NaTour4CChange | Interreg Euro-MED | Co-funded by the European Union

Identification and assessment of the main coastal tourism-related issues concerning climate change adaptation of destination Dugi otok

The Consortium:

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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 is 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, 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 BASELINE ASSESSMENT

1.1 Introduction

The long and indented coastline and the diversity of land and sea landscapes, the rich cultural and historical heritage and tradition are strategically important natural, economic and **tourist resources** of Dugi otok. Therefore, it is not surprising that tourism on Dugi otok, as well as on other similar island destinations in the Adriatic and the Mediterranean, is one of the most important economic activities that directly and indirectly provides the main income for the island's inhabitants. According to data from the Sali Municipality Tourist Board (TZ), in 2023, tourist traffic amounted to 26,300 guest arrivals and 190,000 overnight stays. In addition to land guests, Dugi otok is also popular with nautical tourism guests, so it recorded excellent results in 2023, although the Sali Municipality Tourist Board does not have official figures. Data on the income of the Tourist Board related to the number of guests on the island show that in 2023, 78,083.00 euros were generated from the tourist tax, 67,396.00 euros from the tourist tax-nautic and 11,000.00 euros from the tourist membership fee.[1]

On the one hand, the coast and coastal area of Dugi otok are the main tourist attraction, and on the other hand, they are extremely vulnerable to extreme weather events associated with **climate change**. The impact of climate change on the coast and coastal area has been intensified due to increasing negative anthropogenic impacts, of which unplanned and often illegal construction in the coastal zone should be highlighted. In addition to the fact that the adaptation of the coast and coastal area to climate change is difficult in isolated areas such as islands due to limitations in human, material and financial capacities, there is also a visible mismatch between short-term planning of resource use and the expected increase in sea level.[2]

The consequences of climate change pose a major risk to islands and their coastal areas, as well as a challenge for effective adaptation and management, especially for tourism. The increase in temperature and changes in precipitation have a major impact on the environment and terrestrial and marine biodiversity, as well as economic sectors such as fisheries and tourism, which are the most important activities of the inhabitants of Dugi otok. The increase in the temperature of the Adriatic Sea also causes the expansion of seawater (thermal expansion), which, among other impacts, leads to a rise in sea level. Although the Croatian coast is relatively steep, the dimensions of the effects of sea level rise in the coastal area could be significant. This phenomenon contributes to coastal erosion and coastal flooding, which are most at risk in lower coastal areas, including touristically attractive locations on Dugi otok. Due to changes in temperature conditions, storms are more frequent and stronger, i.e. extreme weather conditions, which have a serious impact on the coast, and

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[1] *Source: Source: Sali Municipality Tourist Board (2024): Report on the implementation of the work program for 2023.*

[2] *Adapted from: IPCC Report »Climate Change 2007, Impacts, Adaptation, Vulnerability«*

directly threaten the destruction and increasing costs of maintaining and repairing tourist infrastructure.

The rising temperature of the Adriatic Sea also affects the microclimate conditions of individual locations, which is visible in changes in winds, cloudiness, and precipitation.

Climate change and its consequences have a strong impact on marine and coastal ecosystems and biodiversity, and are manifested in the degradation of habitats and landscapes and the reduction of biodiversity, which further reduces the tourist experience, affecting visitor satisfaction and reducing the economic sustainability of destinations that rely on natural attractions.

The impact of climate change on tourism development is a critical point that needs to be considered when planning and managing tourist sites on Dugi otok. Numerous models have been used to predict changes in tourist flows by country and by season due to climate change. Although the results vary, there will be more competition from northern Europe, where summers will be warmer, and it will be more attractive for visitors to come to the Mediterranean outside the main season, in April and October.

In planning and managing tourism, it is important, among other things, to estimate the number of visitors that can be expected and the typology of the necessary facilities adapted to the expected impacts of climate change. Such data and information can be input for strategies for developing forms of tourism suitable for coastal areas. At the same time, this information has a direct impact on one of the biggest problems of coastal areas – the increasing development. Redistributing visitors outside the summer period may mean that no more construction is needed and that the constant growth of development on the coast can finally be limited.[3]

1.2 National climate change adaptation policy[4]

Legislative and strategic framework - The Ministry of Environmental Protection and Green Transition, as the coordinator of climate change policy, is working intensively to promote climate change adaptation policy. Based on the Act on Climate Change and Ozone Layer Protection (Official Gazette, No. 127/19), the Strategy for Climate Change Adaptation in Croatia for the period up to 2040 with a view to 2070 ("Official Gazette, No. 46/20") was developed, which was adopted by the Croatian Parliament on 7 April 2020.

The Strategy is the first strategic document that provides an assessment of climate change for Croatia by the end of 2040 and 2070, possible impacts and vulnerability assessments.

The objective of the Strategy is to raise awareness of the importance and threats of climate change for society and the necessity of integrating the concept of

[3] *Source: PAP/RAC (2021) "Guidelines for integrating climate change adaptation into Adriatic coastal management", INTERREG AdriAdapt project*

[4] *Source : https://mzozt.gov.hr/o-ministarstvu-1065/djelokrug/uprava-za-klimatsku-tranziciju-1879/prilagodba-klimatskim-promjenama-1965/1965*

climate change adaptation into existing and new policies, to reduce the vulnerability of the environment, economy, and society to mean sea level.

The Strategy also shows the vulnerability of sectors to climate change, including tourism, and lists climate change adaptation measures for which estimates of the necessary amounts and sources of financing are highlighted. The adaptation strategy will be implemented through action plans that will contain the elaboration of specific measures and activities, and will be adopted every five years. The action plans for each measure and activity will provide a description, method of implementation, sequence of activities, deadline, obligors, and coordinators of the implementation of measures and activities, as well as sources of financing. To facilitate the integration of the concept of climate change adaptation, publicly available informal guidelines have been developed, and are available: Guidelines for project managers (European Commission, 2009) - How to increase the resilience of vulnerable investments to climate change, the purpose of which is to help manage additional risks related to climate change and to complete an integral part of the assessments applied in the project development phase. In addition, there are guidelines for including biodiversity and climate change in SEA and EIA, such as: Guidelines for including climate change and biodiversity in environmental impact assessments; Guidelines for integrating climate change and biodiversity in strategic environmental assessments; and Guidelines for climate validation.

1.3 Area description

Dugi otok belongs to the group of North Dalmatian islands of the Zadar archipelago. Molat is located to the north of it, the closest larger islands towards the interior are Sestrunj, Iž and Ugljan, and the Kornati continue to the south (Croatian state geodetic administration, 2022). It is the second largest among the islands of the North Dalmatian group (after Pag) and the seventh largest island in Croatia, with a total area of 114.44 km2 (Croatian state bureau of statistics, 2018). It stretches in a northwest-southeast direction (Dinaric direction), the width of the island ranges between 1.2 - 4.5 km, and the length is over 45 km, which is why it is called Dugi[5] otok. With a coastline of 170.7 km and an indentation coefficient of 6 out of 4.5, it is one of the most indented Croatian islands (Croatian state bureau of statistics, 2018), and it is particularly indented in its areas, which are characterized by large bays and gulfs, among which are the largest ports of Telašćiča and Solišćiča and Pantera Bay. Towards the neighbouring islands and towards the mainland, Dugi otok is surrounded by about 50 islands and islets (Zverinac, Lavdara, Katina, Garmenjak, Sestrica, Trimulić, Tukošćak, Mrtonjak, Golač, Lagan, Ključić, Mežanj, etc.), while the western side of the island, characterized by cliffs, is exposed to the open sea (Croatian State Geodetic Administration, 2022)

Administratively, the island belongs to the Municipality of Sali in Zadar County, which is divided into 12 settlements. The settlements on the island are

[5] *The word means „long" in Croatian.*

connected by several local, county and state highways, the most important of which is the state highway Veli Rat - Brbinj - Sali (D109) with a length of 42 km (Croatian Roads, 2022). The connection with the mainland is via the ferry ports in Brbinj and Zaglav or the fast boat line Zadar-Sali (Municipality of Sali, 2021).[6]

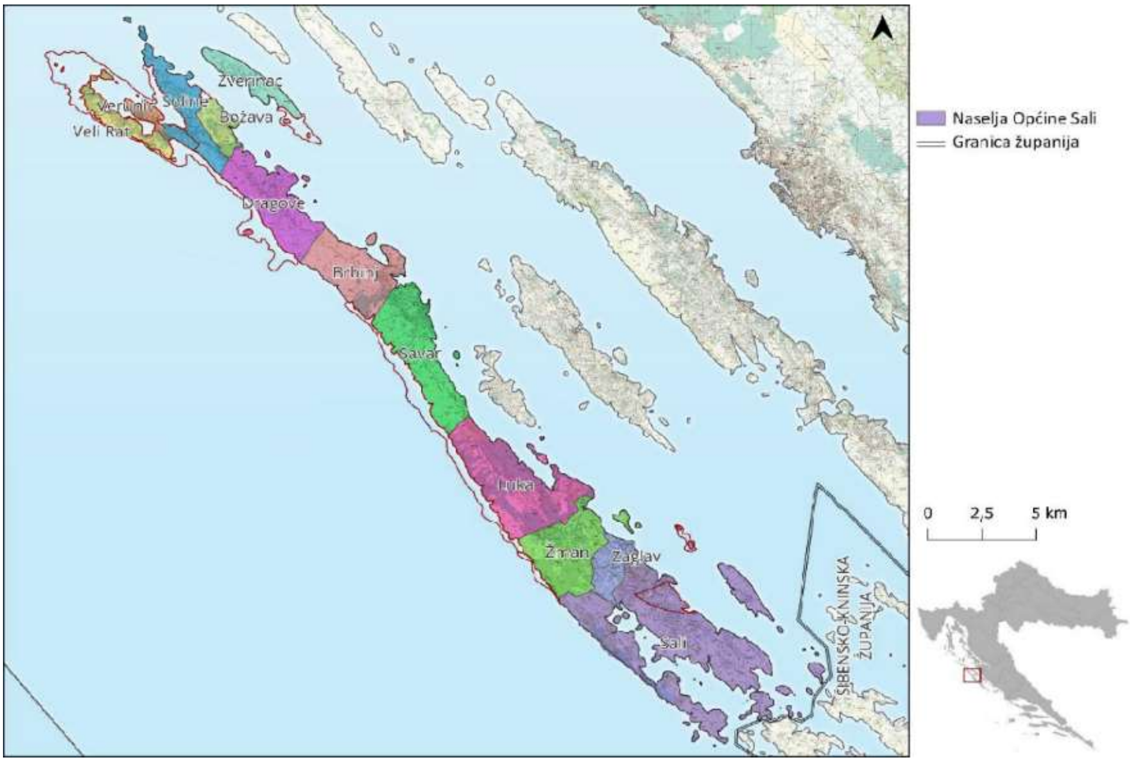

Figure 1 Administrative position of Dugi Island. Source: PI Natura jadera: management plan for protected areas and areas of the ecological network of long island (2023).

1.4 Population

According to the latest census from 2021 (Croatian State Bureau of Statistics, 2022a), the Municipality of Sali has 1,787 inhabitants, which is only 1.1% of the total population of Zadar County, and the Municipality of Sali is one of the least densely populated municipalities in the Zadar archipelago. Compared to the area of 124.20 km2, the average population density of the Municipality is 14 inhabitants/km2, which is a third less than the average for Zadar County. One of the reasons for the low population is the fact that Dugi otok is an open sea island and one of the most remote islands in the county. The number of inhabitants within the settlement is unevenly distributed, so the largest number of inhabitants lives in the settlement of Sali (41.1%), a little more than a third (36.82%) lives in four settlements (Žman, Zaglav, Luka and Božava), and the remaining inhabitants (22.1%) are distributed in the other seven settlements.

Since the 1950s, a general trend of decreasing total population has been visible (Croatian state bureau of statistics, 2011). If we consider the fact that according to the 2011 census, the age index was 359.6, and according 2021 census, the age

[6] *Source: PI Natura Jadera. Management plan for protected areas and ecological network areas of Dugi otok(2023).*

index was 450,3 the trend of decreasing total population could continue[7]. According to the age index, there are more than four older persons (60+ years old) for every young person (up to 19 years old).

On the other hand, positive indicators of the population picture are that two-thirds of the population (66.8%) has secondary or higher education, the largest number of inhabitants (56.2%) belongs to the working-age population (age 15 to 65) (Croatian state bureau of statistics, 2011), and according to the development index of local self-government units, the Municipality of Sali is above the average for the Republic of Croatia. According to the latest census from 2021 (Croatian state bureau of statistics, 2022a), the total population of Zadar County is 162,481 inhabitants. The area of the county is 3,646 km2 (Croatian state bureau of statistics, 2018), and the average population density is 44 inhabitants/km2. The Municipality of Sali belongs to the VI. group, or the third quarter of above-averagely developed local governments (Decision on the classification of local and regional self-government units according to the level of development, NN 132/17).[8]

1.5 Tourist resource of Dugi otok

Dugi otok is impossible to define with the usual marketing adjectives because, due to its geographical position, elongation, indentation, and diversity, it is unique in the combination of its tourist resources, both established and potential. The distance from the mainland and the offshore orientation is a given perceived as an obstacle, but also a comparative advantage for positioning in the tourist segment that expects close contact with nature and tradition, that wants to move away from the saturation caused by "civilization", and that wants to learn and learn, as well as can engage in themselves in a dynamic or slow way.

On the island there is a branch of the Harbour Master's Office, several post offices, a clinic, a customs crossing, Tourist Board offices, and a multitude of catering and other service facilities. In Sali, Božava and Veli Rat, there are also moorings for ships that supply water and electricity.

In Zaglav there is a gas station for sailors, a mandatory stop for all speed enthusiasts. Excursion tourism is also developed, and there are marked trails for trekking and cycling. There is also a paintball field in the Sali field area. There are about fifteen archaeological sites marked throughout the island, complete with information boards.

Dugi otok is primarily a place for relaxation and enjoyment. In each of the 12 villages on Dugi otok, festivals are held during the summer months, most often in the name of the village's patron saint, accompanied by the sounds of local

[7] *Source: Interactive demographic atlas of the Republic of Croatia https://experience.arcgis.com/experience/95c3907c4351401c97966be3d9dbd100/page/Indeks-starosti-2021_/#data_s=id%3AdataSource_8-18c83f9f36d-layer-3-18c30f28792-layer-46%3A336*

[8] *Source : PI Natura Jadera. Management plan for protected areas and ecological network areas of Dugi otok(2023).*

music and traditional dishes. Those who enjoy an active holiday will find their satisfaction in exploring the island along well-maintained and marked hiking trails or on excursions to the Telašćica Nature Park and the Kornati National Park.

Various sports events are organized throughout the year, and hiking trails and a climbing wall are also available. There are also several diving schools on Dugi otok that are at the service of anyone who wants to delve into the mysterious depths of the sea, and whose students visit some of the most attractive diving locations on Dugi ptok, such as the underwater cave Brbinjšćica or the islet of Mežanj.

Dugi otok, with several attractive tourist spots and natural beauties, offers visitors a journey through the world of tradition and a modern way of life.[9]

Figure 2 Tourist map of Dugi Otok. Source: https://romario.hr/karte-otoka/turisticka-karta-dugog-otoka-i/; Retrieved: 02.11.2024

[9] *Sali Municipality Tourist Office: https://www.dugiotok.hr/o-otoku*

Telašćica Nature Park

Telašćica Bay is in the central part of the eastern coast of the Adriatic Sea, in the southeastern part of the island of Dugi otok. Due to its exceptional beauty, richness and significance, this bay, surrounded by 13 islands and islets, and containing six islets within the bay, was declared a Nature Park in 1988. It received the status of a protected area in 1980 thanks to its exceptionally valuable flora and fauna, geological and geomorphological phenomena, valuable seabed communities and interesting archaeological heritage.

The area of the Telašćica Nature Park is an area rich in contrasts, quiet and peaceful beaches, and a laid-back coastline on one side and wild steep cliffs on the other, an area of Aleppo pine and holm oak forests on the one hand, and bare rocky terrain on the other, an area of cultivated fields covered with vineyards and olive groves, but also an area of degraded vegetation covering dry habitats.

Three fundamental phenomena represent the basic characteristics of this area: the unique Telašćica Bay as the safest, most beautiful and largest natural harbour in the Adriatic Sea, with 25 small beaches, the cliffs of the island of Dugi otok or the so-called "rocks", which rise up to 161 meters above the sea and descend to a depth of up to 90 m, and finally the salt lake "Mir" with medicinal properties. The most picturesque among the islands is the island of Katina, and the most unusual is certainly Taljurić. The total area of the Nature Park is 70.50 km2, 25.95 km2 on Dugi otok and neighbouring islets and 44.55 km2 at sea. The surroundings are beautiful cultivated meadows, and on the hills, there is rich Mediterranean vegetation with about 500 plant species and an equally rich fauna. The underwater world counts over 300 plant and 300 animal species.

More than 2,500 hours of sunshine per year, an average January temperature of more than 7°C and an average annual temperature of more than 16°C is characteristics of the climate of this area. In winter, the sea is approximately 13°C, and in summer approximately 23°C. The remains of Roman buildings in Mala Proversa, as well as numerous pre-Romanesque churches, among which the church of St. John in Stivanjem polje stands out, testify to the fact that Telašćica has been a populated area since ancient times, and the fact that the beginnings of fishing in Croatia began precisely on these shores is evidenced by the first record of fishing from the end of the 10th century. In the Nature Park, it is possible to dive in several attractive places near the cliffs, and walk around interesting places, and the beautiful view from the Grpašćak viewpoint should not be missed. This, and much more, has attracted and continues to attract visitors to the Telašćica Bay, which as a Nature Park of the Republic of Croatia belongs to the high category of protected areas of nature, which it deserves. Near the Telašćica Nature Park are three Croatian national parks: NP Kornati, NP Paklenica and NP Krka, and two nature parks: PP Vrana Lake and PP Velebit.[10]

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[10] *Source: PI PP Telašćica: https://pp-telascica.hr/o-parku/*

Significant landscape "The northwestern part of Dugi Otok" is characterized by a relatively gentle terrain and a highly indented coastline with numerous bays, gulfs, peninsulas and narrow islets, and a predominantly natural surface cover of forest vegetation (UZP, MINGOR, 2022). A particularly recognizable feature of the area is the Sakarun bay with a sandy bottom and a sandy shore followed by pebbles, about 300 meters long, with a turquoise blue sea that is further emphasized by the contrast with the surrounding dark vegetation. In addition to this area of special natural, visual, and ambient values, on the coastal sides of the bay there are also spatial structures of anthropogenic origin - dry stone wall forms in an orthogonal arrangement. Although today overgrown with natural Mediterranean vegetation, these dry-stone walls represent valuable elements of the cultural landscape that testify to the traditional way of using and cultivating the land (Bačić and Mihelčić, 2014). In addition to all the above, the area is particularly recognizable by the Punta Bjanka or Veli Rat lighthouse, which was built in 1849 in the same name. Due to its height of 42 meters, it is also the tallest lighthouse on the Adriatic, and represents a landmark and a dominant feature in the area that attracts attention. Next to the lighthouse is the chapel of St. Nicholas, in which the Roman Missal from 1869 is preserved (Plovput, 2022). This complex of buildings, located on an open and flat plateau surrounded by an accessible rocky coast and the sea on one side, and a pine forest on the other, due to the pronounced contrasts and diversity of elements in a relatively small area, makes the landscape of the area complex and extremely attractive, and whose area of Veli Rat is very valuable in terms of ambience.[11]

Special botanical reserve "The olive grove Saljsko polje" is in the southeastern part of Dugi otok, along the NE-oriented coast, where the coastal part extends from the town of Sali to the Dumboka bay, from where it widens towards the hinterland for up to 1.5 km. Within the Saljsko polje, three different areas can be distinguished in relief – a relatively steep and rocky coast that continues onto a flat terrain with accumulated fertile soil, and a series of karst headlands that border the area in the hinterland. To the north, in the coastal part of the reserve, there is the southern part of the Sali settlement, while the rest of the coast is undeveloped and covered with natural vegetation. Most of the coastal area of the reserve is covered by a vast, unique complex of olive groves, locally called the "olive forest". According to oral tradition, the olive grove is more than 2000 years old, with the assumption that it was planted by the Greeks. Due to their considerable age, the olive trees are characterized by unusual trunk and crown shapes. In addition to the above, the specificity of the area is the enclaves of vine and fig plantations within the olive grove. Given its age, spaciousness and traditional form of cultivation and cultivation, the olive grove represents a valuable example of a cultivated landscape, which, in addition to cultural, is characterized by significant botanical, but also visual and ambient values. In addition, the olive grove also has historical significance since the first meeting of the SKOJ[12] of the town of Sali was held there in 1942, which

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[11] *Source: PI Natura Jadera. Management plan for protected areas and ecological network areas of Dugi otok (2023).*

[12] *Union of Communist Youth of Yugoslavia*

is why this place is also marked with a monument. On the southern edge of the reserve, the area is physically and visually bordered by a ring of karst peaks covered by natural vegetation of bushes and mixed forests and holm oak or oak macchia (JU Natura Jadera, 2022).[13]

1.6 Climate

According to its climatic characteristics, Dugi Otok is belonging to the **maritime (coastal) climate zone**. The most important climate modifier of this area is the sea (the area of the central and northern Adriatic). The state of the atmosphere over the area in question is marked by frequent and intense weather changes, except in summer when, under the influence of the Azores anticyclone, which prevents the penetration of cold air into the Adriatic, this area comes under the influence of the subtropical belt. The most significant winds are the jugo and the bora. The bora blows throughout the year, but reaches its greatest strength during the winter months. The jugo brings humid, cloudy, and rainy weather, while the bora brings cold, dry, and clear weather. In the summer months, the mistral usually blows during the day (Zaninović et al., 2008).

According to the Köppen climate classification, the Dugi Otok area has a climate type of moderately warm rainy climate with hot summers. This climate is characterized by hot summers and mild winters, with occasional cold waves that can be uncomfortably cold. The warmest month of the year has an average temperature of more than 22 °C, and more than four months of the year have an average monthly temperature of more than 10 °C. The average temperature of the coldest month is more than -3 °C. The annual amount of precipitation is significant, and most precipitation falls in the winter part of the year. The dry season is in the warm part of the year, and the driest month has less than 40 mm of precipitation and less than a third of the precipitation of the rainiest month (the so-called olive climate) (Šegota and Filipčić, 1996). According to Thornthwaite's climate classification, this area is in the subhumid climate zone, which means that the average value of relative humidity in the air is from 40 to 60% (Zaninović et al., 2008).

Although there are two meteorological stations of the State Hydrometeorological Institute on Dugi otok (automatic stations Veli Rat and Vela Straža), the nearest meteorological station in the wider subject area for which there is publicly available data on the measured values of the main climatological parameters is the Zadar station (main station Zadar). Based on the measured data for the period 1961 - 2019, the mean annual air temperature at this meteorological station was 15.2 °C, and the average annual precipitation was 915 mm. The warmest month is July with an average temperature of 24.3 °C, and the coldest is January with 7.2 °C. The highest daily air temperature at the Zadar station was measured in August 2017 (36.3 °C), while the absolute

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[13] *Source: PI Natura Jadera. Management plan for protected areas and ecological network areas of Dugi otok (2023).*

minimum was measured in January 1963 (-9.1 °C). The rainiest month is November, with an average of 121.1 mm of precipitation in the period. The average annual number of sunny hours for the Zadar area is 2,571 hours (DHMZ).

In projections until 2040, climate change is expected in the Dugi Otok area, primarily in the annual course of precipitation, air temperature, wind speed and rising mean sea level. It is predicted that the average annual amount of precipitation will decrease, the number of rainy periods will decrease, the number of dry periods will increase, the frequency of extremes will increase, the average wind speed will increase (during summer and autumn) and the average annual air temperature will increase by 1 to 1.4 °C (Climate Change Adaptation Strategy, 2020). According to the results of the OGCM (Oceangeneral circulation model), the average sea level will rise by 19 - 33 cm in the next climatological period (Intergovernmental Panel on Climate Change - IPCC, 2014).[14]

[14] *Source: PI Natura Jadera. Management plan for protected areas and ecological network areas of Dugi otok (2023).*

2 CURRENT IMPACT ASSESSMENT

2.1 Meteorological stations on Dugi otok

As part of the Croatian State Hydrometeorological Institute (SHMI) infrastructure, there are a total of 6 meteorological stations on Dugi Otok. **Two automatic meteorological station**s are AMS Veli Rat and AMS Vela Straža, which, among other things, also contain ombrographs - independent devices that measure precipitation continuously over a 24-hour period. All precipitation data is archived on media for computer processing and is available in real time. Based on the ombrograph records, it is possible to determine the beginning, end, total duration, and intensity of precipitation.[15]

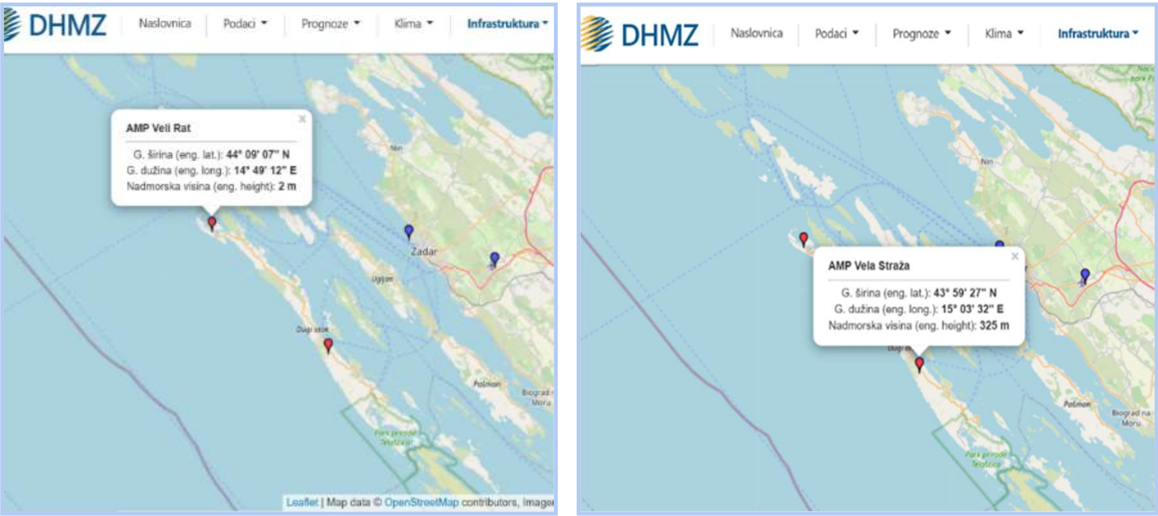

Figure 3 Automatic meteorological stations on Dugi Otok. Source: SHIMI (2024.). Retrieved: 04.11.2024

There are **2 climatological (ordinary) meteorological** stations at the locations of Sestrice Vela and Božava on Dugi Otok. These stations perform observations at 07:00, 14:00 and 21:00 local time and monitor meteorological phenomena throughout the day. Observations are performed by non-professional observers, and the stations are most often located within private properties. Some deliver data for public information, by telephone, once or twice a day. Completed observation diaries are delivered by mail at the end of the month to the State Hydrometeorological Institute, where the data is entered into the computer, controlled, and archived. The data is used directly or via user programs.[16]

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[15] *Source SHMI: https://meteo.hr/infrastruktura.php?section=mreze_postaja&param=pmm&el=glavne. Retrieved: 04.11.2024.*

[16] *Source SHMI: https://meteo.hr/infrastruktura.php?section=mreze_postaja&param=pmm&el=klimatoloske Retrieved: 04.11.2024.*

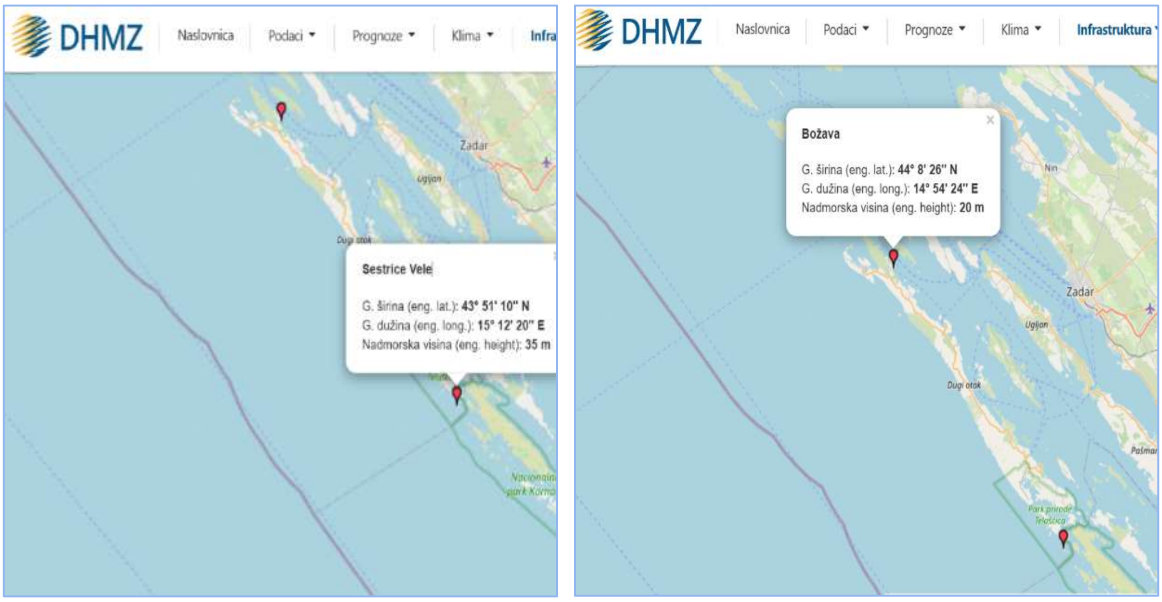


Figure 4 Climatological (ordinary) meteorological stations on Dugi Otok. Source: SHIMI (2024.). Retrieved: 04.11.2024.

Rain gauge stations have been set up in Sali and Brbinj where amateur observers measure the amount of precipitation (e.g. rain, hail, fog, snow, ...) and the height of the snow cover. In addition to measuring the amount of precipitation, the observer will determine and record the form in which the precipitation occurred (rain, snow, hail, sleet, ...), the intensity (light, moderate, heavy) and how long the precipitation lasted (the time from the first occurrence to the complete cessation). In addition, other very significant phenomena such as fog, thunder, stormy wind, or snow cover are also recorded. All data is recorded in a monthly rain gauge report which is submitted to the DHMZ at the end of the month, where the data is processed, controlled, and archived.[17]

2.2 Meteorological data

Since the establishment of the climatological meteorological stations Sestrice Vela and Božava on Dugi otok, various climatological data have been collected, and for the purposes of this study, the State Meteorological Institute of the Republic of Croatia provided data on **average monthly temperatures and precipitation** for all months in the years of collection, as well as summary values by year. The data is presented in tables and graphs below.

[17] *Source SHMI. https://meteo.hr/infrastruktura.php?section=mreze_postaja&param=pmm&el=kisomjerne Retrieved: 05.11.2024.*

2.2.1 Mean air temperature

Table 1 Average air temperatures, Sestrice Vela station in the period January 1981- October 2024[18]

Sestrice Vele - mean monthly dry bulb temperatures (°C)													
year	**Jan**	**Feb**	**March**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**av. annual**
1981	6,6	7,1	11,9	14,4	18,0	21,6	23,4	24,0	21,0	18,7	11,1	9,3	**15,6**
1982	8,0	7,3	9,7	12,8	18,0	23,3	25,0	23,9	23,2	18,0	14,4	11,1	**16,2**
1983	9,9	7,2	10,8	14,2	18,6	21,1	25,4	23,9	21,7	17,3	11,8	9,1	**15,9**
1984	9,1	7,7	9,4	13,3	15,8	20,3	23,9	23,9	20,9	17,8	14,6	10,7	**15,6**
1985	6,2	7,1	10,4	13,7	18,4	21,4	25,3	25,0	22,2	17,5	11,9	11,9	**15,9**
1986	9,4	6,1	10,6	14,3	20,3	21,5	23,4	25,7	21,2	17,9	13,6	9,9	**16,2**
1987	7,4	9,2	6,8	13,5	15,9	21,0	25,7	24,9	23,6	18,3	13,8	10,6	**15,9**
1988	11,3	9,6	10,6	13,8	18,4	21,5	26,5	25,5	21,0	18,2	10,5	9,6	**16,4**
1989	8,9	10,6	13,0	14,8	17,6	20,7	23,9	23,9	20,4	15,6	12,0	10,3	**16,0**
1990	9,4	11,1	12,8	13,7	19,0	21,4	24,8	25,3	20,6	18,3	13,6	8,8	**16,6**
1991	8,7	7,4	12,5	12,7	14,9	21,5	24,5	24,5	22,4	16,3	13,2	7,8	**15,5**
1992	8,7	8,6	10,6	13,7	19,1	21,5	24,4	26,3	22,0	18,4	15,1	9,9	**16,5**
1993	8,7	7,9	9,6	13,8	20,2	23,2	24,2	25,6	21,1	18,4	11,7	11,9	**16,4**
1994	10,3	8,7	13,0	14,0	18,7	22,4	26,6	27,0	23,1	17,6	14,9	10,7	**17,2**
1995	7,9	10,9	9,9	12,9	17,2	20,9	26,3	24,4	20,1	19,0	12,0	10,4	**16,0**
1996	9,4	7,7	9,3	14,4	18,5	23,3	24,3	24,9	18,5	17,0	14,1	9,7	**15,9**
1997	10,4	10,0	12,1	11,2	18,2	22,6	24,5	24,7	22,3	16,4	13,7	10,8	**16,4**
1998	9,9	11,0	10,5	14,4	18,5	23,8	26,5	26,5	21,1	18,1	11,0	8,5	**16,6**
1999	9,1	7,5	11,4	14,2	18,7	23,0	25,1	25,5	22,9	17,8	12,8	10,4	**16,5**
2000	7,7	9,6	11,1	15,1	20,7	24,5	24,1	26,0	21,7	18,9	15,9	12,4	**17,3**
2001	10,6	10,2	14,0	13,7	19,6	21,4	25,4	26,5	19,4	19,3	12,4	6,8	**16,6**
2002	7,6	10,6	12,9	14,5	19,2	23,5	25,0	24,0	20,2	17,9	15,6	10,6	**16,8**
2003	9,1	5,9	11,1	13,7	20,3	26,0	27,1	28,2	21,3	16,4	14,5	10,8	**17,0**
2004	7,8	8,9	10,1	14,0	17,3	22,4	26,1	25,8	22,2	19,4	13,9	11,3	**16,6**

[18] *Source: SHMI (2024.)*

2005	7,8	6,4	10,2	14,2	19,1	23,1	25,8	23,4	22,3	17,3	12,8	9,3	**16,0**
2006	7,3	8,3	9,5	14,2	18,7	22,5	26,6	23,6	22,4	19,1	14,0	11,4	**16,5**
2007	11,3	11,6	12,3	16,6	20,6	24,8	26,8	25,3	19,7	16,1	11,7	8,9	**17,1**
2008	10,0	9,3	11,6	14,6	19,4	23,0	26,3	26,1	20,5	18,0	14,1	10,6	**17,0**
2009	8,7	8,5	11,3	14,7	20,1	21,6	25,9	26,4	22,9	16,7	14,2	10,2	**16,8**
2010	7,5	8,9	10,5	14,4	17,8	22,8	25,6	24,4	20,8	16,5	14,6	9,2	**16,1**
2011	8,5	9,3	11,0	15,6	19,2	23,8	25,0	26,1	24,6	17,4	13,9	12,0	**17,2**
2012	8,9	5,3	13,1	14,1	17,9	24,1	27,6	27,1	22,1	18,5	16,2	10,1	**17,1**
2013	9,9	8,5	11,0	15,5	17,9	21,8	25,9	25,6	21,6	18,1	14,4	12,0	**16,8**
2014	12,0	12,4	12,9	15,3	17,4	22,4	23,8	24,6	20,8	18,7	16,2	11,2	**17,3**
2015	10,3	9,3	11,6	14,1	18,9	23,4	27,4	26,1	22,2	17,5	14,0	12,1	**17,2**
2016	10,3	12,2	11,9	15,4	18,1	22,6	25,8	24,7	22,2	17,1	14,0	11,1	**17,1**
2017	6,0	10,9	13,2	14,5	19,0	24,4	26,5	26,7	20,7	17,6	13,1	9,8	**16,9**
2018	11,0	7,0	10,9	16,9	21,0	23,8	25,9	26,5	22,5	19,2	14,9	10,7	**17,5**
2019	7,9	10,8	12,9	14,8	16,1	24,5	25,7	26,7	22,8	18,9	16,4	12,2	**17,5**
2020	10,8	12,1	11,9	15,0	18,9	21,9	24,8	26,5	23,0	17,7	14,3	12,2	**17,4**
2021	9,7	11,1	11,3	13,0	18,0	24,1	26,3	26,1	22,6	16,8	14,7	10,9	**17,0**
2022	9,3	10,8	10,7	13,8	20,1	25,3	27,2	26,4	21,8	19,7	14,7	13,2	**17,8**
2023	10,8	9,8	12,9	13,6	18,6	23,4	26,8	26,2	24,0	21,3	15,7	13,0	**18,0**
2024	10,9	13,4	13,9	16,0	19,8	24,4	27,8	28,3	22,3	20,0	-	-	**19.7***
SUM	401,0	403,8	498,7	627,1	817,7	1001,5	1124,9	1122,7	955,9	790,7	592.0*	453.4*	715.9*
AVERAGE	9,1	9,2	11,3	14,3	18,6	22,8	25,6	25,5	21,7	18,0	13,8	10,5	16,6
STD	1,4	1,9	1,4	1,0	1,3	1,3	1,1	1,2	1,2	1,1	1,5	1,3	0,6
MAX	12,0	13,4	14,0	16,9	21,0	26,0	27,8	28,3	24,6	21,3	16,4	13,2	18,0
YEAR	2014	2024	2001	2018	2018	2003	2024	2024	2011	2023	2019	2022	2023
MIN	6,0	5,3	6,8	11,2	14,9	20,3	23,4	23,4	18,5	15,6	10,5	6,8	15,5
YEAR	2017	2012	1987	1997	1991	1984	1981!	2005	1996	1989	1988	2001	1991
AMPL	6,0	8,1	7,2	5,7	6,1	5,7	4,4	4,9	6,1	5,7	5,9	6,4	2,5

* Estimated value

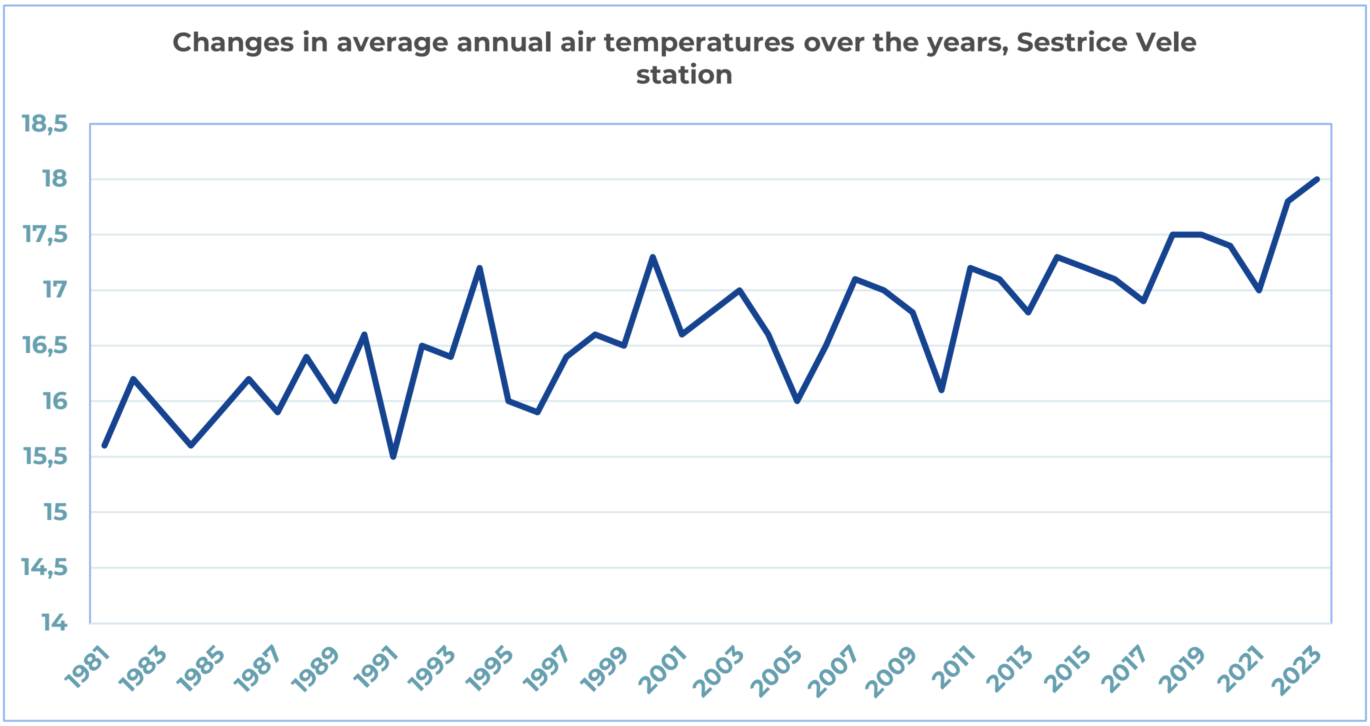
Table 2 Average air temperatures, Božava station in the period January 1997- October 2024[19]

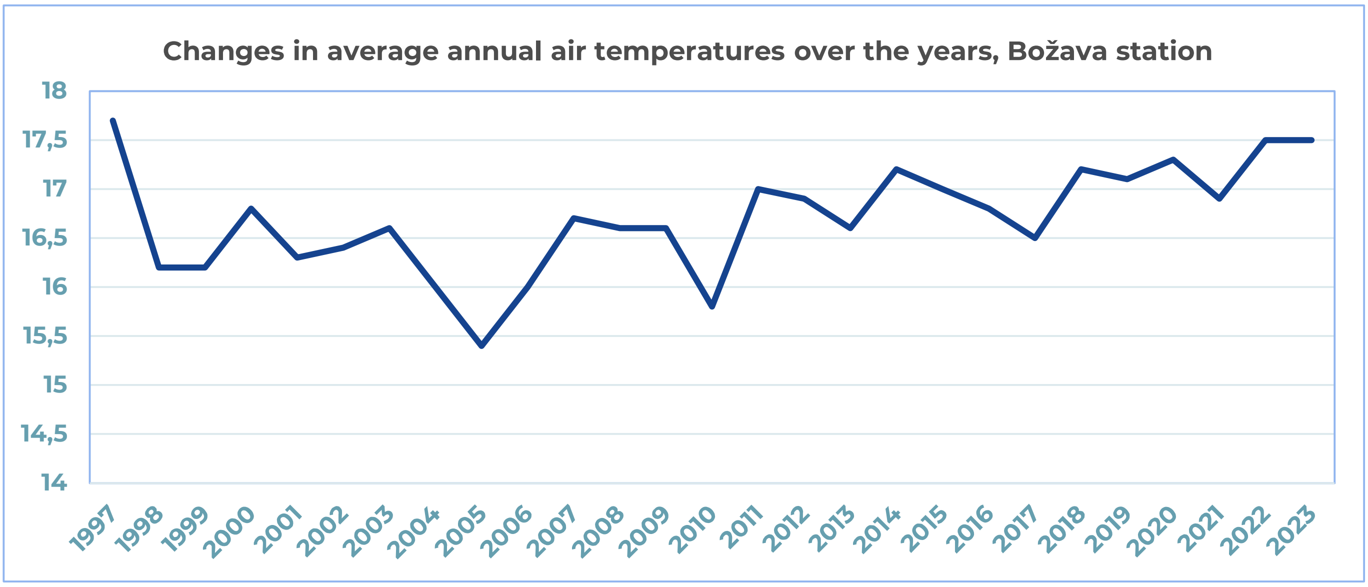
Božava - mean monthly dry bulb temperatures (°C)													
year	**Jan**	**Feb**	**March**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**av. annual**
1997	-	-	-	10,9	18,1	22,0	23,6	24,0	21,5	15,8	12,7	10,4	**17.7***
1998	9,2	10,1	10,1	13,8	18,4	22,8	26,1	26,5	20,7	17,2	11,2	7,9	**16,2**
1999	8,5	7,3	11,0	14,1	18,8	23,1	25,3	25,2	22,1	17,2	11,9	9,6	**16,2**
2000	6,9	8,8	10,3	14,9	20,4	24,3	23,9	26,2	21,3	18,3	15,2	11,6	**16,8**
2001	10,2	9,8	13,6	13,3	19,9	21,4	25,4	26,4	19,0	18,3	11,8	6,6	**16,3**
2002	6,8	9,8	12,1	14,0	18,8	23,6	25,1	23,8	20,0	17,2	15,0	10,2	**16,4**
2003	8,4	5,6	10,2	13,4	20,5	26,1	26,7	28,2	20,5	15,7	14,2	10,3	**16,6**
2004	7,2	8,0	9,8	13,8	17,0	21,9	25,5	24,9	21,6	18,8	13,4	10,7	**16,0**
2005	7,3	6,1	9,4	13,6	19,1	22,8	24,9	22,7	21,4	16,6	12,4	8,7	**15,4**
2006	7,0	7,7	9,0	14,0	18,3	22,5	26,6	22,7	21,7	18,3	13,4	11,0	**16,0**
2007	10,9	11,1	12,2	16,5	20,2	24,1	26,6	24,9	19,2	15,6	10,9	8,3	**16,7**
2008	9,4	8,9	11,0	14,4	19,1	23,2	26,0	25,8	20,5	17,4	13,4	10,3	**16,6**
2009	8,2	8,3	10,9	14,8	20,4	21,6	25,9	26,3	22,8	16,2	13,7	9,9	**16,6**
2010	7,2	8,5	10,2	14,3	17,7	22,7	26,2	24,2	19,9	15,6	13,8	8,7	**15,8**
2011	8,3	8,7	10,8	15,8	19,6	24,0	24,8	26,3	24,2	17,0	12,9	11,7	**17,0**
2012	8,8	5,6	13,3	14,0	18,1	24,3	27,3	26,8	21,6	17,9	15,3	9,6	**16,9**
2013	9,3	8,1	10,5	15,1	17,6	22,2	26,2	25,6	21,1	17,6	14,0	11,3	**16,6**
2014	11,7	12,0	12,8	15,4	17,7	22,8	23,8	24,1	20,4	18,3	15,8	11,0	**17,2**
2015	10,1	9,0	11,4	13,9	18,8	23,5	27,8	26,0	21,9	17,0	13,3	11,2	**17,0**
2016	9,8	11,7	11,5	15,2	17,7	23,0	26,1	24,6	21,7	16,5	13,3	10,0	**16,8**
2017	5,5	10,2	12,9	14,2	18,9	24,4	26,1	27,0	20,0	16,6	12,7	9,5	**16,5**
2018	10,6	6,7	10,3	16,5	20,9	23,8	25,8	26,7	22,0	18,3	14,2	10,0	**17,2**
2019	7,5	10,3	12,4	14,6	15,9	25,0	25,8	26,4	22,1	17,9	15,7	11,7	**17,1**
2020	10,0	11,4	11,7	15,3	19,3	22,4	25,8	26,6	22,8	17,1	13,5	11,7	**17,3**

[19] *Source: SHMI (2024.)*

2021	8,9	10,6	10,8	12,7	18,3	24,9	26,8	26,4	22,6	16,2	13,9	10,5	**16,9**
2022	8,3	9,4	9,1	13,3	20,1	25,9	27,7	26,7	21,3	18,9	-	12,4	**17.5***
2023	10,1	8,5	11,9	13,3	19,0	23,6	26,8	26,1	23,6	20,2	14,8	11,9	**17,5**
2024	9,9	11,8	13,0	15,7	19,5	24,1	28,0	28,5	21,5	18,7	-	-	**19.1***
SUM	236.0*	244.0*	302.2*	400,8	528,1	656,0	726,6	719,6	599,0	486,4	352.4*	276.7*	415.6*
AVERAGE	8,7	9,0	11,2	14,3	18,9	23,4	26,0	25,7	21,4	17,4	13,6	10,2	16,6
STD	1,5	1,8	1,3	1,2	1,2	1,2	1,1	1,4	1,2	1,1	1,3	1,3	0,5
MAX	11,7	12,0	13,6	16,5	20,9	26,1	28,0	28,5	24,2	20,2	15,8	12,4	17,5
YEAR	2014	2014	2001	2007!	2018	2003	2024	2024	2011	2023	2014	2022	2023
MIN	5,5	5,6	9,0	10,9	15,9	21,4	23,6	22,7	19,0	15,6	10,9	6,6	15,4
YEAR	2017	2003!	2006	1997	2019	2001	1997	2005!	2001	2007!	2007	2001	2005
AMPL	6,2	6,4	4,6	5,6	5,0	4,7	4,4	5,8	5,2	4,6	4,9	5,8	2,1

* Estimated value





The tabular and graphical displays of data from both meteorological stations show an increase in average monthly air temperatures, with the note that according to data collected for 2024 (ending in October), this year is expected to have the highest average temperature. Thus, the average annual temperature is estimated to be 19.7 °C for the Sestrice Vele station, and 19.1 °C for Božava.

2.2.2 Precipitation

Table 3 Monthly and annual precipitation amounts, Sestrice Vela station in the period January 1981-October 2024[20]

Sestrice Vele - monthly and annual precipitation amounts (mm)													
year	**Jan**	**Feb**	**March**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**total**
1981	26,2	46,2	42,4	19,0	17,0	68,0	24,0	22,1	120,7	47,2	32,2	195,4	**660,4**
1982	22,1	19,3	66,1	16,2	10,4	31,0	47,4	78,2	41,3	126,7	97,2	93,8	**649,7**
1983	36,8	84,2	69,5	16,8	33,7	23,7	9,1	54,6	21,5	5,6	3,0	53,7	**412,2**
1984	52,9	71,2	67,5	52,0	60,2	35,2	0,0	15,5	125,2	134,0	83,0	41,4	**738,1**
1985	91,4	42,3	148,1	37,8	14,5	42,2	1,6	14,6	0,0	45,4	89,4	66,3	**593,6**
1986	74,0	105,7	31,8	43,0	24,7	55,6	50,0	9,0	16,4	50,2	29,8	20,7	**510,9**
1987	69,8	92,6	24,7	23,6	66,9	35,9	7,9	0,8	43,9	121,7	68,9	59,9	**616,6**
1988	111,4	85,8	55,4	42,8	25,9	50,5	1,0	69,4	6,6	25,9	61,4	65,4	**601,5**
1989	0,8	15,8	24,2	40,8	27,6	80,4	89,3	45,5	58,7	72,4	28,6	7,8	**491,9**
1990	6,2	35,6	12,7	91,7	22,4	34,0	9,9	9,3	91,8	72,8	62,9	33,8	**483,1**
1991	31,8	23,7	50,6	131,7	69,0	16,2	26,9	23,1	5,9	95,6	95,2	15,5	**585,2**
1992	44,7	13,3	32,1	29,4	20,6	56,7	39,4	1,1	74,8	128,2	71,9	95,9	**608,1**
1993	1,4	16,6	40,6	49,0	4,9	39,7	1,5	7,1	109,7	87,6	194,8	40,0	**592,9**
1994	66,3	55,2	6,0	66,3	37,0	64,9	17,5	23,3	27,2	61,9	24,9	104,9	**555,4**
1995	70,2	43,5	59,8	30,1	42,0	89,6	7,0	43,7	114,3	32,9	79,8	154,9	**767,8**
1996	90,0	25,7	42,1	19,7	45,9	6,7	15,2	35,2	119,3	71,4	60,3	118,0	**649,5**
1997	35,7	46,7	0,9	43,0	27,4	33,2	14,4	21,0	30,1	20,2	116,0	55,4	**444,0**
1998	34,0	12,4	3,9	80,5	55,8	16,9	10,4	10,0	97,0	73,3	64,8	33,0	**492,0**
1999	38,9	47,6	22,8	42,4	117,0	80,8	11,2	9,9	23,8	67,3	49,3	65,6	**576,6**
2000	18,1	19,2	29,2	50,7	10,8	11,0	12,0	0,0	26,0	64,7	95,5	69,1	**406,3**
2001	104,7	13,5	54,9	94,0	26,4	29,5	15,7	4,0	84,5	21,9	46,8	16,7	**512,6**
2002	22,0	43,4	0,2	34,5	76,6	34,6	68,3	91,3	100,0	160,2	38,0	147,8	**816,9**
2003	97,7	3,0	8,0	21,0	8,6	22,3	23,3	11,8	14,2	109,3	61,1	41,9	**422,2**
2004	58,8	63,8	52,3	69,5	40,2	28,7	1,8	9,5	22,0	39,7	114,2	78,3	**578,8**

[20] *Source: SHMI (2024.)*

2005	17,8	55,3	48,2	40,0	36,7	6,6	28,9	89,1	16,9	128,4	93,6	128,1	**689,6**
2006	48,9	21,3	54,1	57,2	50,5	35,3	11,0	79,5	27,6	15,0	60,1	11,5	**472,0**
2007	35,6	55,1	81,5	0,7	31,6	21,1	18,2	13,9	42,4	28,0	3,2	41,3	**372,6**
2008	41,4	22,0	49,5	62,1	9,6	123,4	11,0	4,1	6,5	29,4	103,5	87,9	**550,4**
2009	167,9	80,4	35,0	77,2	9,2	52,9	21,2	20,6	49,2	122,2	103,0	73,6	**812,4**
2010	163,9	111,7	28,9	24,4	67,0	45,8	33,1	12,5	67,2	12,9	190,3	98,3	**856,0**
2011	30,8	6,8	30,1	14,0	19,4	12,2	60,9	0,2	13,8	73,8	48,0	37,0	**347,0**
2012	31,4	19,0	0,7	61,0	13,0	3,7	12,8	13,2	99,8	119,4	52,9	104,2	**531,1**
2013	104,8	42,5	101,5	59,7	77,9	61,2	4,5	18,5	79,3	79,0	65,6	13,2	**707,7**
2014	90,4	147,2	56,0	36,9	43,9	50,3	193,8	40,8	213,2	6,4	72,5	87,2	**1038,6**
2015	45,7	140,9	23,4	15,8	39,8	12,1	3,2	74,8	34,6	166,4	26,2	0,0	**582,9**
2016	72,8	64,3	58,0	38,8	76,6	61,0	0,9	16,0	70,8	27,6	109,5	5,6	**601,9**
2017	32,2	47,0	20,3	18,6	16,8	15,2	6,0	0,2	325,8	26,3	98,2	46,5	**653,1**
2018	39,4	103,9	130,6	20,9	79,1	33,9	10,3	66,7	41,9	30,4	91,6	69,0	**717,7**
2019	54,1	3,8	27,2	60,1	-	0,7	84,3	17,4	56,1	-	179,0	136,1	**-**
2020	12,0	19,7	16,0	5,4	15,4	67,7	3,0	6,1	118,5	83,7	77,5	115,9	**540,9**
2021	73,5	25,7	10,8	28,4	16,5	0,5	20,3	42,4	31,0	68,9	191,2	107,8	**617,0**
2022	8,9	36,3	11,1	25,6	10,6	13,6	19,4	24,6	59,7	0,4	92,1	114,3	**416,6**
2023	79,8	31,9	51,8	59,8	142,8	15,0	25,9	88,4	51,7	54,2	129,2	93,9	**824,4**
2024	45,3	13,0	118,7	42,0	4,2	37,6	26,4	51,2	126,2	37,3	-	-	**-**
SUM	2402,5	2074,1	1899,2	1894,1	1646.1*	1657,1	1099,9	1290,2	2907,1	2845.8*	3456.2*	3046.6*	25098.2*
AVERAGE	54,6	47,1	43,2	43,0	38,3	37,7	25,0	29,3	66,1	66,2	80,4	70,9	597,6
STD	37,9	35,5	33,3	25,8	30,1	26,1	33,3	27,6	59,5	43,5	45,6	44,8	142,6
MAX	167,9	147,2	148,1	131,7	142,8	123,4	193,8	91,3	325,8	166,4	194,8	195,4	1038,6
YEAR	2009	2014	1985	1991	2023	2008	2014	2002	2017	2015	1993	1981	2014
MIN	0,8	3,0	0,2	0,7	4,2	0,5	0,0	0,0	0,0	0,4	3,0	0,0	347,0
YEAR	1989	2003	2002	2007	2024	2021	1984	2000	1985	2022	1983	2015	2011
AMPL	167,1	144,2	147,9	131,0	138,6	122,9	193,8	91,3	325,8	166,0	191,8	195,4	691,6

* Estimated value

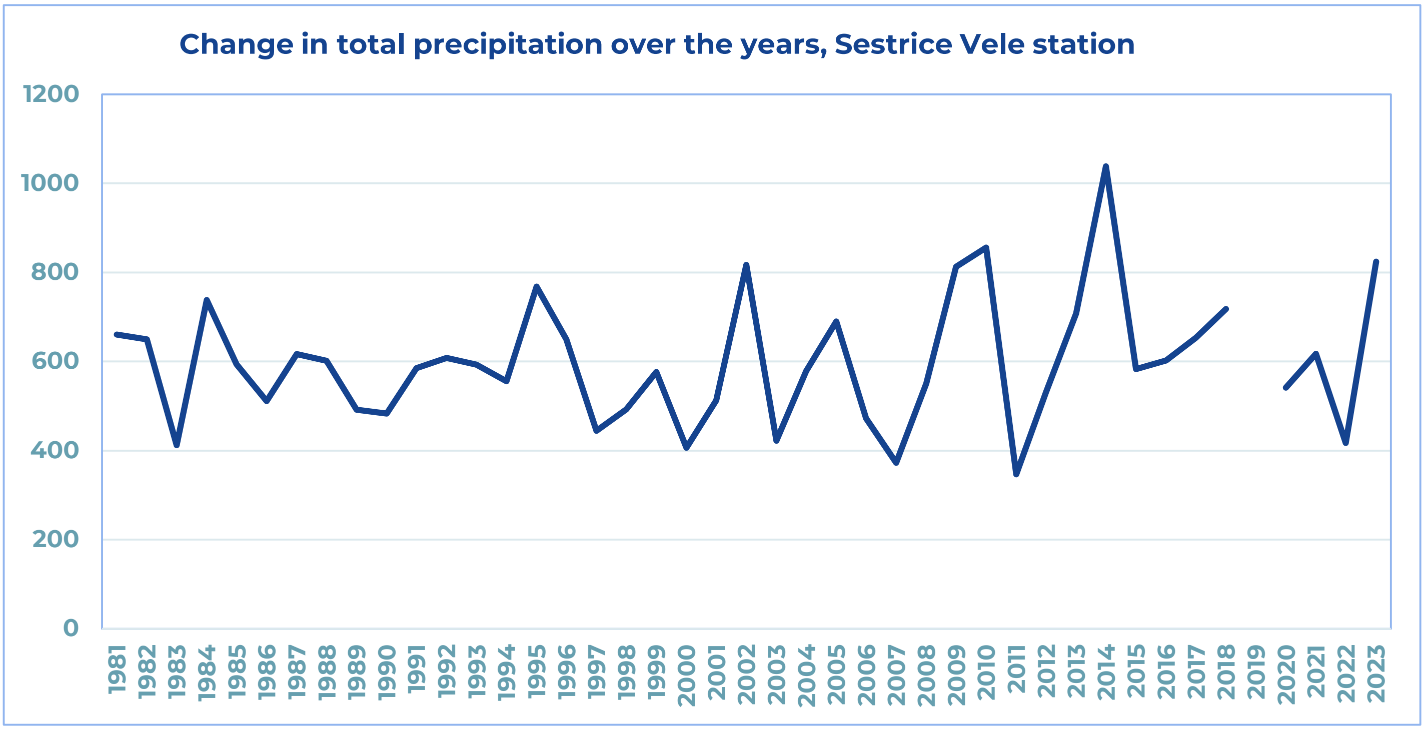
Table 4 Monthly and annual precipitation amounts, Božava station in the period March 1997- October 2024[21]

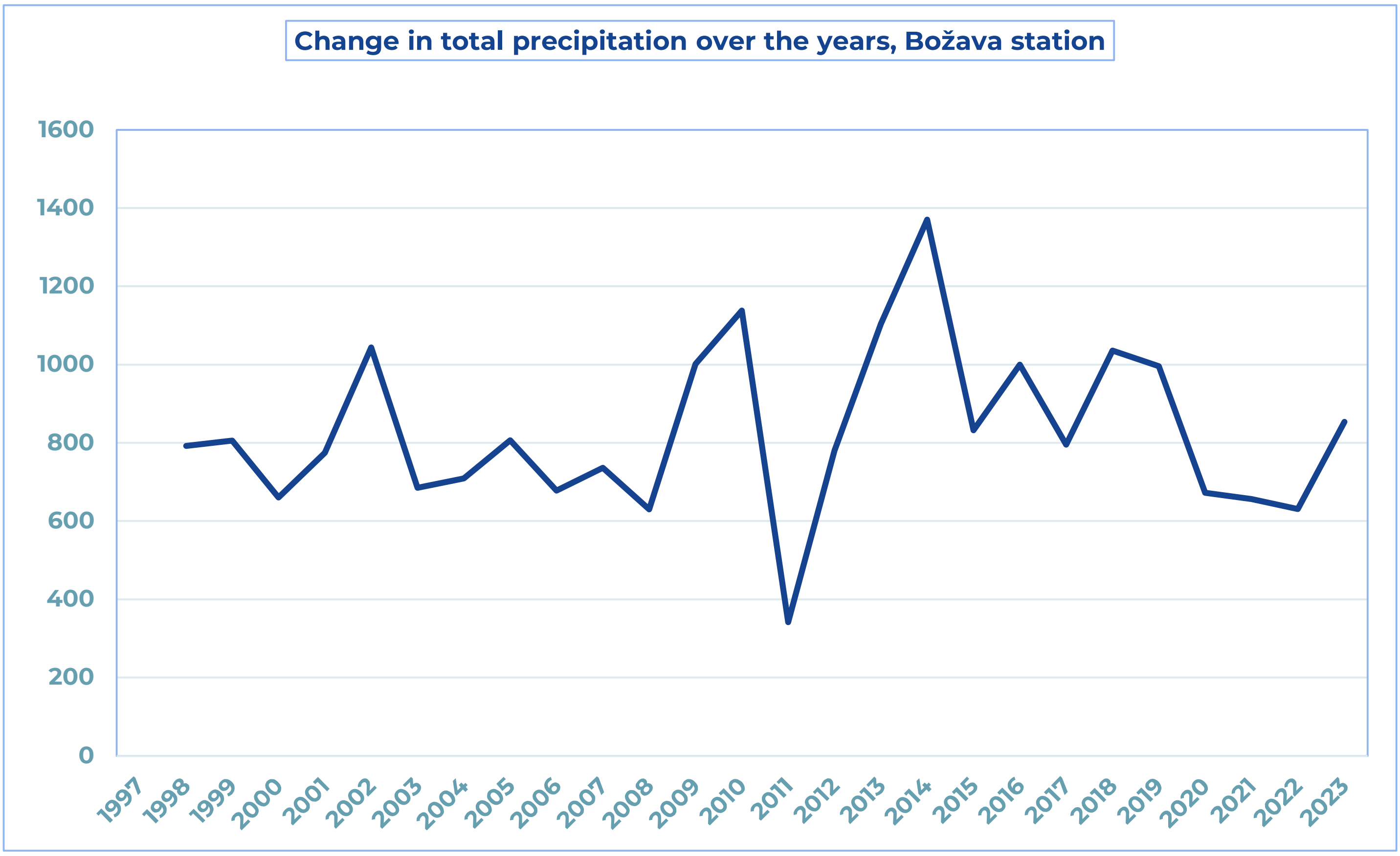
Božava - monthly and annual precipitation amounts (mm)													
year	**Jan**	**Feb**	**March**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**total**
1997	-	-	19,0	101,9	39,4	53,1	83,4	33,7	67,5	39,8	122,7	88,0	**-**
1998	65,9	30,0	8,9	118,1	128,9	30,7	11,9	10,1	109,9	132,1	69,7	75,7	**791,9**
1999	39,4	62,1	62,5	85,7	76,4	53,3	3,9	33,4	75,3	86,1	148,6	78,7	**805,4**
2000	14,3	40,1	71,6	56,8	23,9	6,5	71,7	0,0	33,5	117,5	118,0	106,6	**660,5**
2001	154,3	19,3	75,0	61,9	34,4	68,6	13,0	12,8	155,9	24,9	111,5	42,5	**774,1**
2002	29,9	75,9	4,4	77,2	52,2	47,8	59,5	154,2	204,3	85,2	84,5	168,4	**1043,5**
2003	166,5	7,3	35,4	20,0	10,4	54,8	1,5	0,0	168,9	110,5	72,5	37,3	**685,1**
2004	75,5	92,8	55,9	62,2	43,8	59,5	12,5	8,4	29,8	49,8	99,7	118,9	**708,8**
2005	40,5	47,1	28,1	72,4	36,0	15,0	86,0	85,3	74,8	86,0	77,5	157,6	**806,3**
2006	56,0	50,5	66,9	48,2	48,5	31,6	3,0	207,7	69,0	28,2	41,8	26,3	**677,7**
2007	56,5	74,3	108,3	0,0	115,2	8,5	18,4	36,5	170,8	41,5	17,5	88,5	**736,0**
2008	64,3	13,0	82,0	43,5	63,0	63,0	14,0	16,7	4,0	53,2	90,9	121,9	**629,5**
2009	195,2	104,5	69,5	63,2	25,8	87,2	3,0	22,5	47,7	178,0	82,8	121,5	**1000,9**
2010	193,4	133,6	84,0	46,5	69,3	22,2	42,3	66,0	152,7	52,5	170,5	104,5	**1137,5**
2011	28,5	4,2	30,0	13,8	17,5	7,4	33,3	0,0	11,8	69,1	54,5	71,4	**341,5**
2012	20,5	16,5	0,0	95,5	35,5	22,5	12,5	0,0	85,5	188,2	147,8	155,5	**780,0**
2013	156,9	80,5	81,8	89,0	83,2	75,0	3,0	60,0	98,6	199,3	165,5	10,7	**1103,5**
2014	118,2	212,3	34,8	67,5	40,6	37,5	267,2	45,0	307,7	3,0	140,6	96,1	**1370,5**
2015	76,8	126,5	34,3	59,3	54,3	33,8	2,0	71,7	67,6	231,5	74,5	0,0	**832,3**
2016	119,1	89,3	127,8	120,0	88,0	47,5	10,9	128,3	73,0	72,6	118,6	4,5	**999,6**
2017	47,5	82,7	38,2	49,5	58,5	8,3	20,5	8,5	173,9	80,0	142,5	85,1	**795,2**
2018	65,7	122,5	148,3	40,5	100,5	69,0	56,5	131,0	91,7	70,2	102,5	36,8	**1035,2**
2019	82,1	7,0	21,8	55,6	175,1	2,7	100,6	29,0	109,7	41,0	224,8	146,1	**995,5**
2020	7,0	8,9	23,8	9,8	14,2	38,0	7,5	35,7	133,6	121,3	124,8	147,6	**672,2**
2021	126,3	31,3	12,5	51,0	20,2	1,0	20,0	36,3	30,1	53,9	150,2	123,5	**656,3**
2022	28,9	39,7	16,7	57,6	35,3	5,8	15,0	11,7	95,2	1,6	137,9	185,0	**630,4**

[21] *Source : SHMI (2024.)*

2023	82,2	74,8	46,3	71,4	116,8	25,5	11,0	109,4	24,3	47,6	146,5	97,7	**853,5**
2024	35,8	24,7	127,0	73,3	44,3	39,0	21,0	32,9	354,7	-927,9	-	-	-
SUM	2147.2*	1671.4*	1514,8	1711,4	1651,2	1014,8	1005,1	1386,8	3021,5	1336,7	3038.9*	2496.4*	21522.9*
AVERAGE	79,5	61,9	54,1	61,1	59,0	36,2	35,9	49,5	107,9	47,7	112,6	92,5	827,8
STD	54,1	48,5	39,0	28,9	38,7	24,1	52,6	52,0	81,2	196,3	44,1	50,6	207,1
MAX	195,2	212,3	148,3	120,0	175,1	87,2	267,2	207,7	354,7	231,5	224,8	185,0	1370,5
YEAR	2009	2014	2018	2016	2019	2009	2014	2006	2024	2015	2019	2022	2014
MIN	7,0	4,2	0,0	0,0	10,4	1,0	1,5	0,0	4,0	-927,9	17,5	0,0	341,5
YEAR	2020	2011	2012	2007	2003	2021	2003	2000!	2008	2024	2007	2015	2011
AMPL	188,2	208,1	148,3	120,0	164,7	86,2	265,7	207,7	350,7	1159,4	207,3	185,0	1029,0

* Estimated value

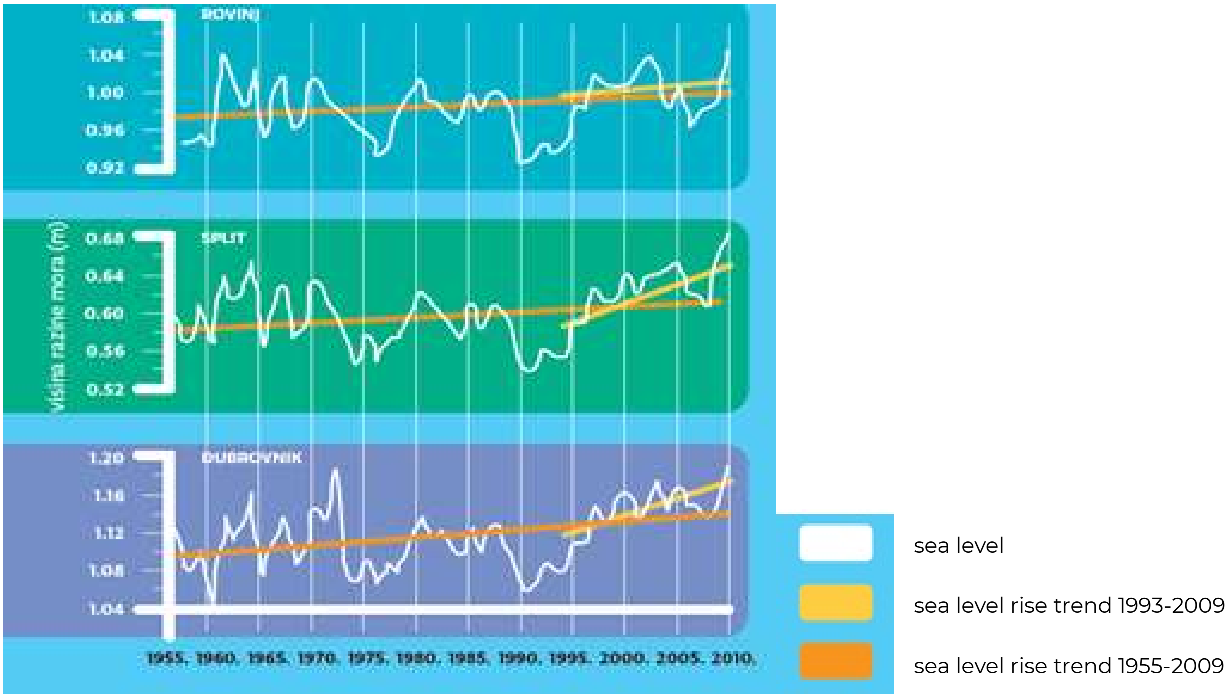

Change in total precipitation over the years, Sestrice Vele station
1200
1000
800
600
400
200
0
1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023


Change in total precipitation over the years, Božava station
1600
1400
1200
1000
800
600
400
200
0
1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023

2.2.3 Annual mean sea level values

Estimates of the average global sea level rise by the end of the 21st century most often vary from 0.18 m to ≥ 1 m compared to today's level. In line with global changes, the level of the Adriatic Sea is also rising. In Croatia, sea level measurements have been taken for many years at tide gauge stations in Dubrovnik, Split, Zadar, Bakar and Rovinj. A tide gauge is a device used to record tides, i.e. high and low tides, and long-term measurements with this device allow the calculation of absolute changes in sea level. These data are important at the global level for estimating the rise in mean sea level, which is gaining increasing importance because it is mentioned as one of the main consequences of climate change. The mean annual sea level values, which have been continuously measured since 1955, indicate a trend of sea level rise of 0.5 to 0.8 mm per year. After 1993, this trend has accelerated and the rise in mean sea level is over 4 mm per year, and if such a trend were to continue in the central and southern Adriatic in the next 100 years, we could expect a sea level rise of about 40 cm.[22]

Graph 1 Annual values of mean sea level at the stations of Rovinj, Split, Dubrovnik

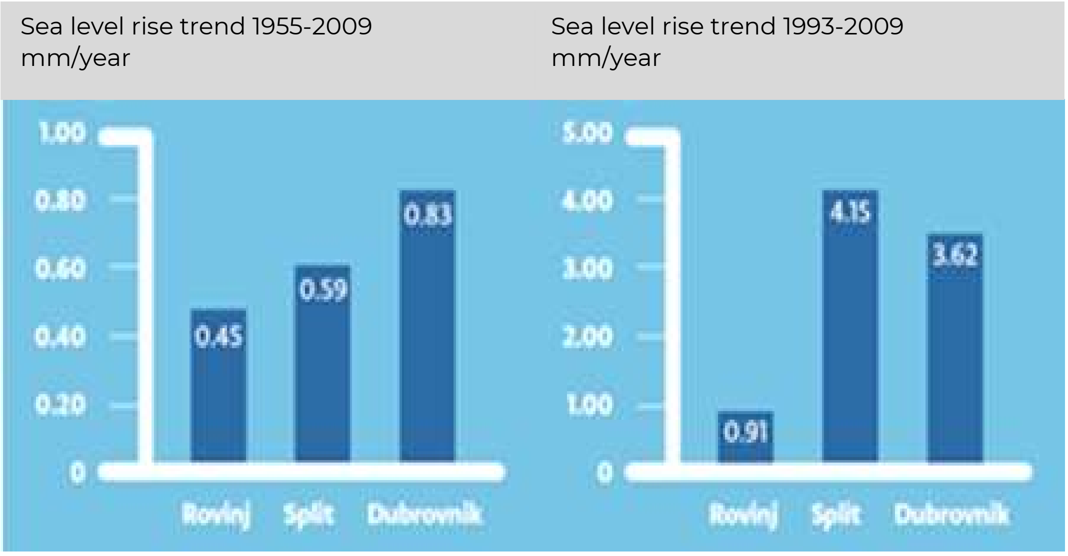


Due to the numerous features of the Croatian part of the Adriatic Sea and coast, not all localities are equally sensitive to the impact of sea level rise, so certain areas such as the Neretva Valley and Zadar are particularly sensitive points. A more detailed analysis conducted in Zadar, as one of the most endangered

[22] *Source: Project: Managing Mediterranean Marine Protected Areas through an Era of Climate Change: Strengthening Resilience and Adaptation- MPA-ADAPT*

parts of the Croatian coast, showed that a sea level rise of 6 m would greatly affect the population and the economic structure of the city.[23]

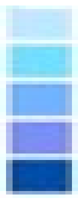
Graph 2 Sea level rise trend



2.3 Flood hazard maps

The 2019 flood hazard maps produced by Croatian Waters show estimates for locations on Dugi Otok. The expected range of flood depths from < 0.5m to > 2.5m for individual locations is visible. The following are flood hazard maps for the Dugi Otok area, divided into three parts (northwest, centra land southeast).

Legend:



depth < 0.5 m
depth 0.5 - 1.5 m
depth 1.5 - 2.5 m
depth > 2.5 m
permanent water surfaces

[23] *Source: Domazetović, F., Lončar, N. & Šiljeg, A. (2017) Quantitative analysis of the impact of Adriatic Sea level rise on the Croatian coast: a GIS approach*

Figure 5 Flood hazard map, northwest of Dugi otok. Source: DGU, Geoportal NIPP

Figure 6 Flood hazard map, central part of Dugi otok. Source: DGU, Geoportal NIPP

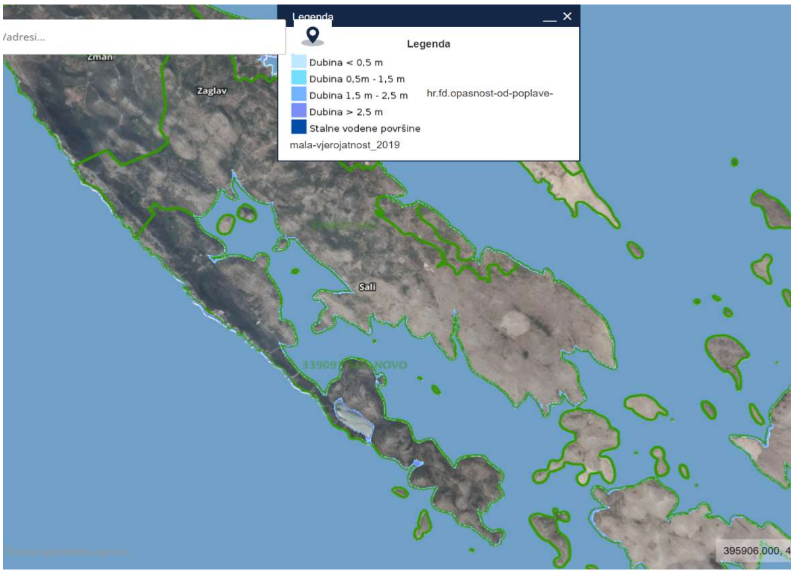


Figure 7 Flood hazard map, southeast of Dugi otok. Source: DGU, Geoportal NIPP

2.4 Impact assessment

For the purposes of this study, two online and one live workshop were organized during the month of December 2024. A total of three representatives of the Natura Jadera public institution, three representatives of the Public institution Nature Park Telašćica, one representative of the Sali Municipality Tourist Board and one representative of the Sali Municipality participated in the workshops. The aim of the workshops was to establish a working group of stakeholders and involve them in the development of the study. During the workshops, the key tourist attractions of Dugi Otok were first identified, and then, through a joint analysis, an assessment of the impact of climate change was made.

An overview of the results is shown in the tables below. When assessing the impact of a particular hazard, one of the categories was selected: high, medium, small, unknown, or not applicable (n/a) impact. To assess the expected trend of changes in the next 10-15 years, one of the categories was selected: increase, decrease, no change or unknown.

Table 5 Temperature increases impact assessment on tourist destinations on Dugi otok

TOURIST ATTRACTIONS	TEMPERATURE INCREASE	EXPECTED CHANGE FOR 10-15 YEARS
Telašćica Bay	Moderate	Increase
Salt Lake Mir	High	Increase
Steep stone "Stene"	Moderate	Increase
Grpašćak Visitor Center	Low	Increase
Diving Sites in the Telašćica Nature Park	Moderate	Increase
Diving Sites out of the Telašćica Nature Park	Low	Increase
Traditional stone construction (old houses, dry stone walls)	N/a	Increase
Vila Rustica	Low	Increase
Sakarun Bay	High	Increase
Punta Bjanka (Veli Rat)	Moderate	Increase
Camping	Moderate	Increase
Natural Bridge	Moderate	Increase
Botanical Reserve Saljsko Polje	Moderate	Increase
Natural sandy, pebble and rocky beaches	Moderate	Increase
Swimming areas	Moderate	Increase
Strašna peć cave	Low	Not known
Hiking and cycling trails	Low	Increase
Hotels	Low	Increase
Nautical infrastructure	Low	Increase

Table 6 Participation changes impact assessment on tourist destinations on Dugi otok

TOURIST ATTRACTIONS	PRECIPITATION CHANGES	EXPECTED CHANGE FOR 10-15 YEARS
Telašćica Bay	Moderate	Increase
Salt Lake Mir	Moderate	Increase
Steep stone "Stene"	Low	Increase
Grpašćak Visitor Center	Moderate	Increase
Diving Sites in the Telašćica Nature Park	Moderate	Increase
Diving Sites out of the Telašćica Nature Park	Moderate	Increase
Traditional stone construction (old houses, dry stone walls)	Moderate	Increase
Vila Rustica	High	Increase
Sakarun Bay	Moderate	Increase
Punta Bjanka (Veli Rat)	Low	Increase
Camping	Moderate	Increase
Natural Bridge	Moderate	Increase
Botanical Reserve Saljsko Polje	Moderate	Increase
Natural sandy, pebble and rocky beaches	Low	Increase
Swimming areas	N/a	N/a
Strašna peć cave	Not known	Not known
Hiking and cycling trails	High	Increase
Hotels	Low	Increase
Nautical infrastructure	Low	Increase

Table 7 Sea level rise impact assessment on tourist destinations on Dugi otok

TOURIST ATTRACTIONS	SEA LEVEL RISE	EXPECTED CHANGE FOR 10-15 YEARS
Telašćica Bay	Low	Increase
Salt Lake Mir	Low	Increase
Steep stone “Stene”	Moderate	Increase
Grpašćak Visitor Center	N/a	Increase
Diving Sites in the Telašćica Nature Park	Low	Increase
Diving Sites out of the Telašćica Nature Park	N/a	Increase
Traditional stone construction (old houses, dry stone walls)	Low	Increase
Vila Rustica	High	Increase
Sakarun Bay	High	Increase
Punta Bjanka (Veli Rat)	Moderate	Increase
Camping	Moderate	Increase
Natural Bridge	N/a	N/a
Botanical Reserve Saljsko Polje	Moderate	Increase
Natural sandy, pebble and rocky beaches	Low	Increase
Swimming areas	N/a	N/a
Strašna peć cave	N/a	N/a
Hiking and cycling trails	Low	Increase
Hotels	Low	Increase
Nautical infrastructure	Low	Increase

Table 8 Coastal erosion impact assessment on tourist destinations on Dugi otok

TOURIST ATTRACTIONS	COASTAL EROSION	EXPECTED CHANGE FOR 10-15 YEARS
Telašćica Bay	Low	Not known
Salt Lake Mir	Low	Not known
Steep stone "Stene"	N/a	Not known
Grpašćak Visitor Center	N/a	Not known
Diving Sites in the Telašćica Nature Park	N/a	Not known
Diving Sites out of the Telašćica Nature Park	N/a	Increase
Traditional stone construction (old houses, dry stone walls)	High	Increase
Vila Rustica	High	Increase
Sakarun Bay	Low	Increase
Punta Bjanka (Veli Rat)	Low	Increase
Camping	Low	No change
Natural Bridge	N/a	N/a
Botanical Reserve Saljsko Polje	Moderate	Increase
Natural sandy, pebble and rocky beaches	Low	Increase
Swimming areas	N/a	N/a
Strašna peć cave	N/a	N/a
Hiking and cycling trails	N/a	N/a
Hotels	N/a	N/a
Nautical infrastructure	N/a	N/a

Table 9 Fires impact assessment on tourist destinations on Dugi otok

TOURIST ATTRACTIONS	FIRES	EXPECTED CHANGE FOR 10-15 YEARS
Telašćica Bay	High	Increase
Salt Lake Mir	High	Increase
Steep stone "Stene"	Moderate	Increase
Grpašćak Visitor Center	Moderate	Increase
Diving Sites in the Telašćica Nature Park	N/a	Not known
Diving Sites out of the Telašćica Nature Park	High	Increase
Traditional stone construction (old houses, dry stone walls)	Moderate	Increase
Vila Rustica	High	Increase
Sakarun Bay	High	Increase
Punta Bjanka (Veli Rat)	High	Increase
Camping	N/a	N/a
Natural Bridge	Moderate	Increase
Botanical Reserve Saljsko Polje	High	Increase
Natural sandy, pebble and rocky beaches	Low	Increase
Swimming areas	N/a	N/a
Strašna peć cave	N/a	N/a
Hiking and cycling trails	Low	Increase
Hotels	High	Increase
Nautical infrastructure	N/a	N/a

Table 10 Climate change impact on marine ecosystem degradation on Dugi otok

TOURIST ATTRACTIONS	DEGRADATION OF MARINE ECOSYSTEMS	EXPECTED CHANGE FOR 10-15 YEARS
Telašćica Bay	Moderate	Increase
Salt Lake Mir	Moderate	Increase
Steep stone "Stene"	Moderate	Increase
Grpašćak Visitor Center	N/a	Increase
Diving Sites in the Telašćica Nature Park	Moderate	Increase
Diving Sites out of the Telašćica Nature Park	N/a	Increase
Traditional stone construction (old houses, dry stone walls)	N/a	Increase
Vila Rustica	High	Increase
Sakarun Bay	Moderate	Increase
Punta Bjanka (Veli Rat)	Low	Increase
Camping	Low	Not known
Natural Bridge	N/a	N/a
Botanical Reserve Saljsko Polje	Moderate	Increase
Natural sandy, pebble and rocky beaches	Low	Increase
Swimming areas	High	Increase
Strašna peć cave	N/a	N/a
Hiking and cycling trails	Low	Increase
Hotels	N/a	N/a
Nautical infrastructure	Low	Increase

Table 11 Climate change impact on biodiversity on Dugi otok

TOURIST ATTRACTIONS	BIODIVERSITY LOSS	EXPECTED CHANGE FOR 10-15 YEARS
Telašćica Bay	Moderate	Increase
Salt Lake Mir	Moderate	Increase
Steep stone "Stene"	Moderate	Increase
Grpašćak Visitor Center	N/a	Increase
Diving Sites in the Telašćica Nature Park	Moderate	Increase
Diving Sites out of the Telašćica Nature Park	N/a	Increase
Traditional stone construction (old houses, dry stone walls)	N/a	Increase
Vila Rustica	High	Increase
Sakarun Bay	Moderate	Increase
Punta Bjanka (Veli Rat)	Low	Increase
Camping	Low	Not known
Natural Bridge	N/a	N/a
Botanical Reserve Saljsko Polje	Moderate	Increase
Natural sandy, pebble and rocky beaches	Low	Increase
Swimming areas	High	Increase
Strašna peć cave	N/a	N/a
Hiking and cycling trails	Low	Increase
Hotels	N/a	N/a
Nautical infrastructure	Low	Increase

3 VULNERABILITY MAP

The above-estimated levels of climate change impacts on the *identified location* on Dugi Otok were used to evaluate the degree of vulnerability. *T*he data is presented in a table and using a vulnerability maps.

Table 12 Assessment of adaptation capacity and vulnerability degree of tourist attractions on Dugi otok

TOURIST ATTRACTIONS	ADAPTATION CAPACITY	VULNERABILITY DEGREE
Telašćica Bay	Moderate	**Moderate**
Salt Lake Mir	Low	**High**
Steep stone "Stene"	Moderate	**Moderate**
Grpašćak Visitor Center	High	**Low**
Diving Sites in the Telašćica Nature Park	Moderate	**Moderate**
Diving Sites out of the Telašćica Nature Park	Moderate	**Moderate**
Traditional stone construction (old houses, dry stone walls)	Low	**High**
Vila Rustica	Low	**High**
Sakarun Bay	Moderate	**Moderate**
Punta Bjanka (Veli Rat)	Moderate	**Moderate**
Camping	Low	**Moderate**
Natural Bridge	Moderate	**Moderate**
Botanical Reserve Saljsko Polje	Moderate	**High**
Natural sandy, pebble and rocky beaches	High	**High**
Swimming areas	Low	**High**
Strašna peć cave	Low	**Low**
Hiking and cycling trails	High	**Low**
Hotels	Moderate	**Low**
Nautical infrastructure	Moderate	**Moderate**

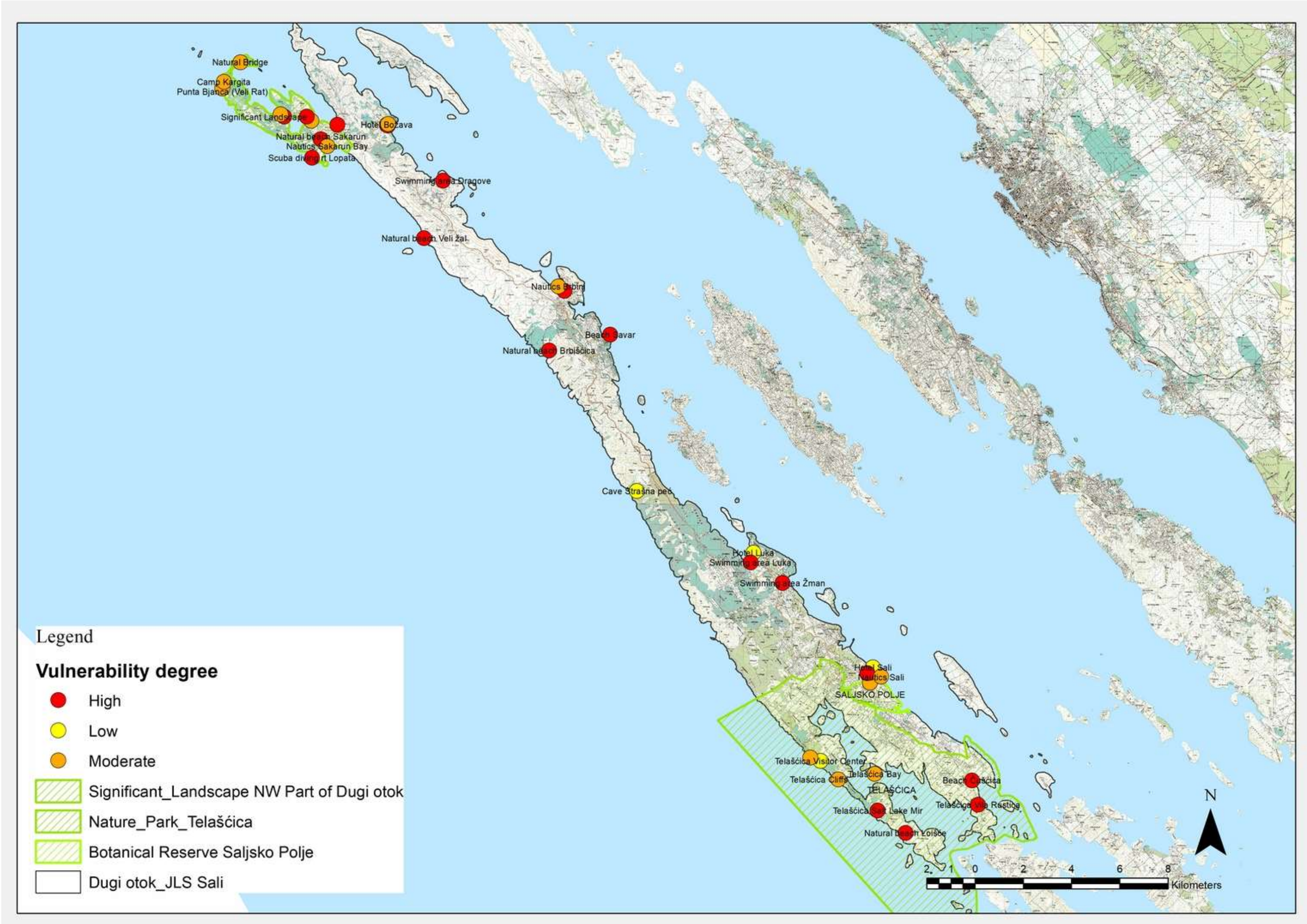


Figure 8 Vulnerability map for locations on the entire Dugi otok

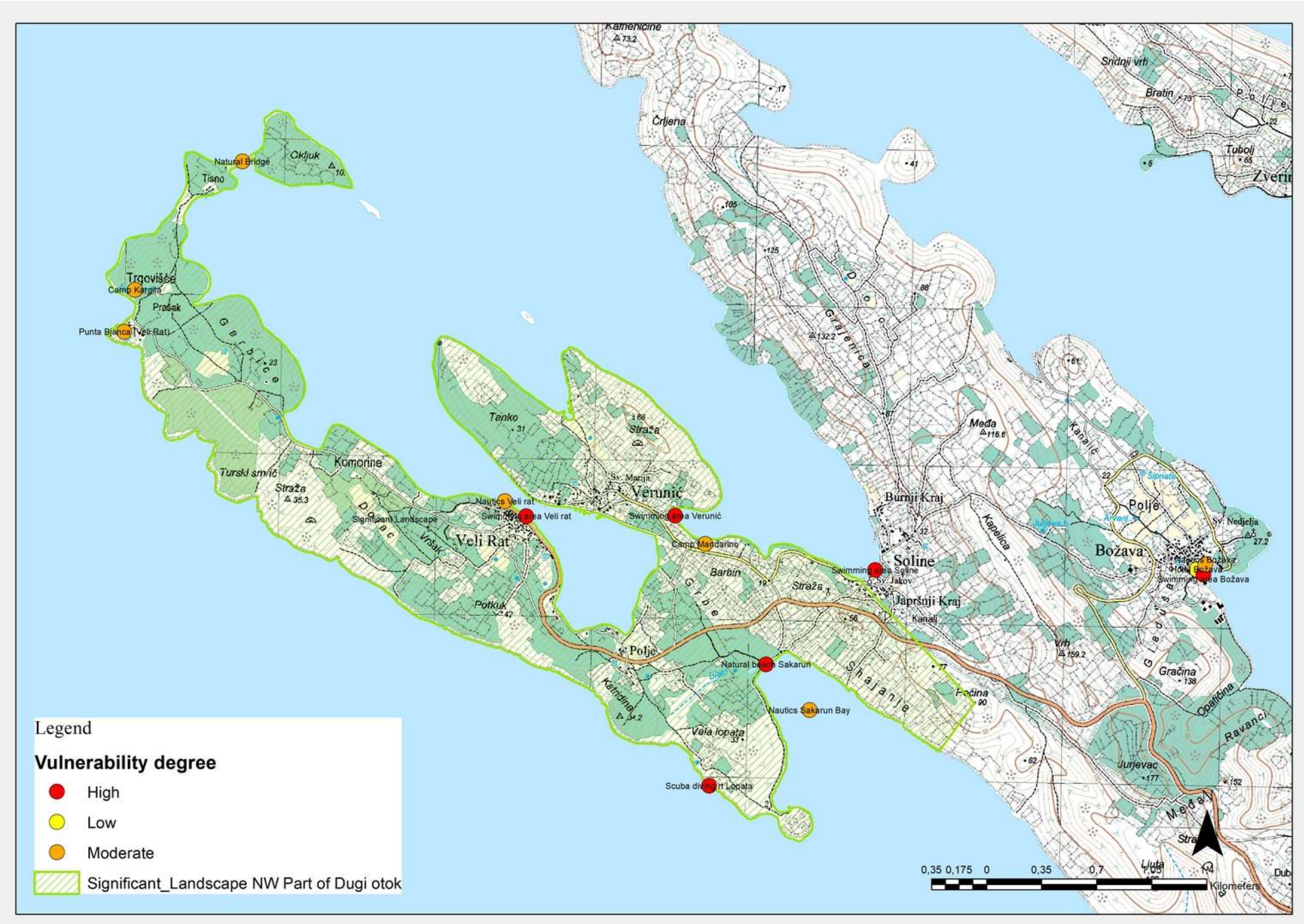


Figure 9 Vulnerability map for locations on the Significant landscape northwest part of Dugi otok

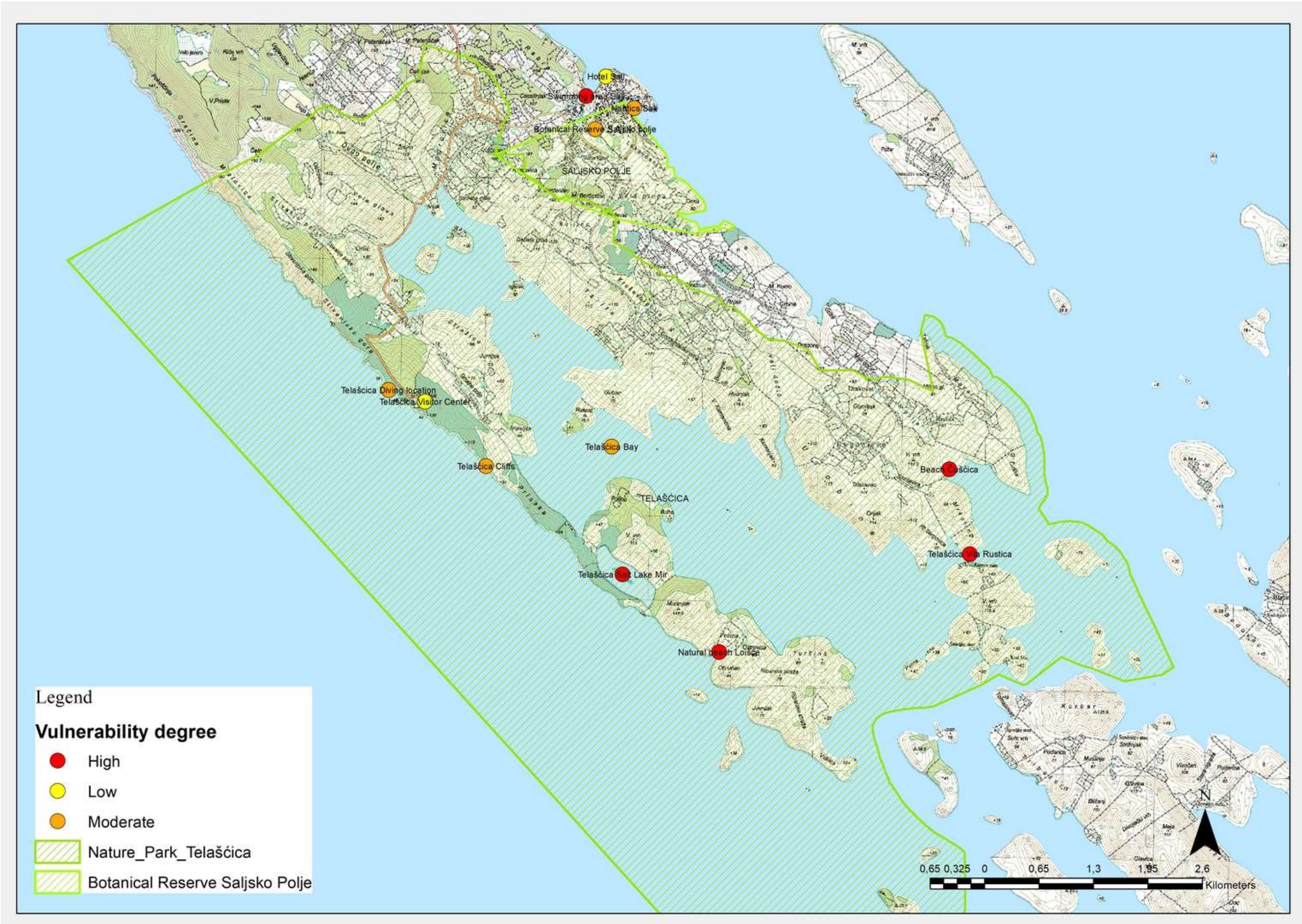


Figure 10 Vulnerability map for locations on the Nature park Telaććica

4 RISK CHARACTERIZATION AND COMMUNICATION

There is increasing evidence that the Republic of Croatia is under the influence of climate change, and given that it largely belongs to the Mediterranean region, it will grow and vulnerability to climate change is assessed as high. Climate change has a strong impact on the environment and exacerbates existing environmental problems such as the decline in biodiversity and the weakening of ecosystem services. The vulnerability of some economic sectors is almost acute, especially agriculture, forestry, fisheries, energy, and tourism, because the success of all these sectors depends largely on climate factors.[24]

Table 13 Projections of climate parameters for the Republic of Croatia according to the RCP4.5 scenario in relation to the period 1971-2000.[25]

Climatic parameter	Projections of the future climate according to the RCP4.5 scenario in relation to the period 1971-2000 obtained by climate modeling	
	2011 – 2040	2041 - 2070
PRECIPITATION	Average annual amount: small decrease (except for a small increase in NW Croatia)	Average annual amount: further decreasing trend (up to 5%) in almost all of Croatia, except in the northwestern parts
	Seasons: different sign; winter and spring in most of Croatia a small increase + 5-10%, and summer and autumn a decrease (maximum - 5-10% in S Lika and S Dalmatia)	Seasons: reduction in all seasons (up to 10% in the highlands and S Dalmatia) except in winter (increase 5-10% in S Croatia)
	Reduction in the number of rainy periods (except in central Croatia where it would increase slightly). The	The number of dry periods would increase

[24] *Source: Croatian Parliament: Climate Change Adaptation Strategy in the Republic of Croatia for the period until 2040 with a view to 2070*
[25] *Adapted from: Croatian Parliament: Climate Change Adaptation Strategy in the Republic of Croatia for the period until 2040 with a view to 2070*

		number of dry periods would increase	
SURFACE RUNOFF		There are no major changes in most regions; but in the mountainous regions and the hinterland of Dalmatia, a reduction of up to 10%	Reduction of runoff throughout Croatia (especially in spring)
AIR TEMPERATURE		Medium: increase of 1 – 1.4 °C (all seasons, all of Croatia)	Medium: increase of 1.5 - 2.2 °C (all seasons, the whole of Croatia - especially the continent)
		Maximum: increase in all seasons 1 – 1.5 °C	Maximum: rise to 2.2 °C in summer (up to 2.3 °C on the islands)
		Minimum: the biggest increase in winter, 1.2 – 1.4 °C	Minimum: the largest increase on the continent in winter 2.1 – 2.4 °C; and 1.8 – 2 °C coastal areas
EXTREME WEATHER CONDITIONS	Heat (number of days with Tmax > +30 °C)	6 to 8 days more than the reference period (reference period: 15 – 25 days per year)	Up to 12 days more than the reference period
	Cold (number of days with Tmin < -10 °C)	A decrease in the number of days with Tmin < -10 °C and an increase in the Tmin value (1.2 – 1.4 °C)	Further reduction in the number of days with Tmin < -10 °C
	Warm nights (number of days with Tmin ≥ +20 °C)	On the rise	On the rise
WIND	Sr. speed at 10 m	Winter and spring without change, but in summer and especially in autumn on the	Winter and spring mostly without change, but a

		Adriatic, an increase of up to 20-25%	strengthening trend in summer and autumn in the Adriatic.
	Max. speed at 10 m	On an annual basis: no change (highest values on the islands of S Dalmatia) By seasons: reduction in winter in the southern Adriatic and hinterland	By seasons: decrease in all seasons except summer. The biggest reduction is in winter in the southern Adriatic
EVAPOTRANSPIRATION		Increase in spring and summer 5 – 10 % (outer islands and W Istria > 10 %)	An increase of up to 10% for most of Croatia, up to 15% on the coast and hinterland, and up to 20% on the outer islands.
SOLAR RADIATION (INPUT SOLAR ENERGY FLOW)		In the summer and in the fall, an increase in the whole of Croatia, in the spring an increase in northern Croatia, and a decrease in western Croatia; in winter, a reduction in the whole of Croatia.	Increase in all seasons except winter (highest increase in mountainous and central Croatia)
MEAN SEA LEVEL		2046 – 2065 19 – 33 cm (IPCC AR5)	2081 - 2100 32 – 65 cm (estimation of average values for the Adriatic from various sources)

The increase in the degree of vulnerability of the **marine environment** caused by climate change will manifest itself in risks related to the weakening of the thermohaline circulation of the Adriatic Sea, which can significantly affect a number of abiotic and biotic processes and changes, especially related to the mixing of the water column and changes in the concentration of oxygen in deeper layers, increasing acidity sea, as well as a series of related biological processes and impacts on the biodiversity of the marine environment and fisheries (e.g. reduction of productivity, change in the dynamics of food webs, reduction of populations of species that form marine biogenic habitats, change in species distribution, greater risk of disease occurrence, etc.). The change in sea and ocean circulation is a direct consequence of climate change and causes drastic changes, not only in the marine environment, ie the biodiversity of the sea, but also in the climate of the surrounding areas, which in turn affects all sectors.

Table 14 Overview of climate change impact on biodiversity

Impacts and challenges that cause high vulnerability
▪ decrease in area, change in proportion and disappearance of some habitats ▪ habitat fragmentation ▪ changes in structure, processes, functions, and services ▪ changes in the composition of species communities ▪ changes in phenology ▪ cessation of flowering of cryophilic and stenothermic plant species with shortening of vegetation and reduction of vigor ▪ damage, degradation, and extinction due to climatic extremes (long-term droughts, excessive amounts of precipitation in a short time, stormy winds, too strong solar radiation, etc.) ▪ changes in the abundance and distribution of species ▪ loss of species adapted to life in a narrow range of ecological conditions (especially endemic species of limited distribution) ▪ the appearance and spread of invasive alien species and species that are adapted to life in a wide range of ecological conditions and the suppression of native species ▪ changes in interactions between species (positive and negative) ▪ changes in life cycles ▪ changes in the timing of migrations ▪ reduction of populations of forest species due to frequent fires caused by an increase in average air temperature and unevenly distributed amount of precipitation ▪ reduction and disappearance of freshwater species in the Adriatic basin due to salinization of coastal habitats caused by rising sea levels ▪ the expansion of marine species to the north and the appearance of thermophilic (tropical) invasive alien marine species due to the increase in sea temperature

Table 15 Overview of climate change impact on tourism sector

Impacts and challenges that cause high vulnerability
▪ lack of adaptation of the tourist offer to projected climate changes (high temperatures, increased solar radiation, frequency of extreme weather events, etc.) ▪ change in the attractiveness of areas on the coast and in the interior of the Republic of Croatia ▪ damage and/or reduced functionality of various infrastructure systems (water supply, drainage, beach infrastructure, horticulture, etc.) ▪ deterioration of the ecosystem, biodiversity, and cultural heritage important for tourism due to the indirect and direct effects of climate change

The above-mentioned projections of the future climate scenario and assessments of impacts on the marine ecosystem and the tourism sector that relate to Croatia are also expected in Dugi Otok.

Based on these projections and local participatory approach, an assessment of risk level for specific locations on Dugi Otok over a period of 10-15 years has been made. Local participatory methods have been adapted to address climate change risks. Challenges include data scarcity and the complex dynamics of community capacities and vulnerabilities.

Table 16 Assessment of adaptation capacity, vulnerability, and risk degree of tourist attractions on Dugi otok

TOURIST ATTRACTIONS	ADAPTATION CAPACITY	VULNERABILITY DEGREE	RISK DEGREE
Telašćica Bay	Moderate	**Moderate**	**Moderate**
Salt Lake Mir	Low	**High**	**Moderate**
Steep stone "Stene"	Moderate	**Moderate**	**Low**
Grpašćak Visitor Center	High	**Low**	**Low**
Diving Sites in the Telašćica Nature Park	Moderate	**Moderate**	**Moderate**
Diving Sites out of the Telašćica Nature Park	Moderate	**Moderate**	**Moderate**
Traditional stone construction (old houses, dry stone walls)	Low	**High**	**Moderate**
Vila Rustica	Low	**High**	**Moderate**
Sakarun Bay	Moderate	**Moderate**	**Moderate**
Punta Bjanka (Veli Rat)	Moderate	**Moderate**	**Moderate**
Camping	Low	**Moderate**	**Moderate**
Natural Bridge	Moderate	**Moderate**	**Moderate**
Botanical Reserve Saljsko Polje	Moderate	**High**	**Moderate**
Natural sandy, pebble and rocky beaches	High	**High**	**Moderate**
Swimming areas	Low	**High**	**Moderate**
Strašna peć cave	Low	**Low**	**Low**
Hiking and cycling trails	High	**Low**	**Low**
Hotels	Moderate	**Low**	**Low**
Nautical infrastructure	Moderate	**Moderate**	**Moderate**

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