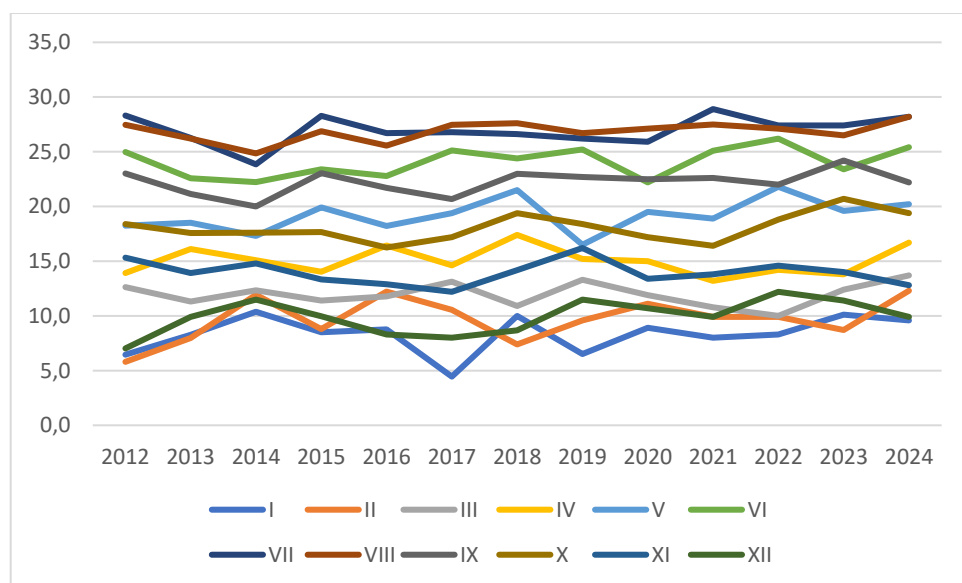
Due to the moderate Mediterranean climate, the Hutovo Blato area has favorable conditions for various forms of tourist activities almost all year round. The average annual air temperature in this area is 14.1°C, with sunny and sometimes very hot summers. The warmest month is July with an average air temperature of 26.9°C, and the absolute highest temperature measured in this month is 41.0°C. Autumns in Hutovo Blato are very pleasant and warmer than spring, with only occasional rain. Due to the proximity of the Adriatic Sea, which in winter radiates heat accumulated during the summer months, average air temperatures in the winter months are quite high. The coldest month is January with an average air temperature of 8.3°C, and a large number of sunny days in the observed period.

Table 2. Neum Meteorological Station – average monthly temperatures (2012-2024)

Godina	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
2012	6.5	5.8	12.6	13.9	18.3	25.0	28.3	27.5	23.0	18.4	15.3	7.0
2013	8.3	8.0	11.3	16.1	18.5	22.6	26.3	26.2	21.2	17.6	13.9	9.9
2014	10.4	11.9	12.4	15.1	17.3	22.2	23.9	24.9	20.0	17.6	14.8	11.5
2015	8.5	8.8	11.4	14.0	19.9	23.4	28.3	26.9	23.1	17.7	13.3	10.0
2016	8.8	12.2	11.8	16.4	18.2	22.8	26.7	25.6	21.7	16.3	12.9	8.3
2017	4.5	10.6	13.1	14.6	19.4	25.1	26.8	27.5	20.7	17.2	12.2	8.0
2018	10	7.4	10.9	17.4	21.5	24.4	26.6	27.6	23.0	19.4	14.2	8.7
2019	6.5	9.6	13.3	15.2	16.5	25.2	26.2	26.7	22.7	18.4	16.2	11.5
2020	8.9	11.1	11.9	15.0	19.5	22.2	25.9	27.1	22.5	17.2	13.4	10.7
2021	8	9.9	10.8	13.2	18.9	25.1	28.9	27.5	22.6	16.4	13.8	9.9
2022	8.3	9.9	10.0	14.2	21.8	26.2	27.4	27.1	22.0	18.8	14.6	12.2
2023	10.1	8.7	12.4	13.8	19.6	23.4	27.4	26.5	24.2	20.7	14.0	11.4
2024	9.6	12.3	13.7	16.7	20.2	25.4	28.2	28.2	22.2	19.4	12.8	9.9

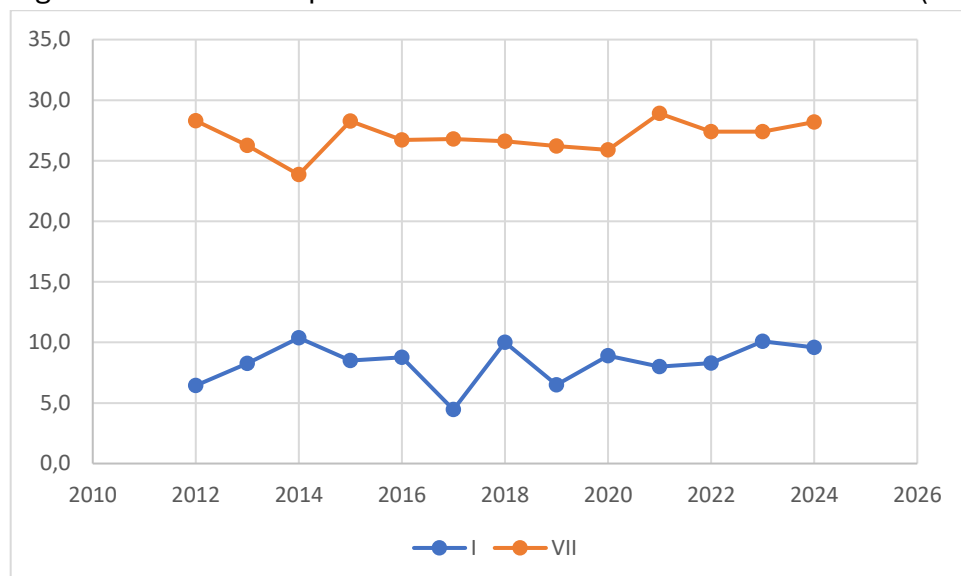
Source: Federal Hydrometeorological Institute, 2025.

Figure 13. Neum Meteorological Station – average monthly temperatures (2012-2024)



Source: Author's processing

Figure 14. Relationship between the warmest and coldest months (2012-2024)



Source: Author's processing

The relative humidity in the Hutovo Blato area is directly related to air temperature and cloudiness. The average annual air humidity is 76%, according to the Čapljina meteorological station. In contrast to the annual air temperature trends, the minimum average monthly air humidity is in July (68%), and the highest average monthly humidity is in November (81%).

3.2.2 Precipitation

The annual rainfall distribution in the area of the Hutovo Blato Nature Park is extremely uneven, with an unfavorable weather pattern, which implies significantly higher amounts of precipitation in the colder part of the year than in the warmer, vegetation period. The largest amounts fall in late autumn, in November and December, but spring amounts are not negligible either. Atmospheric fronts, which bring most of the precipitation, are mainly associated with Mediterranean cyclones. In summer, precipitation is minimal or non-existent, so droughts last an average of three to five months.

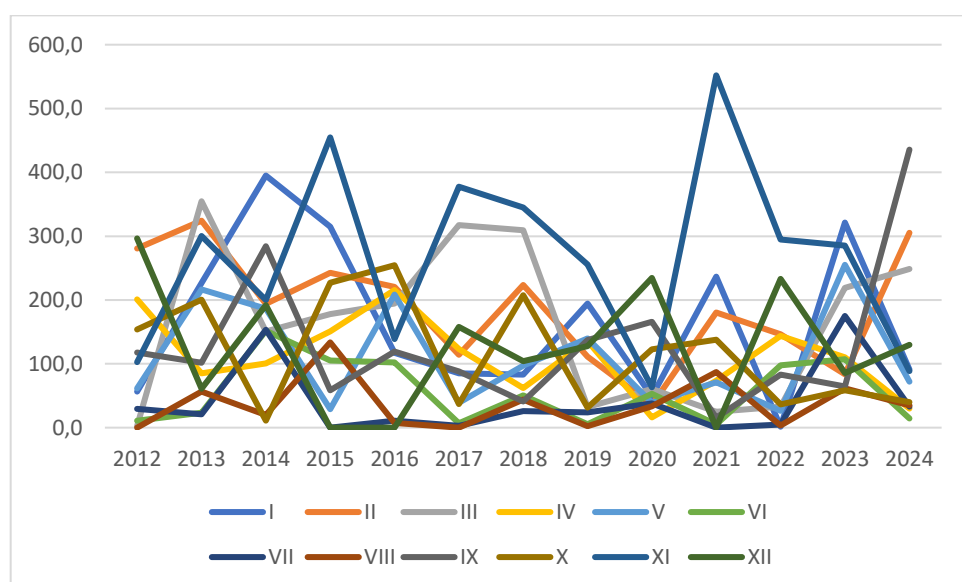
Heavy precipitation falls mostly in the colder part of the year. Precipitation is mainly a consequence of cyclonic movements associated with the general air circulation over the European continent. Snow is rare and its occurrence is associated with the penetration of cold air from the continent.

Table 3. Neum Meteorological Station – average monthly precipitation (2012-2024)

Godina	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
2012	56.7	280.5	2.5	200.9	61.3	11.1	29.2	0.0	117.6	153.9	102.9	296.5
2013	226.6	324.3	354.7	85.1	216.5	23.2	20.8	56.4	101.7	200.6	300.5	61.2
2014	395.0	193.8	150.6	100.8	186.6	151.8	153.1	20.1	284.3	11.0	200.1	192.1
2015	314.9	242.7	177.9	150.7	29.1	105.2	0	133.6	58.4	226.9	455	0.0
2016	117.4	220.6	194.7	215.7	208.7	102.3	11.1	7.2	119.1	254.5	138.8	0.0
2017	85.0	114.0	317.5	123.4	39.0	6.8	3.0	0.0	88.0	37.2	377.3	157.7
2018	83.2	223.7	309.1	62.0	97.2	50.3	25.9	44.1	41.2	207.3	344.7	104.2
2019	194.4	111.3	32.4	135.8	140.0	5.5	23.9	2.3	137.5	31.5	255.5	128.0
2020	48.8	35.6	60.5	16.1	39.2	53.2	37.8	33.6	165.7	122.6	63.3	234.6
2021	236.4	180.6	24.9	73.7	71.1	5.0	0.0	87.3	15.6	137.9	552.0	0.0
2022	1.5	146.1	33.0	144.0	26.4	97.5	5.0	3.6	82.9	36.6	294.7	233.3
2023	321.2	83.7	219.0	110.4	255.1	107.4	175.0	61.5	64.7	58.5	285.1	85.4
2024	91.3	305.3	248.7	29.8	72.2	14.5	33.0	35.0	435.6	40.0	88.7	130.0

Source: Federal Hydrometeorological Institute, 2025

Figure 15. Neum Meteorological Station – Average Monthly Precipitation (2012-2024)



Source: Author's processing

The month with the highest precipitation in the observed period is November with an average amount of about 266.0 l/m². The average amount of precipitation in summer ranges from 35.0 l/m² to 69.0 l/m², and the driest month is July.

3.2.3 Annual mean sea level values

The Neum Hydrometeorological Station does not monitor sea level rise measurements, but the predictions can be linked to the results of the assessment of average mean values for the Adriatic Sea from the Climate Change Adaptation Strategy in the Republic of Croatia for the period until 2040 with a view to 2070, which is shown in the following table.

Table 4. Overview of the characteristics of climate parameter changes according to the RCP4.5 scenario in relation to the period 1971-2000.

2011.-2040.	2041.-2070.
SREDNJA RAZINA MORA	
2046.-2065. / 19-33 cm (IPCC AR5)	2081.-2100. / 32-65 cm (procjena prosječnih srednjih vrijednosti za Jadran iz raznih izvora)

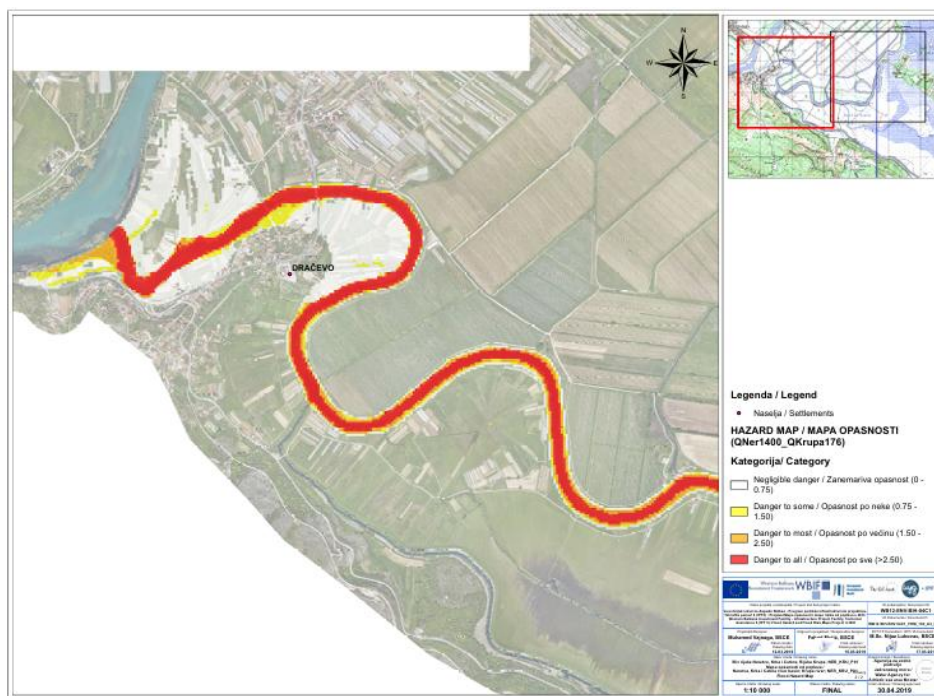
Source: Strategic Environmental Impact Study of the Climate Change Adaptation Strategy in the Republic of Croatia for the period until 2040 with a view to 2070.

The main possible impacts associated with sea level rise are changes in abiotic and biotic processes, changes in biodiversity, sea oxygen concentration, environmental changes and in the fisheries sector.

3.3. Flood hazard maps

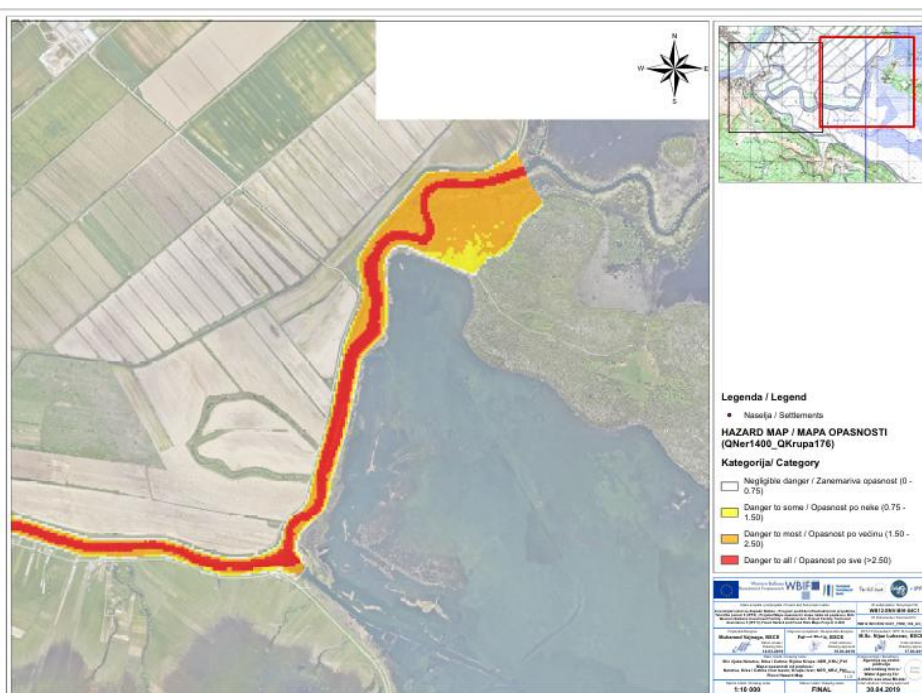
Flood hazards in the pilot area pose a serious risk, especially during the heavy rain seasons in autumn and spring.

Figure 16. Flood hazard map of the Krupa River 1



Source: Agency for the Adriatic Sea Water Area, 2019

Figure 17. Flood hazard map of the Krupa River 2



Source: Adriatic Sea River Basin Agency, 2019

The main potential impacts associated with the high level of vulnerability in the pilot area are an increase in the frequency and intensity of floods, an increase in the frequency and intensity of flash floods, a decrease in the efficiency of coastal infrastructure and a possible salinization of the entire river basin due to sea level rise.



3.4. Impact assessment

Key climate factors and their impact are reflected in:

- The impact of rising temperatures on droughts and reduced water resources, as well as forest fires. Higher temperatures and prolonged droughts threaten the stability of the Hutovo Blato ecosystem, a wetland that depends on constant moisture. Dry summers increase the risk of fires that destroy vegetation and reduce biodiversity.
- Changes in precipitation patterns and their impact on extreme rains and floods, and reduced summer precipitation. Floods disrupt the hydrological balance of wetlands, and lack of water during the summer exacerbates stress on wetland ecosystems.
- Sea level rise and salt intrusion. Sea level rise can lead to saltwater intrusion into freshwater ecosystems, which threatens the quality of irrigation water and the adaptability of plant species (e.g., the replacement of freshwater plants with salt-tolerant ones).
- Changes in bioclimatic zones. Temperature changes can cause species to migrate north or to higher altitudes, endangering endemic species such as waterfowl and fish in Hutovo Blato.

Climate change has far-reaching effects on biodiversity and ecosystems. Hutovo Blato, one of the most important wetlands, is highly dependent on stable hydrological conditions, which is why changes in the flow of the Neretva River or the intrusion of salt water can seriously threaten this ecosystem. Many endemic species, including the red heron and specific fish species, depend on these conditions and may experience declines or extinction.

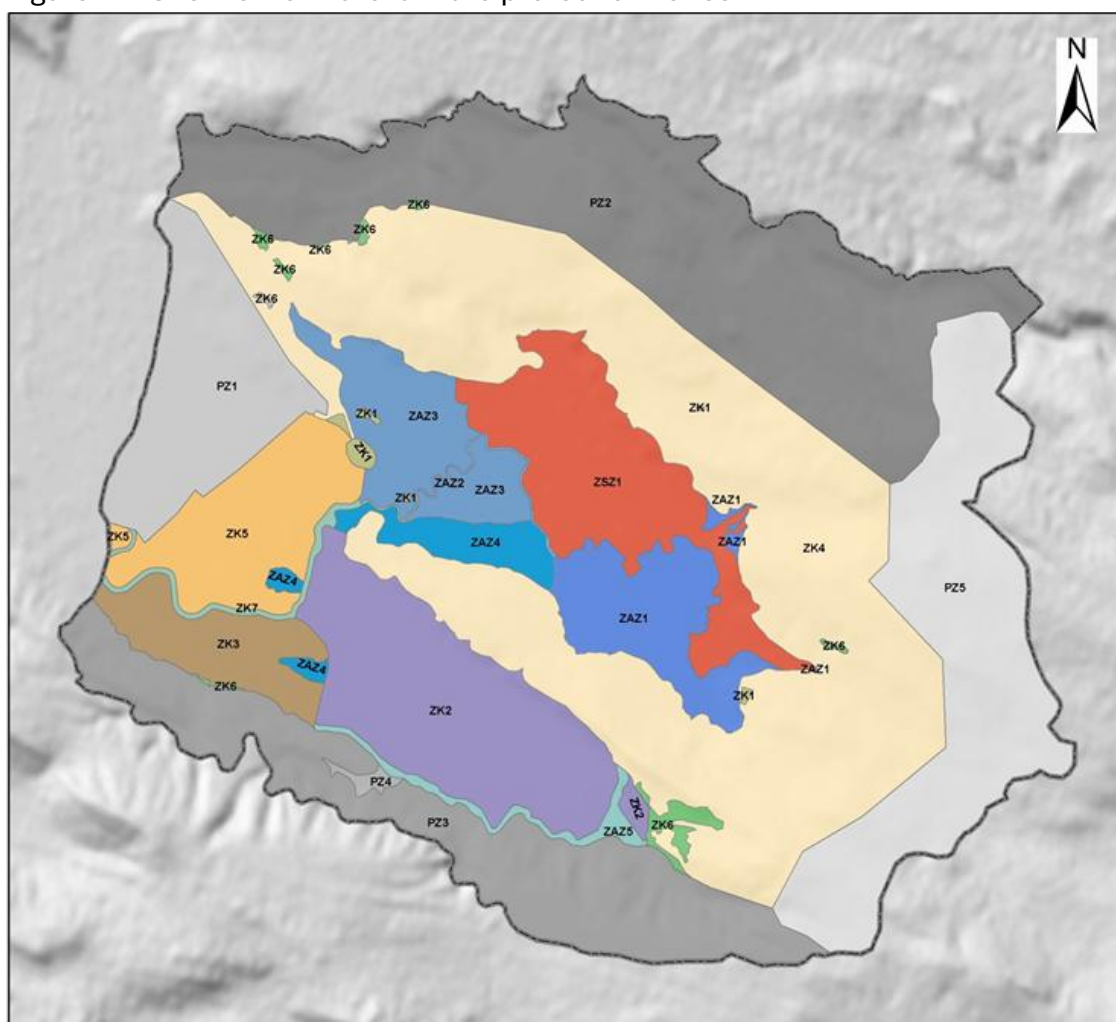
Tourism, especially ecotourism in this area, is vulnerable to climate change. Wetlands, rivers and natural beauty that attract tourists face the threat of degradation, which may have long-term economic consequences for tourism in the region. These changes may lead to a decrease in the number of visitors and, consequently, a decrease in tourism revenues, which may have negative economic effects on the local community and its ability to adapt and maintain a sustainable balance between human activities and conservation.

4. VULNERABILITY MAP

4.1. Climate Change Adaptation Capacity

In order to assess the vulnerability and potential impacts of climate change on Hutova Blato tourism, it is necessary to consider the predictions of the main future tourism flows that affect general tourism flows. In all future tourism flows, any form of climate change will have significant implications for receptive tourist destinations. The following figure shows the zones in which tourism and other activities are prohibited or permitted.

Figure 17. Overview of Hutova Blato protection zones



Tumač znakova	
PZ1 Zona intenzivne poljoprivrede i urbanizacije	ZAZ5 Zona zaštite vodenih ekosustava
PZ2 Zona ekstenzivnog šumarstva i lova i prirodnih vrijednosti	ZK1 Zona rekreacije i turizma
PZ3 Zona urbanizacije i šumarstva	ZK2 Zona usmjerenog gospodarenja vodama
PZ4 Zona posebnih vrijednosti	ZK3 Zona usmjerenepoljoprivrede
PZ5 Zona ekstenzivnog šumarstva i lova, kulutno historijskih vrijednosti	ZK4 Zona ekstenzivnog šumarstva, stočarstva i lovstva
ZAZ1 Zona zaštite vodenih i močvarnih staništa, ihtio i ornitofaune	ZK5 Zona usmjerene poljoprivrede
ZAZ2 Zona zaštite vodenih staništa i ihtiofaune	ZK6 Zona stanovanja
ZAZ3 Zona zaštite vodenih i močvarnih staništa	ZK7 Zona sporta i rekreacije
ZAZ4 Zona zaštite oritofaune	ZSZ1 Zona divljine
	Granica PP Hutovo Blato

Source: Spatial plan and management plan for Hutovo blato Nature Park

Prohibition of tourist activities The zones with a ban on access to tourists and zones without tourist infrastructure include the strict protection zone ZSZ1, i.e. the wider area of Deransko Lake towards Škrkina jaruga. This area has almost never been set foot on by man, which is also the area of the deepest peat.

Zones of limited tourist activities The zones with limited tourist activity include the area of the Strict Protection Zone and the Active Protection Zone. These are the areas of Gornji blato (ZAZ1, ZAZ3, ZAZ4, ZAZ5). In this area, limited, organized and controlled visits are allowed in the form of group sightseeing by boats on waterways, and visits of smaller groups by land routes accompanied by a professional guide.

Zones of moderate tourist activity The Krupa River upstream from Karaotok to Deransko Lake and the peripheral canal along Svitavsko Lake (ZAZ2) are zones of moderate tourist activity. In this zone, tourist activities that are compatible and do not have a significant impact on the environment can be developed. In this zone, the load on tourists can be higher, compared to the zone of limited tourist activity.

Zones of intense tourist activity include the area of Karaotok and the Krupa river downstream from Karaotok, with the catering and tourist zones of G. Prebilovci, Loznica, Koščela, Londža (ZK 1, ZK7), the area of Svitava lake (ZK2), agricultural zones in Višićka kaseta and Sjekosami and Dračevo (ZK3, ZK5, ZK6), a large area of the outskirts of the Park (ZK4). In these zones, it is necessary to set aside a "transfer zone", i.e. the area of Karaotok as an area where appropriate information, service and hospitality activities need to be located. This is the area where the influence of the space use regime that does not correspond to the protected area ends.

4.2. Vulnerability of the pilot area

Based on the previously defined problems, the vulnerability points of the pilot area in the context of climate change are listed in the following table.

Table 5. Points of vulnerability of the pilot area in the context of climate change

Vulnerability point	Description	Vulnerability	Consequences
1. Water regime – water level reduction	Hutovo blato depends on the inflow of water from the Krupa and Bregava rivers and drainage through the Neretva River.	Climate change can cause longer dry periods and reduce water inflow.	Drainage of wetlands, disappearance of aquatic habitats, reduction in the number of birds and fish.
2. Biodiversity - changes in bird migration	Hutovo blato is a key resting and feeding ground for migratory birds.	Changes in temperatures and ecosystems can affect migration routes.	Reduced attractiveness for birdwatchers and disruptions in food chains.
3. Rising temperatures and drought	Average temperatures are rising, and the number of days with extreme temperatures is increasing.	Droughts increase evaporation and reduce water supplies.	Threat to wetland plants, increased fire risk and loss of water-dependent species.
4. Pollution and eutrophication	Climate change may intensify the effects of human pollution (agriculture, sewage).	Higher temperatures accelerate eutrophication processes (algal blooms).	Water pollution, reduced oxygen levels, fish kills and habitat destruction.
5. Tourist pressure in sensitive seasons	Most visitors come in the warmer months, when the swamp is most vulnerable to droughts.	Negative impact on plant and animal life	Excessive use of boats, pollution, noise and waste.
6. Lack of adaptive capacity	There are not enough systems for adaptation (monitoring, education, management plans).	Weak institutional support increases the risk of degradation in the event of climate extremes.	Difficult reaction to changes, loss of resources, environmental and economic damage.

Source: Author's processing



Hutovo Blato Nature Park is particularly vulnerable due to its dependence on stable water resources, which will cause it to experience the cascading effects of global warming, which requires urgent adaptation measures.

Hydropower projects, such as the Dabar HPP under the Gornji Horizonti Project, have a significant cumulative impact on the natural water regime of the Neretva and Trebišnjica rivers, which is crucial for the ecological balance in this area. The construction of dams and water accumulation significantly alter the natural river flows, and the combination of these changes with long-term climate change can lead to numerous negative consequences.

One of the most important impacts is the worsening of droughts. Due to the reduced water flow, due to the dam and reduced accumulation in the reservoirs, there is a decrease in the availability of water for agricultural production, especially during dry periods. This poses a serious challenge to maintaining agricultural practices that depend on a stable source of water, and can also cause a deterioration in agricultural production conditions, which further threatens yields and the economic sustainability of agricultural production.

Changes in river hydrology, caused by the construction of hydroelectric power plants, also seriously threaten wetlands. These ecosystems are characterized by a stable water regime, which is threatened by altered river flows. Imbalances in water bodies can damage biodiversity, as many plant and animal species that form wetlands depend on certain moisture and water flow conditions, and changes in these conditions can lead to a decrease in the number of these species and even their disappearance, thus endangering ecosystems and reducing biodiversity. In addition, unregulated river flow can cause increased erosion and loss of fertile soil. In areas along rivers, where agriculture is crucial, erosion can reduce soil quality, thereby reducing the ability of the soil to grow crops. Strategic measures for regulating watercourses, including erosion control, soil restoration and the application of sustainable agricultural practices, are needed to preserve soil fertility and support agricultural productivity. Only by harmonizing energy interests with the needs of the local community and the environment can it be possible to reduce negative impacts on ecosystems and ensure a balance between energy production and the environment.

Figure 18. Impacts of the construction of the Upper Horizons.



Source: Vranješ, M., Prskalo M., Džeba, T.: Hydrology and hydrogeology of the Neretva and Trebišnjica basins, review of the construction of part of the HPP system - Gornji horizonti, Hydrology and hydrogeology of the Neretva and Trebišnjica basins, issue 5, June 2013.

The Neretva Delta, where fresh water mixes with sea salt, is becoming the center of cross-border dilemmas on how to share water resources while maintaining the balance of the ecosystem.

Hutovo Blato, as a wetland, is subject to extreme weather events, which have a significant impact on the ecosystem and the local community. Due to its specific geographical and climatic position, Hutovo Blato can experience both droughts and floods, which creates great challenges for the preservation of its biodiversity.

1. Droughts are one of the extreme weather events that can seriously threaten the balance of the Hutovo Blato ecosystem. Wetlands like this depend on the constant availability of water, and long dry spells can lead to a decrease in water levels in lakes and marshes, which can have a number of negative consequences:

- Reduction in habitat quality, as lower water levels reduce habitat availability for many species of waterfowl, fish and other aquatic organisms.
- Loss of biodiversity, as drought can cause a decrease in the number of plant and animal species that depend on wetlands.
- Pollution. When water levels decrease, the remaining water resources become saturated with nutrients and contaminants, which can negatively affect the ecosystem.



2. Floods are also frequent extreme weather events in Hutovo Blato, as the area lies on low-lying terrain along the Neretva River, which can often overflow its banks during heavy rains. Floods can also be caused by extreme weather conditions, such as:

- Heavy rains, during the rainy seasons, especially in spring and autumn, can cause a rapid rise in the water level of the Neretva River and its tributaries. This can cause short-term floods that inundate the lower parts of Hutovo Blato. The problems that floods can cause in this area are changes in biodiversity in certain cases, when floods bring new seeds and species. Furthermore, long-term floods can seriously damage the park's infrastructure, such as walking trails, observation posts, and roads, making access to the park difficult and destroying the habitats of birds, fish, and other aquatic organisms that depend on stable water levels.

3. Extreme heat and heat waves, during the summer, temperatures in Hutovo Blato have been rising above 40°C in recent years, which can have an impact on plant and animal health, as the heat causes dehydration of plants and reduces the availability of food for animals, especially those that depend on wet areas. In addition, high temperatures can cause increased water evaporation, which leads to a decrease in the level of lakes and wetlands, and thus a decrease in habitat for numerous species. Hutovo Blato Nature Park, as a wetland area, is extremely sensitive to climate change. The above scenarios can not only affect local nature, but also tourism and economic activities associated with this area. Managing the Hutovo Blato ecosystem becomes a key issue for preserving the biodiversity and stability of this important natural resource.



6. RISK CHARACTERIZATION AND COMMUNICATION

6.1. Impact of climate zones on the pilot area

The studied pilot area is faced with multiple threats of climate change that threaten not only the ecological balance, but also the economic foundation of the region, especially agriculture and tourism – key sources of income for the local population.

Climate change has a significant impact on tourism activities, and especially on ecosystems that are of interest for tourism in the Hutovo Blato Nature Park. The consequences of climate change can manifest themselves at several levels:

The current impact of climate change on tourism activities in Hutovo Blato is mostly focused on changes in ecosystems. Climate change, which is associated with changes in temperatures, precipitation and the frequency of droughts, largely affects biodiversity. Such changes cause a decrease in the attractiveness for ecotourists who come to enjoy bird watching and other activities in nature.

The increase in average temperatures is already affecting the number of visitors during the summer months, because hot summer days make staying outdoors less pleasant. At the same time, this may result in changes in the migration of birds that are attractive to tourists, as they will change their seasonal patterns due to climate change. Climate change also affects the increase in the frequency and intensity of extreme weather conditions, such as droughts, floods and storms. Seen in the same context, it negatively affects the infrastructure that serves tourists, including roads, accommodation facilities and trails, which increases the problems in tourism in the observed area.

The researched issue also negatively affects the local economy by reducing tourism revenue, especially the greatest impact on ecotourism, which is crucial for the preservation of Hutovo Blato and could suffer a serious decline if there is a loss of biodiversity or deterioration of the natural conditions that attract visitors.

Climate change can also negatively affect agriculture in the area, because changes in weather conditions, such as droughts or excessive rainfall, are unfavorable for agricultural production. In the long term, it can reduce the source of income for local communities that depend on agriculture, which further burdens the economy.

Possible positive mitigation and adaptation measures relate to the potential for sustainable development. If appropriate steps are taken for climate change mitigation and adaptation, Hutovo Blato can become an example of a successful integration of ecotourism with the conservation of natural resources. This could attract tourists looking for destinations that are actively engaged in sustainable development and environmental conservation. In the same context, it is important to educate and inform visitors about the importance of conserving natural resources

and the importance of reducing the negative impact of climate change, which can encourage more responsible behavior and greater environmental responsibility. To preserve tourism in Hutovo Blato, it is crucial to implement strategies that combine environmental protection with sustainable development, in order to minimize the negative effects of climate change on tourism and the economy.

6.2. SWOT analysis and climate change adaptation model

Based on the prepared situational analysis, key factors from the internal environment (strengths and weaknesses) and external environment (opportunities and threats) that are significant for the impact of climate change on the development of tourism in the Hutovo Blato pilot area are presented.

Table 6. SWOT ANALYSIS

(STRENGTHS)	(WEAKNESSES)
<p>1. The unique natural heritage of Hutovo Blato can stimulate interest in ecological and ornithological tourism, as climate change raises awareness of the importance of sustainable and natural destinations.</p> <p>2. The proximity of surrounding destinations (Neum, Mostar) has a beneficial impact on the diversification of the pilot area's tourism offer.</p> <p>3. Climate change can stimulate the application of innovations in sustainable tourism and technology such as energy-efficient facilities, sustainable transport solutions (such as electric vehicles) and the use of technologies to reduce the environmental impact of tourism.</p>	<p>1. Dependence on water resources – the entire ecosystem is extremely sensitive and dependent on stable water levels. It is vulnerable to droughts and possible changes in flow.</p> <p>2. Weather extremes that are constantly increasing can significantly disrupt tourism and reduce the number of visits. In shorter periods, this can affect the safety of tourists and destroy infrastructure.</p> <p>3. Increase in costs, for example in the form of higher insurance costs, reconstruction of infrastructure after natural disasters or investments in adapting accommodation facilities to new climate conditions.</p> <p>4. Dependence on bird migrations, as climate change can have a negative impact on the seasonal migrations of specific species of pilot areas.</p> <p>5. Insufficient development of tourism infrastructure due to possible dependence on specific climate conditions can reduce the number of visits and affect accommodation capacities.</p>
(OPPORTUNITIES)	(THREATS)



1. The possibility of developing "green" tourism, is an opportunity to develop tourism based on environmental conservation, the use of renewable energy sources, sustainable waste management and ecological accommodation.
2. The possibility of developing new products and services, e.g. the development of scientific tourism and cooperation with academic institutions
3. Encouraging tourism in the off-season, climate change may allow for an extended tourist season or enable activities that were previously not considered possible in certain periods of the year, thus reducing the problem of seasonality of the pilot area.

1. Impact on natural resources and ecosystems, climate change could cause biodiversity loss and destruction of natural resources, which would be a worst-case scenario for the pilot area.
2. Possible changes in bird migrations and the loss of specific species would have a negative impact on the attractiveness of the pilot area.
3. Impact on infrastructure and transport, serious problems in transport infrastructure are possible (for example, floods blocking access) and endangering safety.
4. Uncontrolled tourism development and possible additional pollution. If tourism develops in the pilot area without controlled management, additional negative consequences and pollution are possible.
5. Given global climate policies, the pilot area may face new regulations or taxes on carbon dioxide emissions, which may increase business costs and reduce the competitiveness of the destination.

Source: Author's processing

The following figure shows a model of climate change adaptation and the possibility of implementing sustainable tourism development defined based on previously defined parameters.

Figure 19. Model of climate change adaptation and implementation of sustainable tourism development in Hutovo Blato



Source: Editing by the author

The process of adaptation to climate change and the implementation of sustainable solutions in the context of the development of sustainable tourism in Hutovo Blat requires a whole series of activities.

First of all, it is necessary to protect the ecosystem and water resources. The mentioned activity can be successfully implemented by monitoring and managing the water level in such a way as to introduce a system for monitoring the water level and the flow of rivers (eg from Bregava and Krupa) in order to maintain the sustainable humidity of the swamp. It is also important to monitor activities related to habitat restoration in order to preserve wetland plant species that regulate the microclimate, as well as stricter control of wastewater from surrounding settlements and agriculture.

As part of sustainable tourism and infrastructure activities, it is important to develop eco-adapted infrastructure such as solar-powered boats, eco-platforms that do not damage the soil, and educational panels about the climate challenges of flora and fauna. Then support the certification of local eco-accommodations.

The third mentioned activity is education, which must focus on ecological workshops and youth camps, and the education of local guides on the application of sustainable practices.

Involving the local community is an activity that can be carried out through the employment of local residents through training in eco-tourism, the production of ecological souvenirs and the promotion of local sustainable products.

And as the last activity, cooperation is mentioned, where it is necessary to highlight connections with international funds and projects, then partnerships with national



parks and reserves from the region for the exchange of knowledge and good practices. The recommendation also refers to the development of an application for visitors with information on routes, species, ecological advice and current events.

6.3. Projections of climate parameters

Unwanted climate change primarily affects the increase in average air and water temperatures, sea level changes, prolongation of dry periods with short extreme precipitation, reduction of the total water balance, reduced water infiltration into the ground, etc. Increasingly frequent dry periods with very intense precipitation cause problems with microbiological pollution, heavy metal pollution and high water turbidity. The development of tourism increases seasonal exploitation, especially during the summer period when water needs are highest.

High daily summer temperatures in the Hutovo Blato pilot area may lead tourists to avoid this destination in favor of some destinations with more comfortable temperatures, which could have serious consequences for the local community.

Tourism adaptation measures to climate change are aimed at adapting natural and human systems to current and expected climate change. This includes all activities aimed at reducing vulnerability to climate change and preserving biodiversity and protecting natural and cultural resources.

6.4. Recommendations

Ecotourism as a special form of tourism in Hutovo Blato, with proper management, can become a model for the future based on the principles of sustainable development. A focus on environmental conservation with simultaneous economic development will enable a balance between nature conservation and human activities. By developing ecotourism, Hutovo Blato can use its natural resources in a way that does not compromise its ecological integrity. Increasing awareness of environmental issues among visitors can contribute to the sustainable use of resources, as well as the promotion of environmental initiatives.

Some of the recommendations are as follows:

1. Water resource management. Given the importance of water for agriculture, ecosystems and human communities, the construction of a rainwater conservation system is a key measure to reduce dependence on surface water sources. This system allows for the storage of excess rainwater during the previous months for later use, especially in dry and wet periods. The modernization of the irrigation system is also extremely important, which allows for more precise water management, reduces losses and enables more efficient use of resources. Wetland restoration, on the other hand, contributes to the restoration of the natural hydrological balance, as wetlands act as natural filters, directing water towards the environment and reducing the risk of flooding.



2. Coastal and riverbed protection. Coastal and riverbed protection is essential for maintaining the balance of ecosystems in the coming decades, especially in light of climate change. The "restoration of natural buffer zones", such as riverbank forests and wetlands, is extremely important for stabilizing riverbanks. These natural zones serve as barriers that absorb and filter excess water, reducing the risk of erosion and flooding. Riverbank forests also help to "prevent saltwater intrusion", which can threaten freshwater ecosystems and irrigation water supplies. Eliminating or reducing human intervention in natural areas along rivers has positive effects on biodiversity, as these areas provide conditions for many species of plants and animals. In addition, the restoration of these zones can also contribute to carbon absorption, thereby reducing greenhouse gas emissions and promoting climate stability in riverine regions.

3. Ecosystem conservation - Monitoring of endangered species, reintroduction programs, combating invasive species. Ecosystem conservation is essential for maintaining the balance of natural processes and ensuring long-term environmental stability. This measure includes activities aimed at protecting natural habitats, planning for biodiversity loss and restoring endangered ecosystems. Monitoring of endangered species involves the systematic monitoring of populations of plant and animal species that are threatened with extinction or are declining. This process allows for timely detection of changes in their population and health status, which allows for a rapid response in the event of a need for protection. The data collected through monitoring are used to make decisions about protection, as well as to evaluate the effectiveness of the protection measures taken. Reintroduction programs allow the return of indigenous (native) species that have disappeared from certain areas due to human activities, habitat loss, hunting or other factors. Controlling invasive species is essential to prevent their dominance, which disrupts food chains and displaces native organisms. Integrating these measures ensures the preservation of biodiversity and the stability of habitats, especially in sensitive areas such as wetlands. Finally, educating the local community and collaborating with experts increases the effectiveness of long-term nature conservation strategies.

4. Integrated planning - Assessments of cumulative impacts of projects (e.g. HPP Dabar) taking into account climate scenarios. Integrated planning is based on a holistic approach that links adaptation and protection measures, ensuring that development projects (e.g. HPP Dabar) are analyzed through the prism of long-term climate challenges. Cumulative impact assessments determine how the combination of projects and climate change (reduced precipitation, drought) affects water resources, ecosystems and local communities. For example, hydropower projects can worsen the vulnerability of the Neretva River to droughts, disrupting irrigation and the stability of wetlands such as Hutovo Blato. Incorporating climate scenarios into planning allows for the design of infrastructure that is resilient to extreme weather conditions, reducing the risk of ecosystem collapse. Finally, collaboration with experts, local communities and decision-makers is essential to balance development needs with nature conservation.



5. Support for agriculture - Promotion of resilient crops and precision agriculture. As an adaptation and protection measure, it aims to strengthen the resilience of agroecosystems to climate change through the "promotion of resilient crops" (e.g. drought-resistant vegetables or citrus varieties resistant to heat waves) that can survive extreme conditions. "Precision agriculture" involves the use of technology (sensors, satellite systems) to optimize the use of water, fertilizers and pesticides, reduce waste and pressure on resources in conditions of increasingly frequent droughts. These practices ensure sustainable food production and reduce dependence on unstable climate conditions, critical for areas like HNŽ where agriculture depends on river systems. The integration of resilient varieties and digital tools creates a "synergy" that reduces soil erosion, preserves water quality and increases the resilience of the agricultural economy. Finally, farmer education and access to financing for the implementation of these methods are key to the transformation towards climate-smart agriculture, ensuring the economic survival of communities and ecological balance.

Table- . Table title.



REFERENCES



ANNEX. Annex title