

Chapter 5

The importance of protected areas on the Slovenian coast for tourism and how they could be impacted by climate change

Valentina Brečko Grubar, Nataša Kolega, Gregor Kovačič

Abstract

In Slovenia, the coastal area contains four large-scale protected areas. Sečovlje Salina Nature Park, Strunjan Landscape Park, Debeli Rtič Landscape Park, and Škocjanski zatok Nature Reserve are “islands of nature” in the largely-urbanised coastal strip, which have also become important sites for leisure and tourism activities. In recent years, the number of visitors (both individuals and groups) has been increasing and has already exceeded the carrying capacity of the environment. The urbanisation and economic use of the coastal strip exerts pressures on its constituent protected areas, which are also increasingly threatened by climate change. According to projections, climate change will bring higher temperatures, less precipitation, lower river discharge, and an increased number of extreme weather phenomena, which will affect habitats and biodiversity in protected areas. However, the greatest concern is related to the anticipated rise in sea level, which will cause frequent or permanent flooding, as well as the loss of existing habitats and sites for leisure and tourism activities.

Key words: landscape park, nature reserve, tourism visitation, climate change, sea level rise, flooding, geography, Slovenia

Introduction

Slovenia's part of the coastal strip of the Gulf of Trieste lies between *Zaliv svetega Jerneja* (St. Bartholomew's Bay) at the border with Italy and the Dragonja River at the border with Croatia, and is approximately 48 km long (Kolega, 2015). Around two-thirds of the strip consists of a high, abrasion coast with active and fossil cliffs of different heights. The lower alluvial parts of the Slovenian coast, which were shaped by fluvial sediments that the Rižana, Badaševica, Dragonja, and Drnica rivers washed into the sea over time, were transformed into saltworks during Roman times. Following the gradual cessation of salt-extraction at the end of the 19th century and the beginning of the 20th century, these areas were retransformed into salty or brackish coastal wetlands.

A large part of the salt-extraction areas in the immediate vicinity of the towns of Koper, Izola, and Portorož has been hydrologically improved, drained, and converted into agricultural land; more recently, it has also been largely built-up. The expansion of the Port of Koper, dating back to the 1950s, created another coastal wetland – Škocjanski zatok. In the past, the port areas were progressively expanded from Koper across *Škocjanski zaliv* (Škocjan Bay), and gradually a “barrier of land” was formed, turning the bay into a closed lagoon (Fig. 1), where materials from the deepening of the port basins, as well as waste and wastewater, were deposited. Thanks to DOPPS-Birdlife Slovenia, the area has avoided complete degradation from drainage and dumping (Mozetič and Šalaja, 2002). During the 1990s, the areas of the Sečovlje Saltpans, the Strunjan Saltpans, and Škocjanski zatok were declared protected areas, followed by the Debeli Rtič area in 2018.

Each year, these four coastal Slovenian municipalities are visited by more than 700,000 tourists, who generate more than two million overnight stays. The majority of the guests and overnight stays are concentrated along the narrow coastal strip, i.e. in coastal towns, with roughly two-thirds of all overnight stays being recorded in the three summer months. From June to the end of August 2019, the settlements Portorož and Piran alone recorded more than half a million overnight stays, while Koper had around 160,000 and Izola around 11,000. By the end of 2019, 71 cruise ships had stopped in Koper, with more than 110,000 passengers aboard (Regional Obala, 2019b). In addition to local beaches and swimming spots, tourists visit points of interest in the close vicinity, including the large-scale protected areas that are the subject of this chapter. Thus, the maintenance of existing conditions,

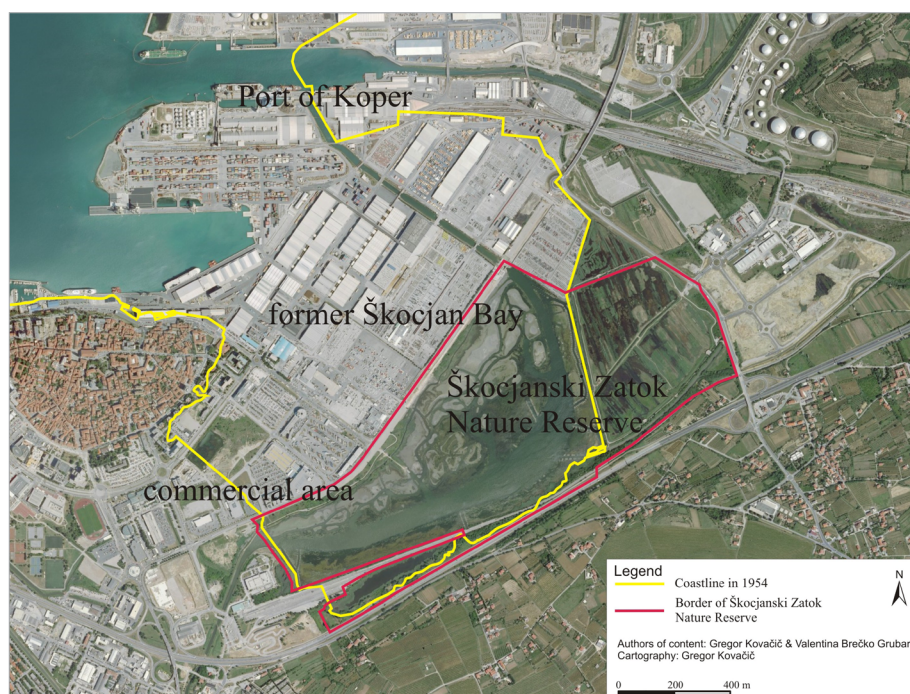


Fig. 1 Former Škocjan Bay and Škocjanski zatok Nature Reserve

Source: Surveying and Mapping Authority of the Republic of Slovenia, 2009

and the planning and sustainable management of these protected areas are not only vital for the preservation of habitats and biodiversity, but also for tourism and the quality of life of the local population. While restrictions on land use and other human activity, as laid down by protection regimes enacted by the *Nature Conservation Act* (1999), are aimed to ensure the long-term existence of the protected areas, they, unfortunately, cannot prevent the negative consequences of the degradation of the global environment and the impact of climate change.

The preserved natural areas contribute significantly to the quality of the environment, they have become leisure sites for local people, and have increasing educational importance; they also offer guided tours and various other activities (Brečko Grubar and Kovačič, 2014). They are also increasingly included in the tourism supply, and the existing number of visitors has already exceeded the carrying capacity of the environment and threatens nature protection imperatives. These protected areas are also exposed to pressures from economic activities that are carried out in their

surroundings, both on land and offshore, and are increasingly threatened by the changing climate.

Climate change is projected to bring about a rise in sea level, which would cause either frequent (during the tides) or permanent flooding, and the loss of important habitats and tourism sites. Climate change typically involves an increase in temperatures and evapotranspiration, a decrease in precipitation and runoff, more frequent extreme precipitation events, and long-lasting dry periods. The protected areas that are the subject of this chapter will almost certainly experience considerable changes in wet/dry dynamics and more frequent heavy flooding, and also be affected by higher temperatures and salinity levels.

Large-scale protected areas on the Slovenian coast and their importance for tourism

Despite the fact that around one-third (30%) of the coastline lies within protected areas, today around four-fifths (81%) of the coastline has been anthropogenically transformed (Kolega, 2015), and protected areas represent the only (partially) preserved natural environments with a high ecosystem value. The coastline contains four large-scale protected areas. Under the *Nature Conservation Act* (1999), these are three landscape parks (Sečovlje Salina Nature Park, Strunjan Landscape Park, and Debeli Rtič Landscape Park), which broadly correspond to IUCN Category V – Protected Landscape, and Škocjanski zatok Nature Reserve, which is classified into Category Ib – Wilderness Area (Sovinc, 2011). The narrowest coastal strip also comprises several natural monuments, sites of valuable natural features, ecologically important areas, and Natura 2000 sites. Together, the large-scale protected areas cover an area of more than 16 km².

Sečovlje Salina Nature Park

Sečovlje Salina Nature Park (also referred to as the Sečovlje Saltpans) extends over an area of around 750 ha, of which saltpans cover 600 ha, between the Seča Peninsula and *Jernejev kanal* (Bartholomew's Channel) on one side and the border with Croatia on the other (Fig. 2). In 2002, the company Soline Pridelava soli d.o.o. was selected as the manager of the Park. One part of the Park consists of the area of the abandoned Fontanigge Saltworks, which is maintained for the purposes of preserving habitat types and other ecosystem values, while the other part of the Park comprises the

active Lera Saltworks, where salt is produced in a traditional manner and tourism activities, e.g. dedicated and guided tours and events, take place. In addition, at the recently-opened Lepa Vida Thalasso Spa guests can enjoy therapy sessions with brine, salt, and salt-pan mud.

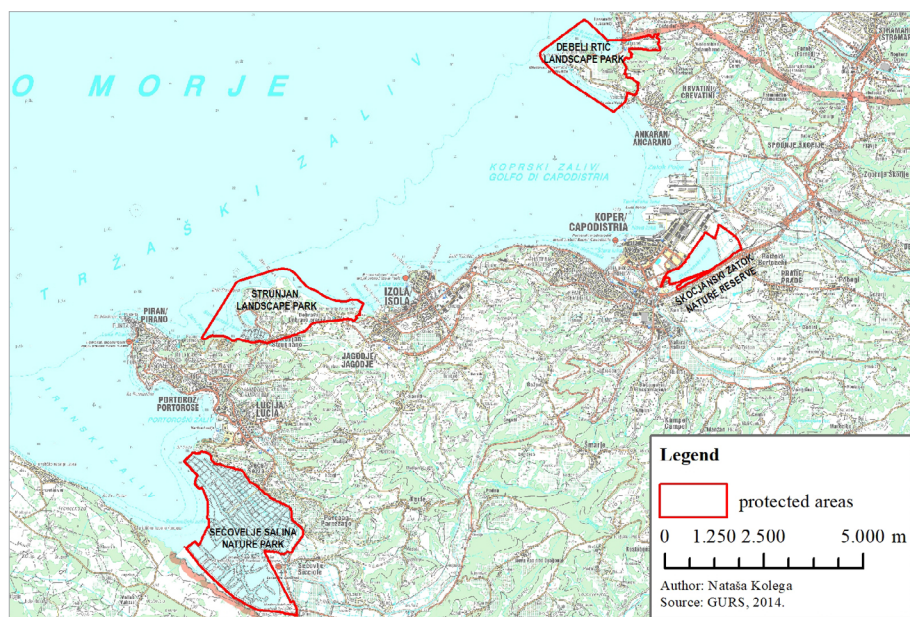


Fig. 2 Large-scale protected areas on the Slovenian coast

Source: Surveying and Mapping Authority of the Republic of Slovenia, 2014

The Sečovelje Salt pans are a permanent or temporary home to a large number of rare and endangered bird species, as well as other species of flora and fauna, for which they are of great national and international importance. They were designated as wetlands of international importance under the Ramsar Convention (Ramsar sites) in 1993. The area in question consists of three conservation zones:

- (1) the Fontanigge Saltworks, which were abandoned in the 1960s;
- (2) the still active Lera Saltworks; and
- (3) the agricultural land in the hinterland of the salt pans (Turk, 2012).

Within the protected area visitors can take part in activities in a salt-pan house renovated as a museum facility, and in areas intended for multimedia presentations, occasional exhibitions, the sale of products made from

salt, souvenirs, and similar materials. There are also 9 km of groomed walking and cycling trails, a demonstration salt field, and information points. Apart from sightseeing, the park hosts various educational and recreational programmes, as well as social activities (Sečovlje Salina Nature Park, 2019).

Visitation of the Sečovlje Salt pans has been high for some time, with evidence showing a significant increase in recent years. In 2010, 28,843 visits were recorded (Sovinc, 2011), while in 2018 the number increased to 51,294, of which 31,402 were individual visits and 19,892 were group visits. Although in 2018 the number of visitors decreased by 2,915 compared to the previous year, it still exceeded the estimated carrying capacity of the environment, which is 50,000 visitors per year (Sečovlje Salina Nature Park, 2019). Apart from groups of primary and secondary school students, Sečovlje Salina Nature Park is visited in large numbers by groups of visitors on organised day trips, and passengers of cruise ships arriving at the port Koper. Among individual visitors, most stay in hotels or in individual accommodation.

In Lucija, there is also a camping site and the largest marina on the Slovenian coast, while in the wider surrounding area there are many private holiday homes, which are mostly occupied over the summer months. The abandoned Fontanigge Saltworks are visited by both domestic and foreign visitors and are also accessible via a groomed cycling trail; the area is popular among visitors for its natural beauty and lack of an entrance fee. In addition, Sečovlje Salina Nature Park can be accessed by sea, as there is a nearby harbour.

Strunjan Landscape Park

Strunjan Landscape Park covers an area of 428 ha located between Izola and Piran (Fig. 2). It encompasses a brackish lagoon with preserved salt pans (Stjuža Nature Reserve), a steep cliff and coastline (Strunjan Nature Reserve), and the cultural landscape in the hinterland. Together, the two nature reserves cover 163 ha, and were declared protected areas in 1989. *The Decree on Strunjan Landscape Park* was adopted in 2004, and the manager of the protected area was designated in 2008 (Strunjan Landscape Park, 2019). The park area encompasses part of the settlement Strunjan, agricultural areas, the Krka Strunjan Spa complex with accommodation facilities, and a natural swimming spot with associated infrastructure.

The *Strunjanski polotok* (Strunjan Peninsula) has largely retained its agrarian character. Arable areas on cultivated terraces are supported by

stone walls, and there are preserved structures made of piled stones (without mortar), which have served as shelters or plant-watering catchments in the past. The area is known for artichoke and persimmon production (there is a traditional Persimmon Festival each year), as well as for the production of olives and other crops. Although the area is populated, it is a largely well-preserved natural environment with high landscape diversity and various habitat types. Development in the landscape park is oriented towards the promotion of sustainable forms of agriculture, ecologically friendly tourism and recreation, cultural heritage protection, implementation of traditional salt production, and the use of ecologically-friendly practices in natural resources management (Jurinčič and Popič, 2009).

Recently, the regulation of tourism development has been at the forefront, as visitation to the park is increasing. To this end, additional groomed and marked walking and cycling trails have been made, an info centre set up, guided tours offered, quays and bollards set up, etc. (Strunjan Landscape Park, 2019). The area is heavily burdened by tourism during the summer months, when longer-term guests are joined by numerous day-trippers and many passing vessels in the bay. Last year, 2,817 people attended guided tours in Strunjan Landscape Park (Makovac, 2019), which, however, represented only a small share of all visitors. Within the park, there are hotels, a camping site, and private accommodation; guests are able to take part in walking, cycling, and other sport activities (tennis, beach volleyball, swimming). The protected area is well-connected with the wider surrounding area, including cycling (*Parenzana*) and hiking trails, and with Izola, Pacug and Fiesa, where there are also various accommodation facilities and tourist visitation is on the rise.

Škocjanski zatok Nature Reserve

The Škocjanski zatok Nature Reserve encompasses 120.7 ha of brackish and salty marshland, situated on the edge of Koper (Fig. 2). It lies between shopping centres in the south-eastern part of Koper, the coastal express road with connecting urban roads, and the railway line. Following its rehabilitation, the area was protected as a nature reserve (1998), and its management was taken over by DOPPS-Birdlife Slovenia in 1999, which was followed by several years of renaturation. As a whole, Škocjanski zatok, with its salty, brackish, and freshwater habitats, has 245 recorded bird species, a variety of other species of fauna, and vast tidal marshes with halophytes; it is a natural asset and an ecologically-important area, as well as a Natura 2000 site

(Škocjanski zatok Nature Reserve, 2019). Among the reserve's many features are a nature trail with wildlife observation blinds and information boards, an info centre, guided tours, and activities involving Camargue horses, which has led to it becoming a popular and highly visited site.

In a survey conducted in 2011, it was found that Škocjanski zatok plays an important role as a daily recreation and leisure time area for the residents of Koper, and that the most important motivation among visitors is to relax in a peaceful natural environment (Brečko Grubar and Kovačič, 2011). In 2018, 7,401 people took part in guided visits to the nature reserve, while the total number of visitors is estimated at over 40,000 (records are not kept of individual visits) (Lipej, 2019). Like the aforementioned protected areas, guided tours organised for groups of primary school students, secondary school students, and day-trippers prevail in Škocjanski zatok. Thanks to the successful renaturation and management of the wetlands, the nature reserve is also a destination for expert study tours, and our observations show that there is also an increasing number of tourists who visit the area by bicycle. The largest proportion of visits consists of locals pursuing recreational and leisure activities.

Debeli Rtič Landscape Park

Debeli Rtič Landscape Park was established in 2018 by an ordinance of the Municipality of Ankaran, which became its manager. The park extends over an area of 340 ha on the *Ankaranski polotok* (Ankaran Peninsula), between *Zaliv svetega Jerneja* at the border with Italy and Valdoltra Bay where the Valdoltra Orthopaedic Hospital is located (Fig. 2). Apart from a narrow coastal strip of land, it also comprises a 160 ha of coastline. The protected area boasts a variety of natural assets, such as cliffs, underwater reefs, an oak forest, a botanical garden near the Red Cross Slovenia Youth Health and Summer Resort, and beds of marine flowering plants. The area of the landscape park is also an ecologically important area and a Natura 2000 site.

The Park is divided into three conservation areas, with the two (stricter) conservation areas comprising a strip of land closer to the sea and a strip of coastal water, and the third conservation area (of a lesser level of protection) comprising the populated and agriculturally exploited ridge of the Peninsula (Debeli rtič Landscape Park, 2019). There are no data on the number of visitors, as the protected area is new and there are no guided tours. According to observations, the area is highly visited during the

swimming season, when tourists staying in the camping site, hotels, youth health and summer resort, as well as in private accommodations, are joined by numerous swimmers from nearby Slovenian and Italian towns and villages. Tourists find the area of Debeli Rtič Landscape Park equally attractive throughout the remaining part of the year, because of its broad offerings in gastronomic and recreational services, as well as its natural beauty.

Consequences of anticipated climate change in the large-scale protected areas on the Slovenian coast

In Slovene Istria, climate change is most notably reflected in the statistically reliable trend of increasing annual air temperature recorded at the Portorož – Airport meteorological station during the 1961–2018 period, with a rate of $0.37\text{ }^{\circ}\text{C/decade}$, while average annual peak temperature is increasing at a rate of $0.42\text{ }^{\circ}\text{C/decade}$. Increasing air temperatures are raising the level of energy in the atmosphere and contributing to increased evapotranspiration, which showed a long-term trend of increasing by 49 mm/decade in the area of Slovene Istria during the 1971–2010 period. Calculations show that during the 1961–2018 period the annual precipitation level was decreasing in statistically significant terms in the same area, at a rate of 32 mm/decade (Fig. 3).

The observed long-term changes in meteorological variables, the decreasing annual precipitation level, and the increasing annual evapotranspiration level affect runoff in Slovene Istria. The volume of water runoff into the sea is decreasing, which is demonstrated by a declining trend in the mean annual discharges of the Rižana River at the Kubed II gauging station during the 1966–2017 period, which, according to reliable calculations, were decreasing at a rate of 360 l/s/decade (Fig. 4).

It is not simple to assess the possible impacts of long-term reduction in the volume of water running through watercourses into the sea within the large-scale protected areas on the Slovenian coast. It can be assumed that the impact will be smallest in the area of Debeli Rtič Landscape Park, where there are only small streams with small catchments, which are largely regulated. However, since the area is agriculturally cultivated, reduced volumes of water in soil could pose a problem in terms of droughts occurring during the growing period of crops.

Since the coastal wetlands of Škocjanski zatok Nature Reserve, Sečovlje Salina Nature Park, and parts of Strunjan Landscape Park (the salt pans

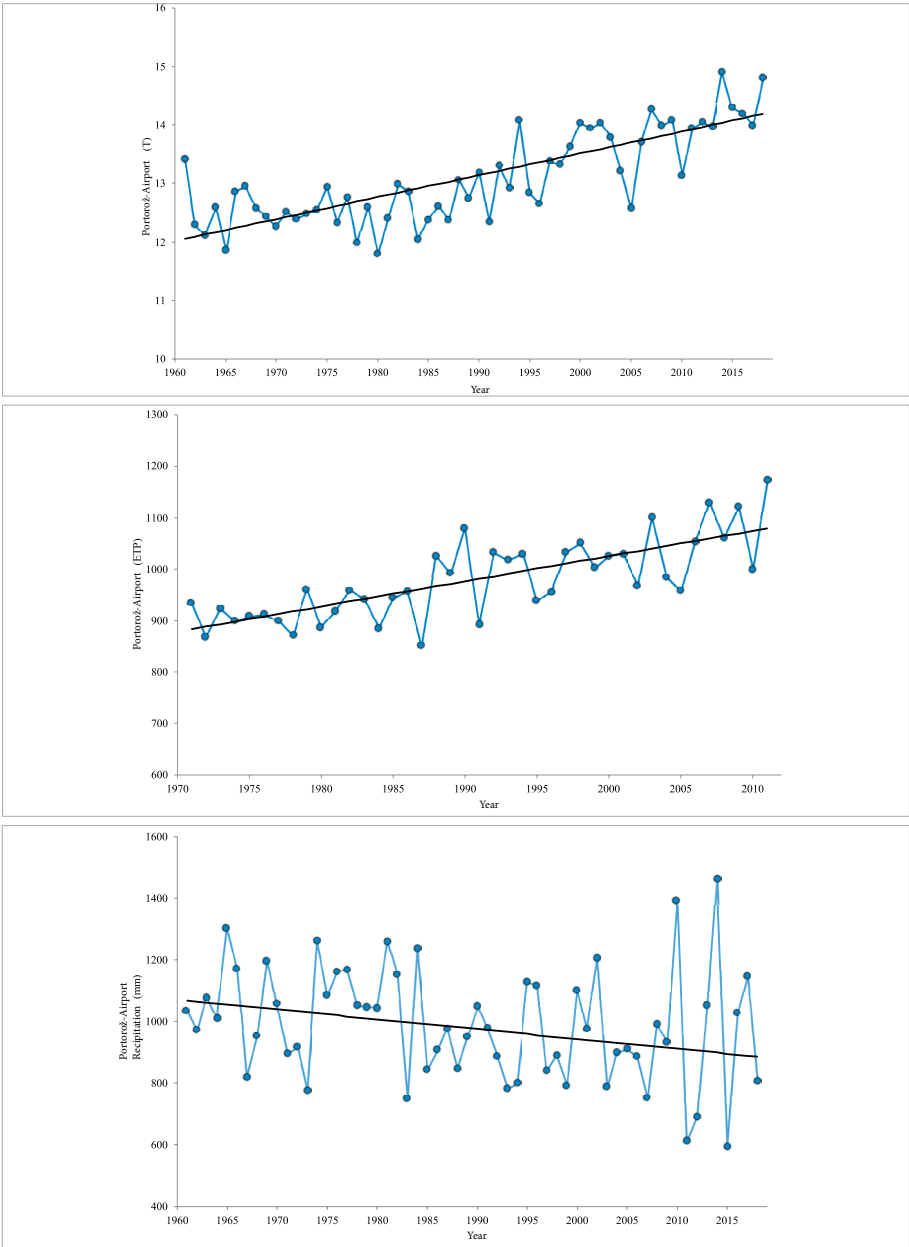


Fig. 3 Average annual values of meteorological variables at the Portorož – Airport meteorological station in the 1961–2018 (temperature and precipitation) and 1971–2010 (evapotranspiration) periods, with an indication of trends
 Source: Slovenian Environmental Agency, 2019c

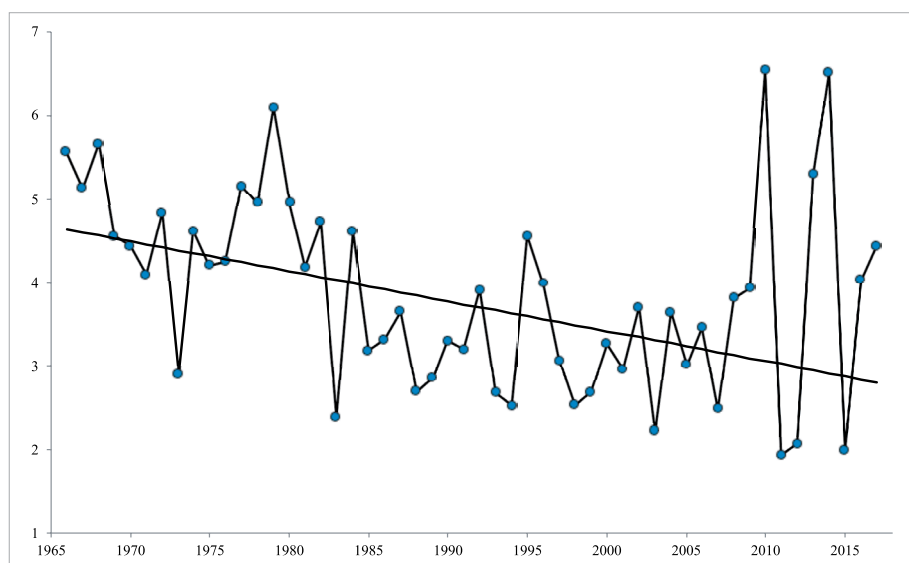


Fig. 4 Average annual discharge (m³/s) of the Rižana River at the Kubed II gauging station during the 1966–2017 period, with an indication of a trend

Source: Slovenian Environmental Agency, 2019b

and the lagoon) are dynamic areas of interaction between running surface waters and seawater, a long-term reduction in surface runoff in the area of Slovene Istria could also have an impact on the geomorphology of floodplains at the estuaries of the rivers that formed them. Smaller volumes of water available for runoff in the future could lead to a reduction in the capacity of watercourses to transport very fine sediments that are needed to build the aforementioned floodplains, i.e. the wetlands. This could, in turn, threaten the dynamic equilibrium of the sedimentation areas in question, and lead to a situation where the amount of sediments washed into (further) the sea is more intense than the amount of material deposited by rivers, which could lead to a reduction in the wetland area.

Given the global rise of air temperature and the related increase of energy in the atmosphere, the frequency of extreme weather events—storms—which cause short-lived and very intense discharges along watercourses, will increase. In such situations, the erosional power of watercourses increases sharply, which can have a negative impact on protected areas (i.e. the wetlands) in the form of flooding and increasing amounts of sediment being washed deep into the sea. This could, of course, negatively affect the future use of the protected areas for tourism purposes.

Therefore, it is also necessary to consider possible scenarios in relation to the protection of protected areas and individual natural assets, and to provide appropriate long-term sustainable measures for the management thereof.

A specific case is the area of Škocjanski zatok Nature Reserve, which is filled with fresh water from an artificially excavated overflow channel (called *Ara*) of the Rižana River. The inflow of freshwater to the wetland area is vital to maintain the dynamics of the periodically flooded and dry areas of the reserve. Reduced volume of water in the Rižana River could also mean that there would not be enough water to properly flood the eastern part of the wetland, particularly in cases where spring discharges are significantly reduced. Since the areas of the wetland represent a retention area in the event of flooding, protecting human activities taking place in the surroundings, a certain threat to the area also comes from the rising frequency of extreme weather events (Lipej, 2019).

Climate change is also reflected in sea level rise, which is a global phenomenon. During strong high tides, which typically occur in the autumn/winter period while there is either a full or new moon and with the sirocco wind pushing water towards the Gulf of Trieste, the sea level rises sharply and the sea overflows the lower-lying parts of the coast. Sea flooding occurs when the sea level rises 82 cm above the mean value. Normal flooding of the lowest-lying areas takes place a few times a year and does not cause damage. In the 1961–2015 period, there were 8 to 31 floods per year, and 482 floods during the whole period in question (Slovenian Environmental Agency, 2019d). Small-scale or large-scale sea flooding occurred before the tide gauge station in Koper was put into operation, and available sources show that the most exposed areas were the low-lying coastal zones at Sečovlje, Piran, and Strunjan (Kolega, 2005). Monitoring of sea levels in Slovenia reveals that in the last 50 years the sea level has risen by 10 cm and has been rising at a rate of 1.7 mm per year (Fig. 5), while in the last 20 years the rate has been even higher than the European and global averages (Regional Obala, 2019a). IPCC (Intergovernmental Panel on Climate Change) scientists estimate that sea levels will rise globally by 0.5 to 1 m by 2100 (Church et al., 2013).

Sea level rise is already being reflected in the introduction of non-native species characteristic of warm seas (Lipej and Kerma, 2012), and climate change will influence the development of terrestrial ecosystems over the long run.

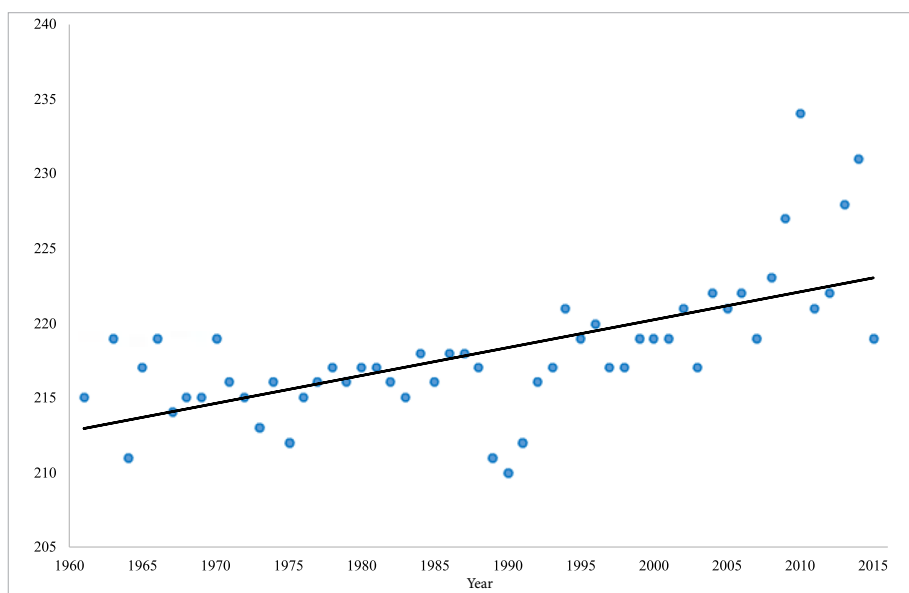


Fig. 5 Mean annual sea levels (cm) in Koper in the 1961–2015 period, with an indication of a trend

Source: Slovenian Environmental Agency, 2019a

With a sea level rise of 50 cm, even slightly higher high tides (+60 cm) will cause flooding, and during strong high tides (+115 cm) the lowest-lying parts of the coast would be covered by approximately 80 cm of water, and around 700 ha of land would be flooded. Frequent annual flooding would be comparable to flooding that is now considered extreme. With a sea level rise of 100 cm, the lower-lying parts of the coast would be flooded during moderate high tides, and only be dry during low tides. During stronger high tides, floodplains would extend over an area of more than 1,200 ha. The most heavily flooded areas would be those near river mouths. The higher sea level would hinder the runoff of water from the land, the lower parts of valleys would therefore be more wet, and river flooding and high tides occurring simultaneously would lead to the formation of vast continuous floodplains. Furthermore, sea level rise would lead to the final “disappearance” of Škocjanski zatok, the Sečovlje Saltpans, and the Stjuža Wetlands (Kovačič et al., 2016).

Figures 6a and 7a show flooded areas within the protected areas at a mean sea level rise of 50 cm and during strong high tides. This means that the lowest-lying parts of the coast would be covered by approximate-

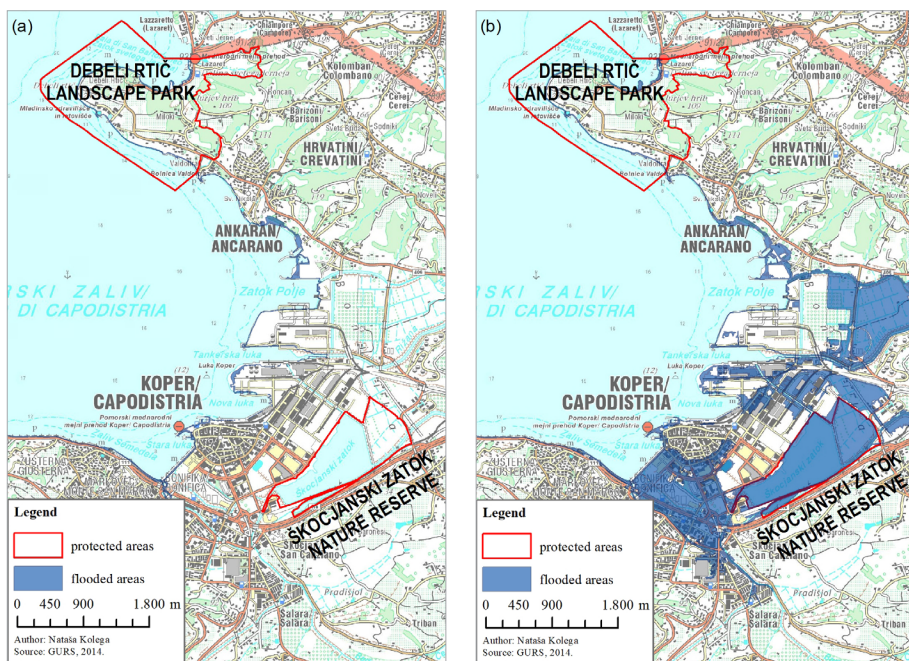


Fig. 6 Flooded areas in the event of a mean sea level rise of 50 cm and strong high tides (a), and in the event of a mean sea level rise of 100 cm and strong high tides (b), in the areas of Debeli Rtič Landscape Park and Škocjanski zatok Nature Reserve

Source: Surveying and Mapping Authority of the Republic of Slovenia, 2014

ly 25 cm of water. Areas in the Strunjan Salt pans and the Sečovlje Salt pans would be flooded to a greater extent, as their low altitude means that they would be almost entirely flooded if the sea rose by 50 cm. At this water level, Debeli Rtič Landscape Park and Škocjanski zatok Nature Reserve would sustain no flooding.

Figures 6b and 7b show flooded areas at a mean sea level rise of 100 cm and during strong high tides. The flooded area is comparable to what would be considered an area of extreme flooding today. Among all of the four protected areas, the least affected would be Debeli Rtič Landscape Park, as this is largely a higher-lying area. Flooding would occur in a small area close to the former border crossing point of Lazaret, and the higher sea level would make the coastal cliffs significantly more exposed to the erosional effects of the sea. Škocjanski zatok Nature Reserve and Sečovlje Salina Nature Park would be almost completely under water. In Strunjan Landscape Park, the entire area of the salt pans and the area around the Stjuža Lagoon would be

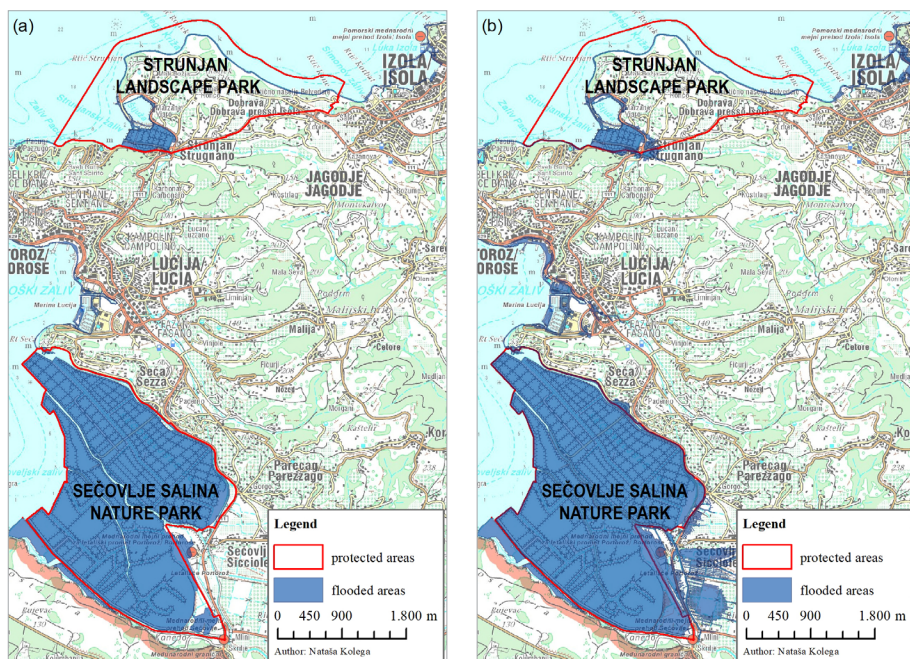


Fig. 7 Flooded areas in the event of a mean sea level rise of 50 cm and strong high tides (a), and in the event of a mean sea level rise of 100 cm and strong high tides (b), in the areas of Strunjan Landscape Park and Sečovlje Salina Nature Park

Source: Surveying and Mapping Authority of the Republic of Slovenia, 2014

flooded, and the coastal cliffs would be more exposed to the erosional effects of the sea, like those near Debeli Rtič.

Conclusion

Because the large-scale protected areas on the Slovenian coast are small in terms of surface area, and are surrounded by heavily-exploited urban and agricultural areas, they are even more vulnerable to various direct or indirect impacts. According to our findings, higher temperatures are already reducing runoff, which can alter conditions in the brackish wetlands by making them more salty. On the other hand, we can expect more frequent flooding of the wetlands due to the probable increase of extreme weather events in the future. The largest direct impact of climate change on the protected areas in question and thus on tourist visitation, however, will come from sea level rise. A large part of the Sečovlje Salt pans, the Strunjan Salt pans, and Škocjanski zatok will turn into a shallow sea, and areas of

land along the watercourses in the hinterland will be transformed into brackish marshes. During high tides, the sea will flood riverbeds further upstream and cause the floodplains to become salinated. Water will also spread upstream along the regulated watercourses, as the higher sea level will obstruct river mouths and, during high tides, floodplains will considerably expand. In areas characterised by coastal cliffs, within the protected areas of Strunjan Landscape Park and Debeli Rtič Landscape Park, beaches will be frequently or permanently flooded, and more intense abrasion processes will take place.

Management of tourist activities on the Slovenian coast, associated with its protected areas, will have to consider the inevitable impacts of the global climate change and introduce some long-term and sustainable solutions for anticipated problems. Construction of small retention basins in the catchments of the rivers might be a sustainable solution for preventing flash flooding of the protected coastal wetlands during extreme weather events, and to enhance the discharge of the rivers in periods of rainfall shortage, preventing wetlands from becoming further salinated. Furthermore, water retention basins could also be used for irrigation. It is uncertain whether construction of higher coastal embankments is a sustainable solution for prevention of sea flooding of the low-laying protected areas. Preservation and maintenance of the very popular beaches under the coastal cliffs of Strunjan Landscape Park and Debeli Rtič Landscape Park would be a serious challenge, since the higher sea level would make it significantly more exposed to the erosional activity of the sea and the extent of the beaches would shrink.

Acknowledgment

The authors acknowledge the project Environmental effects and karst water sources: impacts, vulnerability and adaptation of land use, no. J6-8266 which was financially supported by the Slovenian Research Agency.

References

- Brečko Grubar, V., Kovačič, G., 2011: Odnos prebivalcev Mestne občine Koper do Škocjanskega zatoka, in: *Razvoj zavarovanih območij v Sloveniji, Regionalni razvoj 3* (eds. Nared, J. et al.), Založba ZRC, Ljubljana, 63-70.
- Brečko Grubar, V., Kovačič, G., 2014: Pomen obalnih mokrišč za prebivalce slovenske Istre, *Geografski vestnik* 86 (2), 45-58, DOI: 10.3986/GV86203.

- Church, J. A., Clark, P. U., Cazenave, A., Gregory, J. M., Jevrejeva, S., Levermann, A., Merrifield, M. A., Milne, G. A., Nerem, R. S., Nunn, P. D., Payne, A. J., Pfeffer, W. T., Stammer, D., Unnikrishnan, A. S. 2013: *Sea Level Change, Climate Change 2013, The Physical Science Basis, Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, IPCC, Cambridge.
- Jurinčič, I., Popič, A., 2009: Sustainable tourism development in protected areas on the pattern of Strunjan Landscape Park, *Varstvo narave* 22, 177–192.
- Kolega, N., 2005: *Poplave morja na slovenski obali*, Graduation Thesis, Univerza na Primorskem, Fakulteta za humanistične študije, Koper.
- Kolega, N., 2015: Spreminjanje obalne črte na slovenski obali med letoma 1954 in 2010, *Acta geographica Slovenica*, 55 (2), 205–221, DOI: 10.3986/AGS.1887.
- Kovačič, G., Kolega, N., Brečko Grubar, V., 2016: Vpliv podnebnih sprememb na količine vode in poplave morja v slovenski Istri, *Geografski vestnik* 88 (1), 31–36, DOI: 10.3986/GV88102.
- Lipej, L., Kerma, S., 2012: Stanje in ogroženost biodiverzitete slovenskega morja, in: *Geografija stika Slovenske Istre in Tržaškega zaliva* (ed. Ogrin, D.), GeograFF 12, Znanstvena založba Filozofske fakultete, Ljubljana, 159–176.
- Mozetič, B., Šalaja, N., 2002: *Naravni rezervat Škocjanski zatok – oaza na pragu Kopra* Društvo za opazovanje in preučevanje ptic Slovenije, Ljubljana.
- Sovinc, A., 2011: *Oblikovanje modela za učinkovito upravljanje zavarovanih območij narave*, Doctoral Thesis, Univerza na Primorskem, Fakulteta za humanistične študije, Koper.
- Turk, R., 2012: Zavarovana območja, in: *Geografija stika Slovenske Istre in Tržaškega zaliva* (ed. Ogrin, D.), GeograFF 12, Znanstvena založba Filozofske fakultete, Ljubljana, 273–289.

Sources

- Debeli rtič Landscape Park, 2019: *Krajinski park Debeli rtič*, <https://obcina-ankaran.si/sl/zivljenje-v-ankaranu/okolje-in-prostor/krajinski-park-debeli-rtic> (05. 09. 2019)
- Lipej, B., 2019: *Strokovna sodelavka v Naravnem rezervatu Škocjanski zatok*, Oral source (04. 09. 2019)
- Makovac, S., 2019: *Strokovna sodelavka v Krajinskem parku Strunjan*, Oral source (04. 09. 2019)
- Nature Conservation Act*, 1999: Uradni list RS 56/99.

- Sečovlje Salina Nature Park, 2019: *O parku*, <http://www.kpss.si/si/intro> (05. 09. 2019)
- Strunjan Landscape Park, 2019: *O parku*, <https://parkstrunjan.si/o-parku/> (05. 09. 2019)
- Škocjanski zatok Nature Reserve, 2019: *Nastanek*, <http://www.skocjanski-zatok.org/rezervat/> (05. 09. 2019)
- Regional Obala, 2019a: *Gladina morja v Kopru se dviga: do leta 2100 tudi do 95 centimetrov*, <https://www.regionalobala.si/novica/gladina-morja-v-kopru-se-dviga-do-leta-2100-tudi-do-95-centimetrov-video> (05. 09. 2019)
- Regional Obala, 2019b: *Poletna sezona v številkah: V Piranu pol milijona več nočitev, porast tudi v Kopru in Izoli*, <https://regionalobala.si/novica/poletna-sezona-v-stevilkah-v-piranu-pol-milijona-nocitev-porast-tudi-v-kopru-in-izoli-> (18. 09. 2019)
- Slovenian Environmental Agency, 2019a: *Podatki o dnevnih višinah morja na mareografski postaji Koper 1961–2015*, Ljubljana.
- Slovenian Environmental Agency, 2019b: *Podatki o karakterističnih mesečnih in letnih pretokih Rižane na vodomerni postaji Kubed II (obdobje 1966–2017)*, Ljubljana.
- Slovenian Environmental Agency, 2019c: *Podatki o letnih padavinah ter povprečnih in najvišjih temperaturah zraka (obdobje 1961–2018) ter povprečni letni evapotranspiraciji (obdobje 1971–2010) na meteorološki postaji Portorož – letališče v obdobju 1961–2018*, Ljubljana.
- Slovenian Environmental Agency, 2019d: *Prognozirano plimovanje morja 2019*, <https://www.arso.gov.si/vode/morje/Plima2019> (06. 09. 2019)
- Surveying and Mapping Authority of the Republic of Slovenia, 2009: *Ortophotography, area Koper 1: 5000*, Ljubljana.
- Surveying and Mapping Authority of the Republic of Slovenia, 2014: *Topographical map, area Slovenian littoral 1: 50.000*, Ljubljana.