

**CLIMATE VULNERABILITY INDEX
ASSESSMENT FOR THE
LITHUANIAN COMPONENT OF
THE CURONIAN SPIT WORLD
HERITAGE PROPERTY**

CVI

CLIMATE VULNERABILITY INDEX ASSESSMENT FOR THE LITHUANIAN COMPONENT OF THE CURONIAN SPIT WORLD HERITAGE PROPERTY

Authors

Scott F. Heron^{1,6}, Justė Zavišaitė², Sigita Bugenienė³, Jon C. Day¹, Rimantė Dėringytė³, Renata Kepežinskienė⁵ & Judita Liukaitytė-Kukienė⁴

Affiliations

¹ College of Science and Engineering, James Cook University, Australia

² Kuršių nerijos nacionalinio parko direkcija (Curonian Spit National Park Administration), Lithuania

³ Lietuvos Respublikos kultūros ministerija (Ministry of Culture, Lithuania)

⁴ Lietuvos Respublikos aplinkos ministerija (Ministry of Environment, Lithuania)

⁵ Lietuvos nacionalinė UNESCO komisija (Lithuanian National Commission for UNESCO)

⁶ UNESCO Chair on Climate Change Vulnerability of Natural and Cultural Heritage

Publication date

January 2025

Citation

Heron SF, Zavišaitė J, Bugenienė S, Day JC, Dėringytė R, Kepežinskienė R, Liukaitytė-Kukienė J (2025) Climate Vulnerability Index assessment for the Lithuanian component of the Curonian Spit World Heritage property. *Ministry of Culture, Vilnius; and Climate Vulnerability Index, Townsville*. 75+ix pp.

ISBN 978-0-6459516-9-1

Enquiries regarding this report should be addressed to:

- Ministry of Culture, Vilnius, Lithuania
- Curonian Spit National Park Administration, Lithuania
- Climate Vulnerability Index, Townsville, Australia

Images

All photos by Renata Kilinskaitė, unless otherwise noted

Front and back cover: A snow-covered Great Dune Ridge of the Curonian Spit is not seen by summertime visitors. In winter, this frosty layer becomes a vital shield for the sandy terrain against the powerful northwestern winds that once shaped these famous dunes but now threaten to wear them away. As winters grow shorter and warmer, the loss of this protection increases the vulnerability of the dunes.

Inside cover: Sand collection devices (wooden sticks in the foreground), as traditionally used to build up the dunes, are still employed today.



VALUES-BASED | SCIENCE-DRIVEN | COMMUNITY-FOCUSED

CLIMATE VULNERABILITY INDEX ASSESSMENT FOR THE LITHUANIAN COMPONENT OF THE CURONIAN SPIT WORLD HERITAGE PROPERTY



CONTENTS

EXECUTIVE SUMMARY	iv
SANTRAUKA	vii
1. INTRODUCTION	1
1.1 Background to this report	2
1.2 Overview of the Climate Vulnerability Index (CVI)	3
1.3 Why was the Curonian Spit chosen for a CVI application?	3
2. OVERVIEW OF THE CURONIAN SPIT	5
2.1 Location of the Curonian Spit	6
2.2 The Curonian Spit World Heritage property	6
2.3 The context surrounding the Curonian Spit WH property	8
2.3 Physical geography and landscape	9
2.4 Biodiversity of the Curonian Spit	9
2.5 Human Habitation	12
2.6 Analysis of Curonian Spit Outstanding Universal Value (OUV): Values and Attributes	14
2.7 Current condition and recent trend for the attributes of the identified key World Heritage values	14
3. MANAGEMENT AND USE OF THE CURONIAN SPIT WORLD HERITAGE PROPERTY	21
3.1 Managing and governance of the Curonian Spit	22
3.2 Key considerations for management	23
3.3 Economic aspects of the Lithuanian component of the Curonian Spit	27
3.4 Social and Cultural Context	28
3.5 Intertwined cultural and natural values	29
4. CLIMATE, ITS INFLUENCE AND RELATED POLICY	31
4.1 Current climate	32
4.2 Observed climate trends	33
4.3 Future change to 2100	34
4.4 Related policy	36
5. APPLYING THE CLIMATE VULNERABILITY INDEX	39
5.1 Background to the CVI	40
5.2 Preparatory steps and the CVI workshop	41
5.3 Key climatic stressors	42
5.4 OUV Vulnerability	43
5.5 Community Vulnerability	47

5.6 Summary	50
6. CONCLUSION.....	51
6.1 Outcomes from the CVI process	52
6.2 Gaps Identified	52
6.3 Management Implications	53
6.4 Lessons for other European heritage places	54
6.5 Revisiting the CVI Process in the Curonian Spit	54
ACKNOWLEDGEMENTS.....	55
APPENDICES.....	57
Appendix 1: Statement of Outstanding Universal Value for the Curonian Spit World Heritage Property	58
Appendix 2: Images illustrating the key values for the Curonian Spit.....	61
Appendix 3: List of other Significant Property Values (SPVs) for Curonian Spit.....	66
Appendix 4: CVI workshop schedule, 26 th –30 th August 2024	70
Appendix 5: List of workshop participants	72
Appendix 6: Glossary and Acronyms	74

EXECUTIVE SUMMARY



The proximity of forests, dunes and the water
brings a heightened experience of natural beauty
(Renata Kilinskaitė)

EXECUTIVE SUMMARY

Climate change has been identified as the fastest growing global threat to heritage places around the world; many heritage places are already experiencing significant negative impacts and degradation. Recent observed trends for a range of climate stressors are expected to continue and accelerate as climate change intensifies.

With funding support through the *EEA and Norway Grants* and in cooperation with the Curonian Spit National Park Administration, the Lithuanian Ministries of Culture and Environment and the Norwegian Directorate of Cultural Heritage, the Climate Vulnerability Index (CVI) process was applied for the Lithuanian component of the Curonian Spit World Heritage (WH) property to systematically assess the vulnerability of the cultural landscape values to the impacts of climate change.

The Curonian Spit is the youngest landmass in Lithuania and one of the largest sandspits in the world. The high coastal sand dunes and broader landscape of beaches, meadows, wetlands and forests encompass extraordinary biological diversity. People have lived on the Curonian Spit for thousands of years, taming the landscape that threatened their survival through substantial efforts to stabilise the dunes. Links between actions of the Spit's inhabitants and the environment remain today.

The CVI assessment was undertaken in August 2024 through a workshop held in Smiltynė, near the northern tip of the Spit. Facilitated by the co-developers of the CVI, workshop participants included representatives from the management agencies for the property, government and non-government conservation organisations, other experts and community representatives. This report describes the outcomes of that expert appraisal of the effects of climate change on the Curonian Spit based on the collective understanding of property values, the best-available climate science and connections between the property and the community.

Five key values were identified for the property from the approved UNESCO Statement of Outstanding Universal Value (OUV), with associated tangible and intangible attributes. Assessments of the current

condition of the key values revealed 40% of the attributes were categorised to be in Good condition, most of which were assessed as having a stable trend since WH inscription in 2000 (one had deteriorated, while some had improved). A further 40% of the attributes were evaluated to be in Good condition with some concerns, most of which had a stable recent trend. The remaining 20% were assessed to be of Significant Concern and had shown deterioration since the time of inscription (except for one attribute, for which the recent trend could not be determined). These included tangible attributes of the dune ridge and associated peninsulas, flora and fauna; and elements of the marine cultural heritage, as well as intangible attributes of fishermen's ethnography and the community involvement in heritage preservation.

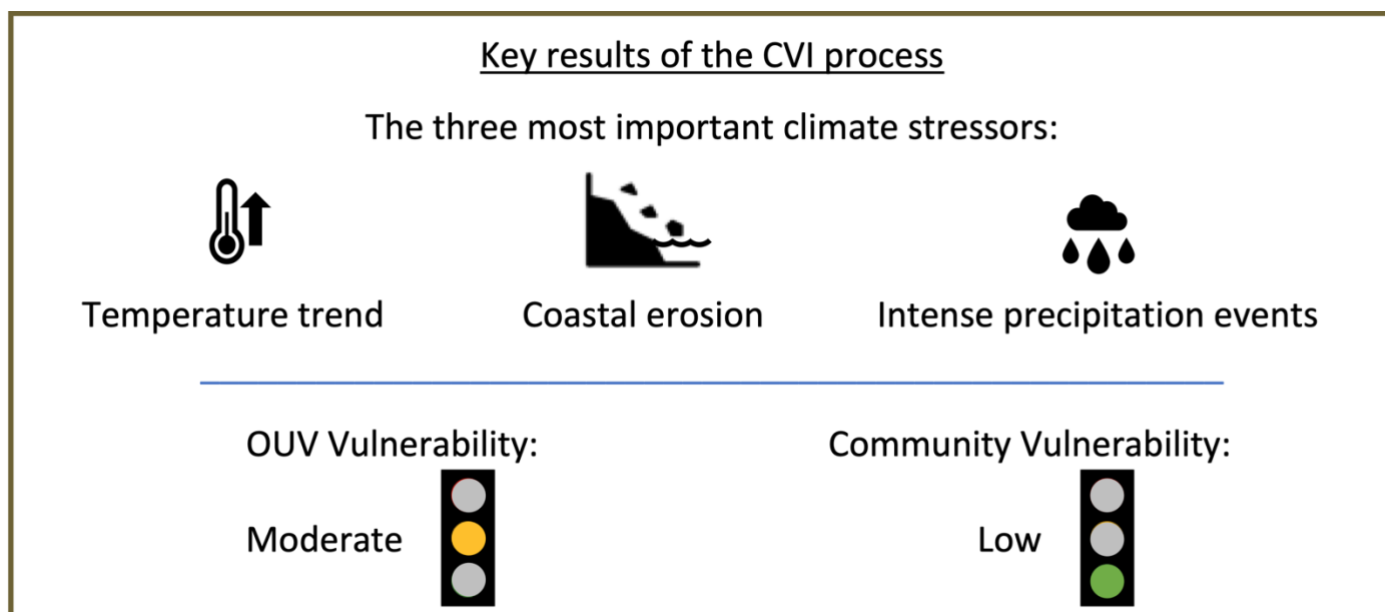
Workshop participants chose to consider a high-emissions scenario (RCP8.5, CMIP5) and selected ca. 2070 as the future time scale to assess vulnerability. A standardised list of climate stressors was considered as part of the CVI process to determine which are most likely to impact the WH values. A diverse array of climate stressors was identified as important for at least one key value. The three key climate stressors identified as the focus of the CVI analysis for the Curonian Spit were:

- Temperature trend (air and/or water);
- Coastal erosion; and
- Intense precipitation events.

Effects of these three key stressors have already been seen on the Curonian Spit, while future impacts on heritage attributes have the potential to unveil at different times.

The CVI process determined the **OUV Vulnerability** for the property to be **Moderate** (on a three-point scale, Low/Moderate/High), indicating the potential for some decline or alteration of many of the values and attributes that comprise the OUV.

Eight key areas of economic activity connected with the Curonian Spit were also identified. These had varying degrees of reliance upon the key values and attributes, with the greatest reliance linked to Tourism, Recreation and the provision of Goods and services. Economic areas were considered, together with social and cultural connections to the property, in



determining the potential impact upon the community from a decline in WH values. Through these assessments, the workshop determined the **Community Vulnerability** to be in the lowest category (**Low**).

These two assessments of vulnerability considered the adaptive capacity of WH values and their management, and of the community. Various adaptive strategies were discussed to mitigate potential impacts from the key climate stressors, including:

- Forest management (including fire protection)
- Dune management (including regulating visitation)
- Improving traditional knowledge about building restoration; and
- Raising awareness about climate change.

The identified strategies need to be evaluated against national adaptation plans. Participants also identified

research opportunities and potential changes to policies to support more efficient and effective conservation.

Knowledge of climate change effects upon the Curonian Spit may be transferrable to support the management of other coastal areas of significance along the Baltic Sea and beyond. Furthermore, the familiarity with the CVI process developed by the management partners will benefit any future CVI applications in other Lithuanian heritage properties.

Immediate global action to substantially reduce greenhouse gas emissions is critical to preserve heritage, especially to reduce climate change impacts in the near-term. The combination of actions to address climate change (mitigation) and support climate adaptation will be essential to maintain the OUV of the Curonian Spit.

SANTRAUKA

Nustatyta kad, klimato kaita yra sparčiausiai auganti pasaulinė grėsmė paveldo objektams visame pasaulyje. Daugelis paveldo vietovių jau patiria ženklų neigiamą poveikį ir nykimą. Tikėtina, jog ši tendencija išliks ir, intensyvėjant klimato kaitai, dar labiau sustiprės.

Pasitelkus Europos ekonominės erdvės (EEE) ir Norvegijos finansinių mechanizmų paramą, bendradarbiaujant su Kuršių nerijos nacionalinio parko direkcija, Kultūros ir Aplinkos ministerijomis bei Norvegijos kultūros paveldo direktoratu, Pasaulio paveldo vertybės – Kuršių nerijos Lietuvos daliai pritaikyta Klimato pažeidžiamumo indekso (toliau – KPI; angl. *Climate Vulnerability Index, CVI*) priemonė, skirta sistemingai vertinti kultūrinio kraštovaizdžio verčių pažeidžiamumą klimato kaitos poveikiui.

Kuršių nerija – jauniausia sausumos dalis Lietuvoje ir viena didžiausių smėlio nerijų pasaulyje. Aukštų pakrantės smėlio kopų, plačių paplūdimių, pievų, pelkių ir miškų kraštovaizdis jungia išskirtinę biologinę įvairovę. Tūkstančius metų čia gyvenę žmonės savo veikla reikšmingai prisidėjo prie kraštovaizdžio kaitos. Iš pradžių savo poreikiams kirsdami miškus ir vos nesunaikinę nerijos, vėliau ėmėsi didžiulių miškų atsodinimo ir kopų sutvirtinimo darbų, atkūrusių sąlygas gyventi. Glaudus ryšys tarp žmogaus ir gamtos yra gyvas ir šiandien.

KPI vertinimas atliktas 2024 m. rugpjūčio mėnesį Smiltynėje vykusiose dirbtuvėse, kuriose, moderuojant KPI metodikos bendraautoriams, dalyvavo už Kuršių nerijos valdymą atsakingų institucijų bei vyriausybinių ir nevyriausybinių aplinkosaugos organizacijų atstovai, kiti specialistai ir vietos bendruomenių nariai. Ataskaitoje pateikiami klimato kaitos poveikio Kuršių nerijai ekspertinio vertinimo rezultatai, vadovaujantis kolektyvine vietovės vertės samprata, naujausiais mokslinių tyrimų duomenimis bei bendruomenės ryšio su vertybe aspektais.

Remiantis patvirtintu UNESCO Išskirtinės visuotinės vertės aprašu (toliau – IVV; angl. *Outstanding Universal Value, OUV*), vertinimui pasitelktos penkios pagrindinės vertės ir su jomis susijusios materialiosios ir nematerialiosios vertingosios savybės arba

elementai (angl. *attributes*). Įvertinus esamą pagrindinių verčių būklę nustatyta, kad 40 % vertingųjų savybių yra geros būklės, nes nuo įrašymo į Pasaulio paveldo sąrašą 2000 m. išliko nepakitusios (vienos būklės pablogėjo, o dalies pagerėjo). Dar 40 % vertingųjų savybių buvo įvertintos kaip geros būklės su tam tikromis abejonėmis, tačiau dauguma išlaikė stabilią būklę. Likusios 20 % vertingųjų savybių buvo įvertintos kaip keliančios didelį susirūpinimą ir nuo įrašymo jų būklė pablogėjo (išskyrus vieną vertingąją savybę, kurios būklės kaitos tendencijos nepavyko nustatyti). Iš materialijų buvo vertinamos kopagūbrių ir susijusių pusiasalių, floros ir faunos savybės, jūrinio kultūros paveldo elementai, iš nematerialiųjų – žvejų etnografijos ir bendruomenės dalyvavimo išsaugant paveldą savybės.

Dirbtuvių dalyviai pasirinko Pasaulinės klimato tyrimų programos Penktojo klimato modelių palyginimo projekto (angl. *CMIP5*) tipinį scenarijų RCP8.5 klimato kaitos tendencijoms ir pažeidžiamumui vertinti iki maždaug 2070 m. Siekiant nustatyti, kurie klimato kaitos rodikliai gali labiausiai paveikti pasaulio paveldo vertes, pasitelkiamas standartinis klimato rodiklių sąrašas. Nustatyta, kad įvairūs klimato rodikliai turi įtakos bent vienai iš pagrindinių verčių. Kuršių nerijos KPI analizės metu buvo nustatyti trys pagrindiniai klimato rodikliai:

- Vidutinės temperatūros kilimas (oro ir/ arba vandens);
- Pakrantės erozija;
- Gausių kritulių atvejai (jų skaičiaus ir/ arba intensyvumo didėjimas).

Šių trijų pagrindinių rodiklių poveikis jau buvo pastebėtas Kuršių nerijoje, o ateityje jų įtaka kultūrinėms vertybėms gali pasireikšti skirtingais laikotarpiais.

KPI projekto metu nustatyta, kad **IVV pažeidžiamumas** šioje paveldo vietovėje yra **vidutinio lygmens** (vertinant pagal trijų lygių sudėtingumo skalę – žemas/vidutinis/aukštas), įžvelgiant daugelio verčių ir savybių, sudarančių IVV, būklės pablogėjimo arba pasikeitimo galimybę.

Taip pat buvo nustatytos aštuonios pagrindinės nuo Kuršių nerijos vertingųjų savybių neatsiejamos

Pagrindiniai KPI proceso rezultatai

Trys svarbiausi klimato rodikliai:



Vidutinės temperatūros
kilimas



Pakrantės erozija



Gausių kritulių atvejai

IVV pažeidžiamumas:

Vidutinis



Bendruomenės pažeidžiamumas:

Žemas



ekonominės veiklos sritys. Šių sričių priklausomybės nuo vietovės vertingųjų savybių lygmuo skirtingas, o labiausiai priklausomos pasireiškė – turizmo, poilsio, prekybos ir paslaugų sritys. Vertinant galimą pasaulio paveldo vertybės nykimo poveikį bendruomenei, dėmesys buvo sutelktas būtent į pastarąsias sritis bei socialinius ir kultūrinius ryšius su vietove. Atlikus jų vertinimą dirbtuvių metu nustatyta, kad **Bendruomenės pažeidžiamumas** yra žemiausio lygmens (**žemas**).

Pažeidžiamumo indekso vertinimuose buvo atsižvelgta į pasaulio paveldo vertybių, jų valdymo ir bendruomenės prisitaikymo galimybes. Aptartos įvairios prisitaikymo priemonės, kuriomis siekiama sumažinti klimato kaitos poveikį, įskaitant:

- miškotvarką (taip pat priešgaisrinę apsaugą)
- kopų priežiūrą (taip pat lankytojų srautų valdymą)
- žinių apie pastatų restauravimą stiprinimą;
- sąmoningumo apie klimato kaitą didinimą.

Nustatytas priemonės reikia įvertinti atsižvelgiant į Nacionaliniame prisitaikymo prie klimato kaitos plane numatytas priemonės. Dalyviai taip pat atkreipė dėmesį į mokslinių tyrimų perspektyvas ir politikos ar teisinės sistemos pokyčius, kurie suteiktų daugiau galimybių užtikrinti efektyvesnę ir veiksmingesnę vertybės apsaugą.

Ilgautos žinios apie klimato kaitos poveikį Kuršių nerijai gali būti pritaikytos tiek kitų reikšmingų Baltijos jūros pakrantės, tiek ir nutolusių teritorijų valdymui. Įtraukus KPI proceso išmanymas ir ataskaitos rengimo patirtis bus naudinga įgyvendinant KPI programas kitose paveldo vietovėse Lietuvoje.

Labai svarbu imtis veiksmų siekiant iš esmės sumažinti šiltnamio efektą sukeliančių dujų išmetimą globaliu mastu, ypač ieškant būdų klimato kaitos poveikio mažinimui artimiausiu metu. Priemonių kompleksas, skirtas švelninti klimato kaitą ir prisitaikyti prie jos padarinių, taps reikšmingu įrankiu išskirtinės Kuršių nerijos vertės išsaugojimui.

INTRODUCTION

The fragrant properties of the forests contributed to the reputation of the Curonian Spit as a place of natural healing
(Renata Kilinskaitė)

1.1 Background to this report

This report outlines the application of the Climate Vulnerability Index (CVI) to assess the Lithuanian component of the Curonian Spit World Heritage (WH) Cultural Landscape, one of five UNESCO WH properties¹ in Lithuania. The Curonian Spit comprises a 98 km long peninsula formed entirely of sand that separates the Curonian Lagoon from the Baltic Sea. The northern part (just over half of the Spit) is in Lithuania, while the southern part is within the Russian Federation's Kaliningrad Region.

The Spit is one of the largest sandspits in the world and includes some of the highest coastal sand dunes in northern Europe (Figure 1.1). It is also the youngest landmass in Lithuania, formed just 7,000 years ago. Today the landscape encompasses extraordinary biological diversity including notable coastal beaches, distinct types of sand dunes, savannah-like meadows, wetlands and various forest types, along with small coastal settlements on the lagoon side (Figure 1.1).

People have lived on the Curonian Spit for thousands of years. Many early settlements were buried by sand movement, which was exacerbated by widespread deforestation and uncontrolled livestock grazing. Major efforts were subsequently undertaken to tame the landscape including ongoing stabilisation and reforestation projects. The inextricable links between the activities of the inhabitants of the Spit and the environment were recognised in 2000 when the Curonian Spit was declared a Cultural Landscape on the WH List.

Today a wide range of pressures, including climate change and unsustainable practices, threaten the values for which the area has been internationally recognised. This vulnerable cultural landscape continues to evolve, modified by wind, sand, water and human activities, and remains subject to a variety of climatic conditions that have and will continue to change.

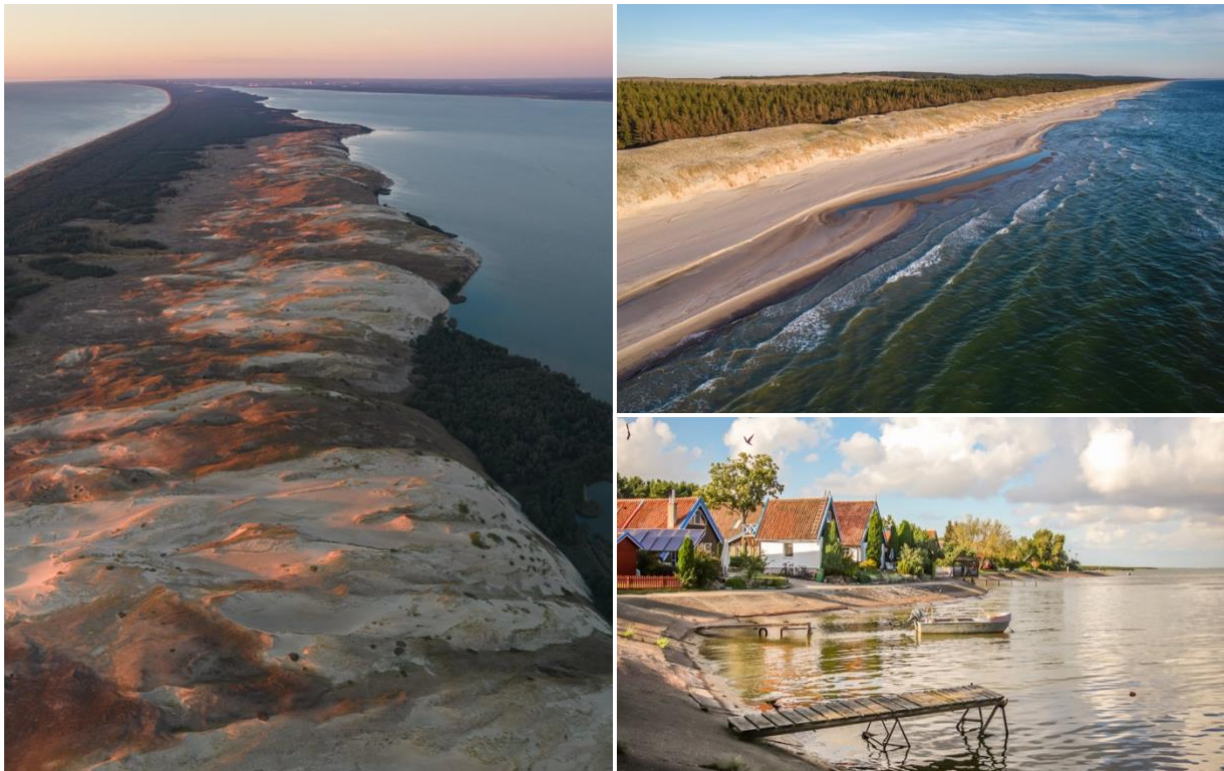


Figure 1.1 The extensive sandspit features areas of sand dunes (left) and beaches (top-right), as well as small coastal settlements on the Curonian Lagoon (bottom-right).

Credit: Renata Kilinskaitė, Kristina Valasevičienė

¹ The term World Heritage 'property' is the formal name in the international convention referring to a site or an area that is inscribed on the WH List; however, terms such as WH Site are colloquially used in other documents.

1.2 Overview of the Climate Vulnerability Index (CVI)

Climate change is the fastest growing global threat to a wide range of WH properties (Osipova et al. 2017, 2020) and many WH properties have already been severely impacted. The severity of current climate impacts on individual areas varies, as do the range of climate stressors causing those impacts and the rate at which they are occurring. In most cases, impacts of climate change result in a degradation of the values and attributes that collectively convey the Outstanding Universal Value (OUV), the central concept for WH properties and the basis for a property's inscription on the WH List.

The Climate Vulnerability Index (CVI) is a systematic and rapid assessment tool that is values-based, science-driven and community-focused (Day et al. 2020). It was initially developed to assess the vulnerability of climate change upon all types of WH properties – natural, cultural, and mixed – but it is now being more widely applied and in different formats. The CVI is comprised of two phases assessing:

- **OUV Vulnerability** through use of a modified version of the IPCC vulnerability framework to evaluate the exposure, sensitivity, and adaptive capacity of identified key values of the property (i.e., the WH attributes that convey the OUV). Application of this process determines to what degree the key values may be impacted by three key climate stressors chosen to be the most relevant for that property; and
- **Community Vulnerability** through consideration of economic, social, and cultural connections of the community associated with the WH property. The dependency of the community upon the property, and the capacity of the community to cope with climate change-related decline in the key values are each evaluated.

Both assessments of vulnerability are highly relevant for key stakeholders including site managers, management agencies, and the community that lives in and around the property. Through its application, the CVI enables managers and stakeholders to consider what may be appropriate adaptive capacities for the management of their natural, cultural and community assets.

The development of the CVI was supported by insights provided by many experts around the world. This has included members of the International Council on Monuments and Sites (ICOMOS) and the International Union for Conservation of Nature (IUCN), the two primary advisory bodies to the WH Committee.

1.3 Why was the Curonian Spit chosen for a CVI application?

Following guidelines for the implementation of the *Convention Concerning the Protection of the World Cultural and Natural Heritage* (i.e., the World Heritage Convention), the Minister of Environment in the Republic of Lithuania directed in 2023 that a management plan needed to be prepared for the Curonian Spit. The aims of this plan are to assess the current state of the protected area; strengthen the protection priorities of the OUV; and provide appropriate actions for the conservation and sustainable development of the Curonian Spit into the future.

This planning task coincided with a proposal from the Norwegian Directorate of Cultural Heritage (*Riksantikvaren*) to the Ministry of Culture of the Republic of Lithuania to assess the impacts of climate change upon selected WH properties. Both parties agreed to adopt the proposal in Lithuania as this was within the scope of the EEA (European Economic Area) and Norway Grants Cultural Program already underway, and an appropriate methodology (the CVI) had been successfully applied in several Norwegian WH properties.

The Curonian Spit was chosen as the first place that the CVI methodology would be applied in Lithuania. The initiative aimed to facilitate relevant consideration of climate change among heritage specialists and the community, whilst encouraging relevant research. The project was therefore implemented in close cooperation with the Lithuanian National Commission for UNESCO, the Ministry of Environment and the Curonian Spit National Park administration.

A project Steering Committee was appointed representing different interest groups (in the fields of cultural heritage and climate change, see Appendix 5), which was tasked to collate relevant data and organise

the workshop. The CVI assessment was undertaken in August 2024 for the Lithuanian component of the transboundary WH property; however, the general recommendations of this report may also be pertinent for the Russian component of the transboundary property. It is also hoped the outcomes will lead to a more responsive management approach, including a more informed planning system for cultural heritage and potential changes to national legislation.

Sources

- Day JC, Heron SF and Markham A (2020) Assessing the climate vulnerability of the world's natural and cultural heritage. *Parks Stewardship Forum* 36: 144–153.
- Osipova E, Shadie P, Zwahlen C, Osti M, Shi Y, Kormos C, Bertzky B, Murai M, Van Merm R, Badman T (2017). IUCN World Heritage Outlook 2: A conservation assessment of all natural World Heritage sites. Gland, Switzerland: IUCN. 92pp.
- Osipova E, Emslie-Smith M, Osti M, Murai M, Åberg U, Shadie P (2020) IUCN World Heritage Outlook 3: A conservation assessment of all natural World Heritage sites, November 2020. Gland, Switzerland: IUCN. x + 90pp. <https://doi.org/10.2305/IUCN.CH.2020.16.en>

THE CURONIAN SPIT



Historical efforts to stabilise and develop the sand dunes characterise the human interaction with the environment recognised by the World Heritage inscription
(Curonian Spit National Park Administration archives)

2.1 Location of the Curonian Spit

The Curonian Spit is a 98-kilometre (61-mile) long, thin, sandy peninsula that separates the shallow Curonian Lagoon from the Baltic Sea (Figure 2.1). The Spit stretches from the Sambia Peninsula in the south to its northern tip next, separated by a narrow strait from the port city of Klaipėda on the Lithuanian mainland (Figure 2.2). The northern 52-km (32-mile) long stretch of the Curonian Spit lies in Klaipėda County, Lithuania, while the remainder is part of Kaliningrad Region of the Russian Federation. The width of the slightly concave arc-shaped Spit varies from a maximum of 3.8 km (2.4 mile) in Lithuania (just north of Nida) to a minimum of 400 m (0.25 mile) in Russia (near the village of Lesnoy).

One main road traverses the entire length of the Curonian Spit. Car ferries provide a transportation link between Klaipėda and Smiltynė, near the northern tip (Figure 2.2).



Figure 2.1 Satellite image of the Curonian Spit (July 2006)
Source: NASA/METI/AIST/Japan Space Systems

2.2 The Curonian Spit World Heritage property

In 2000, the entire Curonian Spit was inscribed on UNESCO's World Heritage List. The total area of the transboundary WH property is 33,021 hectares (26,400 ha in the territory of the Republic of Lithuania; 6,621 ha in the Kaliningrad Region of the Russian Federation). Of this area, 49% is on land, 13% is within the Curonian Lagoon, and 38% is within the Baltic Sea.

In Lithuania (Figure 2.3), the extent of the WH property coincides with the original area of the Curonian Spit National Park ('*Kuršių Nerija*'), as established in 1991. The Curonian Spit National Park in Lithuania was slightly modified in 2010 and 2023 to its current area of 27,389 ha. The land of the National Park in Lithuania is predominated by forest and is exclusively state-owned; the territory is administered by the municipalities of Neringa and Klaipėda. In the Russian component of the Curonian Spit, another National Park ('*Kurshskaja Kosa*') was declared in 1987.



Figure 2.2 Map of the Curonian Spit
Source: Lithuanian Wikipedia created by H. Padleckas, 8 July 2005

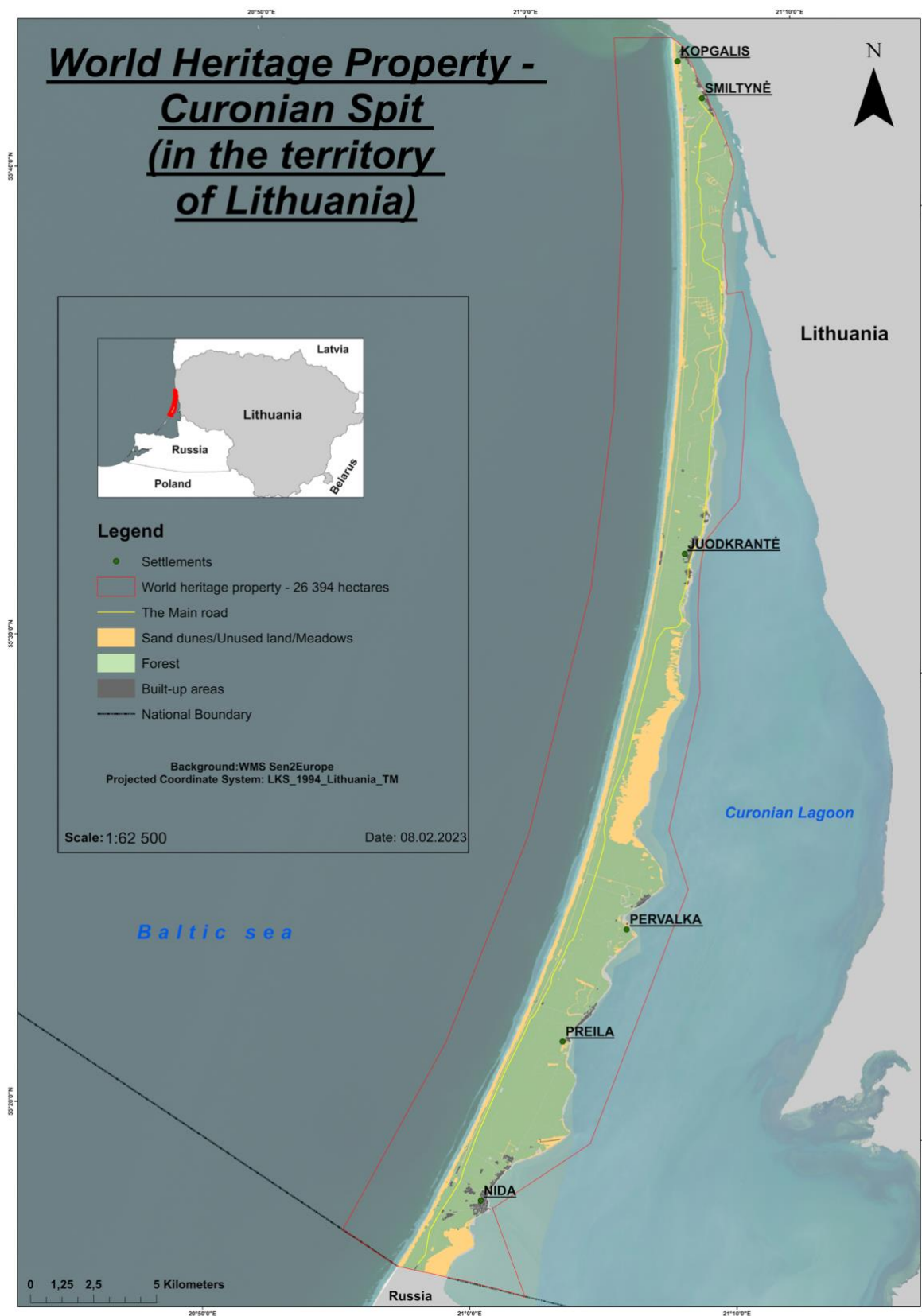


Figure 2.3 Indicative land cover/land use for the Lithuanian component of the Curonian Spit World Heritage property, with the property boundary extending into the Baltic Sea and the Curonian Lagoon
Source: supplied by Curonian Spit National Park Administration

2.3 The context surrounding the Curonian Spit WH property

No buffer zone has been designated for the WH property. However, certain areas, such as the biosphere polygons of the Baltic Sea and the Curonian Lagoon (Figure 2.4), effectively function as buffer zones. These areas are subject to stricter regulations than those outlined in Lithuanian legislation for national park buffer zones.

The Baltic Sea is a unique seascape with substantial marine biodiversity, including an estimated 100 species of fish, 450 species of macroalgae, 1,000 zoobenthos species, 3,000 plankton species and many thousands of unknown species of bacteria and viruses² (Figure 2.4–left panel). Multiple countries³ share maritime boundaries in the Baltic Sea and the area has a range of maritime uses. As such, a regional sea convention was established in 1974 to protect the Baltic marine environment. The convention is administered by an intergovernmental organisation, the Baltic Marine Environment Protection Commission

(also known as HELCOM) that adopts recommendations relating to the protection of the marine environment and sustainable maritime activities throughout the Baltic Sea. The entire Lithuanian part of the Curonian lagoon is protected as a *Natura 2000* area, managed by the local authorities (Figure 2.4–right panel).

The northern part of the Curonian Spit WH property borders the Klaipėda State Seaport⁴. This is an intensive-use seascape zone, regulated for heavy maritime use. Priority is given to areas related to port operations (anchorage, access channels, dredging sites, etc.), corridors and facilities of engineering infrastructure, and sustainable fishing practices that do not disrupt the ecological and biological balance of water resources.

The comprehensive plan for this state seaport (land, internal waters, outer roads and related infrastructure) was approved by the Lithuanian Government in 2019 (Resolution No. 1278). The port plan specifies that any work cannot contradict the

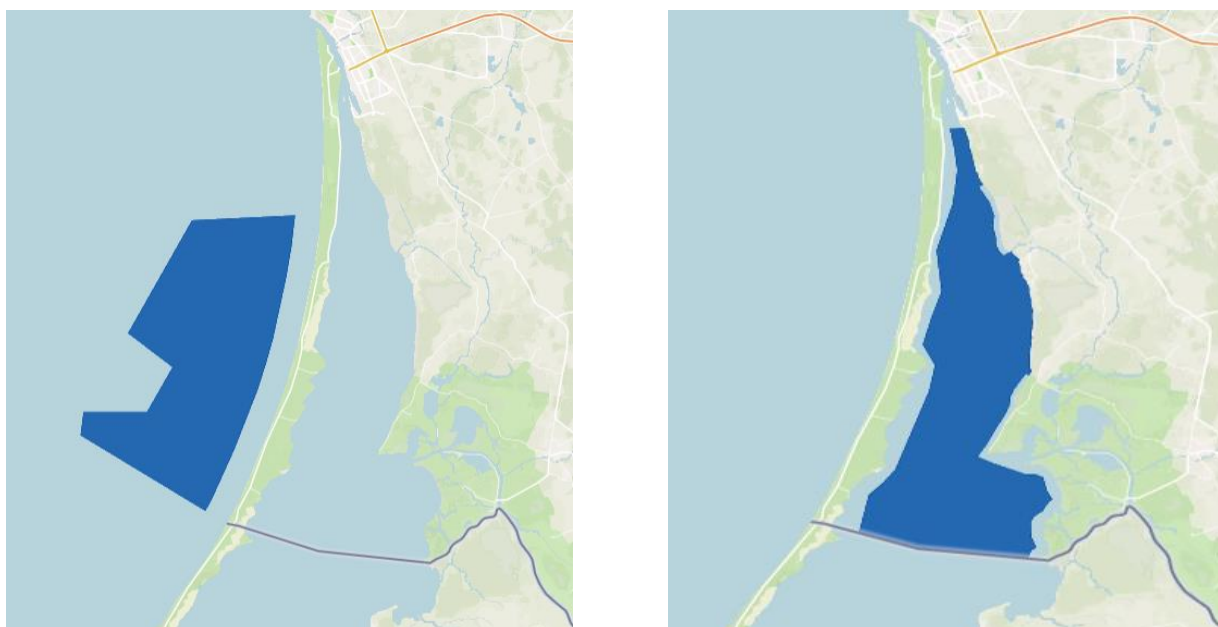


Figure 2.4 Maps showing two biosphere polygons declared as State Protected Areas by the Ministry of Environment of Lithuania. The purple line marks the border between Lithuania and Russia.

Source: Protected Planet, <https://www.protectedplanet.net/396147>

² <https://helcom.fi/baltic-sea-trends/biodiversity/>

³ The HELCOM contracting parties comprise Denmark, Estonia, the European Union, Finland, Germany, Latvia, Lithuania, Poland, Russia and Sweden.

⁴ For more information, see <https://portofklaipeda.lt/en/main-page/>

Special Management Plan of the Curonian Spit National Park⁵ (hereafter Curonian Spit Special Plan) or national legislation. During preparation of the port plan, a strategic environmental impact assessment was conducted to evaluate economic, environmental and social aspects so as to identify the optimal port development. This best option would harmonise the interests of the port, Klaipėda city and the Curonian Spit as a UNESCO WH property.

National plans also influence the functioning of the WH property. The Comprehensive Plan of the Republic of Lithuania 2030, approved by the Government on 29 September 2021 (Resolution No. 789), does not include plans for the installation of wind turbines in the Baltic Sea near the Curonian Spit (beyond the national park boundaries). This means no areas within or adjacent to the WH property have been designated for the development of renewable energy resources.

2.3 Physical geography and landscape

From a geomorphological perspective, the Curonian Spit is a young formation shaped by accumulation processes that began around 7,000 years ago. These processes were driven by the interaction of sea waves and currents, which formed the Spit's core structure, and wind, which sculpted its relief. The Spit's foundational structure took shape during the Littorina Sea epoch; the Spit continues to evolve through ongoing processes such as sediment accumulation, erosion, dune reshaping, vegetation expansion and wetland formation.

The Curonian Spit has starkly different coastlines. The Baltic Sea coastline, shaped by wind and waves, is relatively flat, whereas on the lagoon side, the dunes, such as the parabolic dunes near Juodkrantė and Nida, retain their ancient crescent shapes. Natural forces still impact both coasts: storms erode the protective foredune ridge along the Baltic coastline, while lagoon currents wear away shores and reshape bays. Strong westerly winds send sand sliding into the lagoon.

Central to the Spit's identity is the Great Dune Ridge, a striking 'spine' that in some places rises over 50 m above sea level, providing the peninsula's iconic

silhouette and preserving its geomorphological legacy. The highest dune, *Vecekrug*, reaches 64 meters.

Human activity has significantly influenced this unique landscape. Intensive deforestation in the 17th–18th centuries turned parts of the Spit into drifting sand deserts. Stabilisation efforts in the 19th–20th centuries included afforestation and the construction of a protective foredune ridge. Built over nearly a century and standing 7–16 meters tall, these protective works illustrate the community's efforts to halt the shifting sands.

Today, the Curonian Spit is a semi-natural landscape with minimal urbanisation, enriched by historical, cultural and modern features. The terrain is entirely sandy, encompassing a variety of dune systems — white (bare sand), gray (moss/lichen-covered) and forested. Wind actively reshapes the open dunes, while the forested dunes remain stable.

2.4 Biodiversity of the Curonian Spit

The Curonian Spit hosts a diverse mosaic of ecosystems: the lush lagoon shoreline contrasts with savannah-like meadows and the white deserts, whilst wetlands are interspersed between dry sand dunes (Figure 2.5). Forests cover 72% of the Curonian Spit, ranging from old-growth forests and verdant groves to mountain pine stands.

The forests are essential for stabilising the landscape of the Spit. Historically, natural forests were lost to deforestation, leading to massive sand drifts. Today, planted forests, particularly mountain pines introduced in the 19th century, shield the dunes. These hardy trees adapt well to barren sand but age quickly in the dry soil, requiring continuous management to mitigate fire risks and promote regeneration.

The Curonian Spit's Billberry Scots pine forests, some over 200 years old, with a few pines as ancient as 300 years, grow on the old parabolic dunes near Juodkrantė and Nida. Spruce and oak trees mix with the pines. In the 19th century, when Juodkrantė became a resort, this forest gained prominence and was called the 'Forest Cathedral'. Doctors prescribed therapeutic walks through its serene beauty, and today, the old promenades remain, inviting leisurely

⁵ Curonian Spit National Park Management Plan (adopted 2012, last amendment 2022) via <https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/TAIS.428043/asr>



Figure 2.5 The Curonian Spit contains myriad habitat types, including coastal marshes, wetlands, old-growth forests and vibrant meadows.

Source: Curonian Spit National Park Administration, Nendrė Žilinskaitė, Renata Kilinskaitė

strolls. In early summer, the old-growth forest floor is adorned with blooms of the tiny pink bells of the twinflower (*Linnaea borealis*), a delicate woodland relic beloved by Karl Linnaeus, the father of botany.

Dune and Sand Grassland Plants

The Curonian Spit's plant life has adapted to thrive in sandy, dry soils, strong winds, shifting sands, and salty water (Figure 2.6). The seashore is home to sea sandwort (*Honckenya peploides*), Baltic searocket (*Cakile baltica*) and saltwort (*Salsola kali*), the latter listed as endangered in the Red Book of Lithuania⁶. The foredune ridge is covered with drought-tolerant sandy plants such as European beachgrass (*Ammophila arenaria*), sand ryegrass (*Leymus arenarius*) and fescue (*Festuca sabulosa*) whose deep

roots anchor the sand. Colourful flowering plants, such as beach pea (*Lathyrus maritimus*) and goats beard (*Trogopogon heterospermus*), brighten the dunes.

The Gray Dunes get their name from mosses and lichens that cover their surface, trapping moisture and preventing erosion. Low-growing herbage grasses such as gray hair-grass (*Corynephorus canescens*) and sand sedge (*Carex arenaria*) dominate the landscape, while wildflowers, like blue daisy (*Jasione montana*) and wild thyme (*Thymus serpyllum*), add colour in summer. In autumn, the bushes of black crowberry (*Empetrum nigrum*) are covered with shiny berries. Fungi, including the dune stinkhorn (*Phallus hadriani*) and dune brittlestem (*Psathyrella ammophila*), play a key role in breaking down organic matter and helping to stabilise the dunes.

⁶ <https://am.lrv.lt/lt/nuorodos/lietuvos-raudonoji-knyga-1/>



Figure 2.6 Dune plants abound; however, some species are listed in the Red Book of Lithuania: (clockwise from top-left) Sea sandwort, Baltic searocket, European beachgrass, Baltic toadflax, Saltwort.

Source: Curonian Spit National Park Administration, Žygimantas Valiuška

Rare and Protected Species

The Curonian Spit hosts some extremely rare plants. One is the Baltica toadflax (*Linaria loeselii*), an endemic plant that grows only in this region. Sea holly (*Eryngium maritimum*), featured on the National Park's coat of arms, is highly protected. Conservation efforts include a sea holly nursery, where plants are germinated from seed and cultivated as part of the management of this rare species.

Fauna of the Spit

The Curonian Spit's animals live in a unique, resource-scarce environment. Moose, the symbol of the Spit,

thrive in dense forests, helping maintain open habitats by feeding on young pines. Wild boars, foxes and roe deer (Figure 2.7) also roam the area, adapting to limited food and water sources.

The dry, barren sands host rare insects (Figure 2.7), including the Red Book⁶-listed pine chafer (*Polyphylla fullo*, vulnerable), dune tiger beetle (*Cicindela maritima*, vulnerable) and shore earwig (*Labidura riparia*, near-threatened). The antlion (*Myrmeleon formicarius*) constructs traps in the sand for ants, while earwigs burrow deep into the sand during winter.

About 300 bird species have been recorded on the Spit (Figure 2.7), including 60 listed in the Red Book of



Figure 2.7 The Curonian Spit is renowned for its diversity of mammals (red fox, roe deer, hedgehog), insects (pine chafer, dune tiger beetle shore earwig, antlion) and birds (tawny pipit, common shelduck, white-tailed eagle).

Source: Curonian Spit National Park Administration, Antanas Beniulis, Kristin Heron (CVI), Vytautas Knyva

Lithuania. Rare species, such as tawny pipit (*Anthus campestris*, near-threatened) and common shelduck (*Tadorna tadorna*, endangered), nest in the area, while white-tailed eagle (*Haliaeetus albicilla*, near-threatened) and the large colonies of the great cormorants (*Phalacrocorax carbo*) also make their home here. Despite their controversial reputation, cormorants play a crucial role in promoting biodiversity, as their nesting grounds attract a wide variety of wildlife.

The Curonian Spit lies along the White Sea-Baltic Sea migration route, with 15 million birds passing through the region each year. Birds stop here to rest and feed, and around 10,000 birds are ringed each season at the Juodkrantė Bird Ringing Station.

2.5 Human Habitation

The Curonian Spit has a rich history, with human habitation beginning around 5,000 years ago. This unique landscape has long served as a crossroad of cultures, reflected in its deep historical connections to Europe. Over the centuries, it has undergone significant transformations.

In the 13th–15th and 18th centuries, the Curonian Spit was a vital thoroughfare, serving as a military route during various conflicts. Its strategic importance led to the establishment of Curonian (*Kuršininkai*) settlements that supported travellers, resulting in the construction of taverns and postal stations. It then functioned as an important European postal road in the 17th–19th centuries.

However, life on the Spit was difficult. Agriculture was scarce due to the desert-like landscape, forcing the local population to rely heavily on fishing, which was not just a profession but a way of life for the *Kuršininkai*. Environmental challenges added to these hardships. Centuries of deforestation left the region vulnerable to shifting sands, which gradually buried at least 14 villages between the 16th and 19th centuries. Although residents managed to relocate their homes, much of their cultural heritage remained buried beneath the dunes.

Once the sands were stabilised, the Curonian Spit evolved into a popular destination for tourists from nearby Germany. When the lagoon was deepened in the late 1850s, ferries were able to access different parts of the Spit and tourism began to flourish. The development of waterways allowed steamboats to navigate the area. Juodkrantė, once a fishing village, became the first resort on the peninsula.

In the course of the lagoon deepening, samples of amber were found just north of Juodkrantė. In 1860 the Stantien & Becker company was founded and, during 30 years of operations, about 2,250 tonnes of amber were removed. Juodkrantė soon developed a steamboat pier, a lagoon promenade, scenic forest paths designed by landscape architects and elegant villas, which continue to charm visitors.

Industrialisation efforts in Smiltynė, near the Klaipėda seaport, began in the late 19th century to combat the shifting sands. These efforts led to the creation of a protective foredune ridge and to large-scale dune afforestation projects along the Spit. With the sands stabilised, fishermen could finally settle without fear of being forced to move.

Despite this transition from fishing villages to tourist hubs, the local population continued to rely primarily on fishing. However, the rise of tourism began to transform the peninsula, with fishermen's homes contrasted by luxurious villas.

As the tourists arrived, the Spit also attracted renowned scientists, artists, writers and other notable travellers. In the late 19th and early 20th centuries, artists, inspired by Hermann Blode's initiatives, began to gather in Nida, further solidifying the region's reputation as a resort destination. Nida earned the reputation of an artists' haven—a title it still holds today. In the late 19th century, it hosted an artists'

colony and became the summer retreat of writer Thomas Mann.

The 20th century brought both growth and disruption. The Curonian (Kuršininkai) population was forced to leave their homes during World War II, with only 13% returning afterwards, leading to significant demographic and cultural shifts (explored further in Section 3.4). The Curonian Spit became part of the Soviet Union and, in 1961, the town of Neringa was established to unite its settlements. Fishing and forestry remained the primary economic activities but the Iron Curtain dramatically altered tourism in the region.

Since Lithuania regained independence in 1991, the population of the Curonian Spit has grown, with new residents arriving from across Lithuania and beyond. Strict regulations, introduced in the mid-20th century and upheld through local efforts, have preserved the Spit's character. Historical settlements remain, connected to each other by the main road and via ferries from Smiltynė; traditional water transports also link the Spit settlements to the mainland.

Today, there are numerous small settlements along the Curonian Spit (Figure 2.2); from north to south:

- Smiltynė, Juodkrantė, Pervalka, Preila, Nida and the homestead of Alksnynė (in Lithuania)
- Morskoye, Rybachy, Lesnoy (in Russia)

Nida is the administrative centre of Neringa Municipality and captivates visitors with its rich historical heritage, enduring creative spirit and the nearby Parnidis Dune. The smaller settlements of Preila and Pervalka are known for their tranquil ambiance, spectacular sea and dune views and Pervalka's unique lagoon-based lighthouse, a symbol of the peninsula's industrial era.

Smiltynė hosts the Lithuanian Sea Museum, Dolphin Therapy Center and Baltic Sea Animal Rehabilitation Center. From here, visitors can see the bustling Klaipėda Seaport.

Today, the Curonian Spit has become one of the most prestigious and exclusive resort areas in Lithuania, whilst preserving its historical character. Surrounded by the tranquillity of nature, newcomers are establishing their second homes here, while the peninsula itself has become a drawcard for visitors from around the world.

2.6 Analysis of Curonian Spit Outstanding Universal Value (OUV): Values and Attributes

When formally listed as a WH property, the significant values and attributes are summarised by UNESCO in a Statement of Outstanding Universal Value (SOUV). This is a static description of the values of the property referenced to the date of inscription. The SOUV for the Curonian Spit (Appendix 1) forms part of the property's UNESCO webpage. Prior to the CVI workshop, the CVI developers undertook their typical analysis to distil and group SOUV excerpts into a small number of high-level key values. At the same time, managers of the Curonian Spit National Park in Lithuania were pursuing a similarly purposed analysis of values and attributes. Noting a high degree of correspondence, it was determined that the latter (locally-produced) values summary would be used for the CVI workshop to ensure consistency with other activities.

The five key values (KVs) identified for the Lithuanian component of the Curonian Spit WH property are:

- 1 A unique and vulnerable coastal cultural landscape;
- 2 Human efforts to restore suitable living conditions;
- 3 Natural heritage;
- 4 Authentic historical cultural heritage;
- 5 Traditions, spirituality and local lifestyle

These became the foundation for the initial assessments in the CVI process. Each value is characterised by a series of associated attributes (listed in Table 2.1), which are the elements that convey the heritage/conservation values and enable an understanding of those values. Attributes can be physical qualities, material fabric and other tangible features but can also be intangible aspects such as processes, social arrangements, cultural practices, associations and relationships that are reflected in physical elements of the property. Management is typically undertaken considering the tangible attributes but may also consider intangible aspects. Values and attributes are associated with SOUV excerpts (Table 2.1).

2.7 Current condition and recent trend for the attributes of the identified key World Heritage values

Participants in the CVI workshop assessed the current condition and recent trend of identified attributes associated with the five KVs (Table 2.1, legend on pp. 12 and 16). Two-fifths (12 of 30) of the attributes were assessed to be in Good condition (green), with a further two-fifths evaluated as Good with some concerns (light green). The remaining 20% (six attributes) were considered to be of Significant concern (orange), comprising:

- Tangible attributes of:
 - non-forested shifting gray and white dunes of the Great Dune Ridge (KV3);
 - lagoon peninsulas formed from slipped parts of the dune ridge and their associated bays (KV3);
 - sand flora and fauna (KV3); and
 - elements of marine cultural heritage (KV4);

and

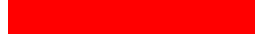
- Intangible attributes related to:
 - the ethnography of fishermen's lifestyle and folklore (KV4); and
 - modern community involvement in heritage preservation (KV5).

Five of these attributes of Significant concern were evaluated to have shown recent deterioration (downward arrow), with the last attribute in that group assessed as having an unknown recent trend. A further four attributes (in better condition) were also assessed to have deteriorated (in total, nine attributes had deteriorated). Precisely half (15 of 30) of the attributes were considered to have been stable since inscription, whilst five attributes were assessed as having improved (upward arrow) since the time of inscription. These five included both tangible (planted forests, KV2; Baltic Sea coast, KV3) and intangible (methods for forest management, KV2; traditional crafts and arts, KV4; and the preservation of cultural memory, KV5) attributes.

In summary, whilst 80% of attributes were evaluated to be Good or Good with some concerns and two-thirds had improved or remained stable in their condition since inscription, the corollary is that there is a significant proportion of the WH property for which improvement to the recognised values is desirable.

Table 2.1 Key values derived from the Statement of Outstanding Universal Value, together with the current condition and recent trend (CCRT) since inscription in 2000 assessed within the CVI process (legend below table).

Key values	Excerpts taken directly from the Statement of OUV	Attributes (site-specific characteristics that inherently contribute to a key value)	Assessment of current condition and recent trend (since 2000 inscription)
1. Unique and vulnerable coastal cultural landscape	- The Curonian Spit is a unique and vulnerable, sandy and wooded cultural landscape on a coastal spit which features small Curonian lagoon settlements. - Local communities adapted to the changes in the natural environment in order to survive. This interaction between humans and nature shaped the Curonian Spit cultural landscape. - The most valuable elements and qualities of the Curonian Spit cultural landscape are its unique size and general spatial structure, demonstrating the harmonious coexistence between humans and nature. - The cultural, natural and human-made elements of the Curonian Spit cultural landscape illustrate the most important features of its formation through their shapes, volumes, materials, and functions. - The entire area of the Curonian Spit cultural landscape reflects valuable qualities and underlying processes, retains historical functions and specific sustainable land use methods related to the peculiarities of the natural environment, and reflects the unique spiritual bond between humans and nature.	[T] Unique size, form and general spatial structure of the Curonian Spit [A narrow peninsula (98 km long, 0.4–3.8 km wide) formed 5,000 years ago between the Baltic Sea and the Curonian Lagoon]	
		[T] Forested dune landscape with lagoon settlements [A unique territorial spatial composition of natural elements (dunes, forests, seashores, meadows) and residential areas]	
		[T] Characteristic panoramas and silhouettes [A unique panorama of high dunes and forests with settlements and the silhouette of the Spit from the Curonian Lagoon]	
		[T] Historical parts of Nida, Juodkrantė, Preila, Pervalka, Smiltynė settlements and the homestead of Alksnynė [Distinctive landscapes of residential areas, their structure]	
		[I] Example of harmonious coexistence between humans and nature	

				Improved 	Stable 
Good The property's values are in good condition and are likely to be maintained for the foreseeable future, provided that current conservation measures are maintained	Good with some concerns While some concerns exist, with minor additional conservation measures the property's values are likely to be essentially maintained over the long-term.	Significant concern The property's values are threatened and/or may be showing signs of deterioration. Significant additional conservation measures are needed to maintain and/or restore values over the medium to long-term.	Critical The property's values are severely threatened and/or deteriorating. Immediate large-scale additional conservation measures are needed to maintain and/or restore values over the short to medium-term or the values may be lost.	Deteriorated 	Unknown 

Key values	Excerpts taken directly from the Statement of OUV	Attributes	CCRT (since 2000)
2. Human efforts to restore suitable living conditions	- The Spit was formed by the sea, wind and human activity and continues to be shaped by them. - Local communities adapted to the changes in the natural environment in order to survive. This interaction between humans and nature shaped the Curonian Spit cultural landscape. - After intensive logging in the 17th and 18th centuries, the dunes began moving towards the Curonian Lagoon, burying the oldest settlements. At the turn of the 19th century, it became evident that human habitation would no longer be possible in the area without immediate action. - After disastrous human interventions that menaced its survival, the Spit was reclaimed by massive protection and stabilization works that began in the 19th century and are still ongoing. - Dune stabilization work began, and has continued ever since. By the end of the 19th century, a protective dune ridge was formed along the seashore to prevent inland sand migration, and the Great Dune Ridge was reinforced using trees and brushwood hedges. - natural and human-made elements including the distinctive Great Dune Ridge [...] a human-made protective coastal dune ridge; [...] seacoast and littoral forests and littoral capes [...] mountain pine forests - The most vulnerable elements of the Curonian Spit cultural landscape are [...] the human-made protective coastal dune ridge, which is influenced by the natural coastal processes under the influence of global climate change. - unique methods of protective coast and dune ridge management and forest maintenance - The cultural, natural and human-made elements of the Curonian Spit cultural landscape illustrate the most important features of its formation through their shapes, volumes, materials, and functions.	[T] Parts of the Great Dune Ridge with forested dunes [Dunes liberated by humans, reshaped by nature, reinforced by humans, and still influenced by natural forces]	
		[T] Human-made protective foredune ridge [Protective coastal dune ridge created to stop sand movement into the Curonian Spit]	
		[T] Planted forests, including mountain pine forests [The Spit, denuded by intensive logging, was reforested. A unique formation is the pine and mountain pine forest-planted Great Dune Ridge]	
		[I] Methods of protective coast and Great Dune Ridge management	
		[I] Forest management and maintenance methods	

Key values	Excerpts taken directly from the Statement of OUV	Attributes	CCRT (since 2000)
3. Natural heritage	- The most valuable elements and qualities of the Curonian Spit cultural landscape are [...] distinctive Great Dune Ridge and individual dunes, relics of ancient parabolic dunes; seacoast [...] littoral capes; ancient forests, [...] unique sand flora and fauna including a bird migration path; - The history of the Curonian Spit is dramatic: 5,000 years ago, a narrow peninsula (98 km in length and 0.4-3.8 km in width), the Great Dune Ridge separating the Baltic Sea from the Curonian Lagoon, was formed on moraine islands from sand transported by currents, and later covered by forest. - The Curonian Spit is an outstanding example of a landscape of sand dunes that is under constant threat from natural forces (wind and tide).	[T] Parts of the Great Dune Ridge with remnants of ancient parabolic dunes [A unique part of the old dune ridge, never altered by natural forces or human activity]	
		[T] Parts of the Great Dune Ridge with individual dunes (T) (Vecekruogas, Urbas, Angiu, Preilos, Pervalkos, Giedruže etc.)	
		[T] Parts of the Great Dune Ridge with gray and white (shifting) dunes [A non-forested part of the Great Dune Ridge, actively influenced by natural forces and elements]	
		[T] Lagoon capes and bays [Unique lagoon peninsulas formed from parts of the slipped dune ridge]	
		[T] Old-growth forests [Ancient forests covering parabolic dunes]	
		[T] Unique sand flora and fauna	
		[T] Baltic sea coast	
		[I] Bird migration path	

Key values	Excerpts taken directly from the Statement of OUV	Attributes	CCRT (since 2000)
4. Authentic historical cultural heritage	- The most valuable elements and qualities of the Curonian Spit cultural landscape are [...] the spatial-planned structure and architecture of ancient fishermen villages turned into resort settlements (ancient wooden fishermen houses, professionally designed buildings of the 19th century, including lighthouses, piers, churches, schools, villas) - cultural elements including the remains of postal tracks, trade villages from the 10th and 11th centuries, traditional fishermen villages and other archaeological heritage covered by sand - The vitality, spirituality and special mood of the cultural landscape and its unique characteristics is further highlighted by authentic forms of local intangible heritage. These include the marine cultural heritage; traditional trades, folklore and artistic traditions; the ethnographic elements of the fishermen's lifestyles; unique methods of protective coast and dune ridge management and forest maintenance; sustainable recreational activities and a cultural leisure tradition dating back to the 19th century.	[T] Ethno-architectural heritage - old wooden fishermen's houses and decoration elements	
		[T] The heritage of professional architecture: buildings and their decor developed since the 19th century [Including churches, schools, villas, elements of resort infrastructure]	
		[T] Sand-buried and other archaeological heritage [Artifacts and cultural phenomena related to the post road, 16th-19th-century buried fishing villages, ancient settlements of Nida and Alksnynė]	
		[T] Marine cultural heritage [Historical transformation: amber mining and excavation, and associated shipping and resort growth, and lighthouses and piers]	
		[I] Marine cultural heritage [fishing methods in the sea and lagoon, traditions (ice fishing for smelt with drums), flat-bottomed boats (<i>kurenai</i> , <i>vytinės</i>); navigation signals (lighthouse signals, etc.), distinguishing signs],	
		[I] Traditional crafts and arts [The tradition of building old Curonian boats - <i>kurenai</i> ; Making of weathervanes, unique ship identification signs used since the mid-19th century; Making of authentic forms of crosses (<i>krikštai</i>), preserved in the old Nida cemetery]	
		[I] Ethnographic elements of fishermen's lifestyle and folklore [Curonian language, songs, fishing (catching smelt, <i>vimba</i>), traditional dishes, crow hunting tradition, fish drying and smoking typical of the coastal region in the 17th-19th centuries; net knitting and mending]	

Key values	Excerpts taken directly from the Statement of OUV	Attributes	CCRT (since 2000)
5. Traditions, spirituality and local lifestyle	- the social-cultural traditions, spirituality, and the social perception of the area, which reflect the local lifestyle formerly centred on fishermen, artists, scientists, yachtsmen and gliders, travellers and other visitors - the spatial-planned structure and architecture of ancient fishermen villages turned into resort settlements - The vitality, spirituality and special mood of the cultural landscape and its unique characteristics is further highlighted by authentic forms of local intangible heritage. These include the marine cultural heritage; traditional trades, folklore and artistic traditions; the ethnographic elements of the fishermen's lifestyles; unique methods of protective coast and dune ridge management and forest maintenance; sustainable recreational activities and a cultural leisure tradition dating back to the 19th century. - The cultural, natural and human-made elements of the Curonian Spit cultural landscape illustrate the most important features of its formation through their shapes, volumes, materials, and functions. The authenticity of the landscape is reflected by the tangible and spiritual values of the different historical periods that shaped its identity. - The local community is directly involved in the conservation of the property's tangible heritage and also carries the region's intangible heritage.	[I] Sociocultural traditions, spirituality, and social perception [traditionally shaped local life by fishermen, artists, scholars, sailors, traders, travelers, and other visitors]	
		[I] Harmonious recreational activities and cultural leisure traditions developed since the 19th century [centuries-old tradition of hospitality]	
		[I] Preservation of cultural memory	
		[I] Involvement of modern local communities in heritage preservation	

Good	Good with some concerns	Significant concern	Critical	Improved	Stable
The property's values are in good condition and are likely to be maintained for the foreseeable future, provided that current conservation measures are maintained	While some concerns exist, with minor additional conservation measures the property's values are likely to be essentially maintained over the long-term.	The property's values are threatened and/or may be showing signs of deterioration. Significant additional conservation measures are needed to maintain and/or restore values over the medium to long-term.	The property's values are severely threatened and/or deteriorating. Immediate large-scale additional conservation measures are needed to maintain and/or restore values over the short to medium-term or the values may be lost.		
					
				Deteriorated	Unknown

Sources

- Biosphere polygons declared as State Protected Areas by the Ministry of Environment of Lithuania, Protected Planet website. Available at: <https://www.protectedplanet.net/396147>.
- Biodiversity, Baltic Sea Knowledge, Helcom. Available at: <https://helcom.fi/baltic-sea-trends/biodiversity/>.
- Curonian Spit National Park (2023) Representative publication.
- Curonian Spit (Lithuanian component) Management Plan (to be adopted in 2025).
- Curonian Spit National Park administration (2023) Landscape. Available at: <https://nerija.lrv.lt/lt/apie-nacionalini-parka/krastovaizdis/>.
- Curonian Spit National Park Management Plan (territorial planning) (adopted 2012, last amendment 2022). Available at: <https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/TAIS.428043/asr>.
- Knutux, H. and Padleckas (2005) Map of Curonian Spit. Lithuanian Wikipedia.
- NASA METI AIST (2006) Satellite image of Curonian Spit. Japan Space Systems.
- Ravaityte-Meyer, R. (2019) Kuršių nerijos istorija - kitu žvilgsniu. Su prof. dr. Vasilijumi Safronovu kalbasi Raimonda Ravaitytė-Meyer, Kultūros almanachas Dorė. Spaustuvė Druka, Klaipėda. https://www.neringosvb.lt/wp-content/uploads/2021/01/DORE_2019_7.pdf.
- Safronovas, V. (2018) Migrantai ir pabėgėliai Kuršių nerijoje XX amžiaus viduryje, Klaipėdos universiteto Baltijos regiono istorijos ir archeologijos institutas, Vilniaus dailės akademijos leidykla.
- Sereika, R. (2021) Curonian Spit Travel Guide. Curonian Spit National Park Administration, Didakta, Vilnius. Available at: https://nerija.lrv.lt/uploads/nerija/documents/files/Vadovas_po_Kursiu_nerija_EN.pdf.
- State Service for Protected Areas (under the Ministry of Environment) (2019) Preparation of Landscape Structure Schemes for State Parks – Curonian Spit National Park https://vstt.lrv.lt/uploads/vstt/documents/files/VP_kr_st_r_schemas/Kursiu_nerijos_NP_krastovaizdzio_strukturos_schemas_aprasas.pdf.
- The Comprehensive Plan of the Republic of Lithuania 2030. Available at: <https://www.bendrasisplanas.lt/>.
- The General Plan for the Territory of the Municipality of Neringa and Parts Thereof (adopted 2012, amended 2023). Available at: <https://neringa.lt/veiklos-sritys/teritoriju-planavimas-ir-statyba/bendrasis-planas/508>.

MANAGEMENT AND USE OF THE CURONIAN SPIT WORLD HERITAGE PROPERTY



Traditional building techniques are an important
part of the Curonian Spit's cultural heritage
(*Kristina Valasevičienė*)

3.1 Managing and governance of the Curonian Spit

A multi-agency framework for management and governance is in place for the Lithuanian component of the Curonian Spit World Heritage property (Figure 3.1). The protection of the property component is overseen by the Ministry of Environment, as designated by a resolution of the Government of Lithuania. However, the responsibility for shaping policies to safeguard both cultural and natural values at the national level lies with two ministries: the Ministry of Environment and the Ministry of Culture, along with their subordinate institutions.

At the national policy formulation level, important roles are played by advisory expert bodies of the highest government institutions, namely the National Commission for Cultural Heritage of the Republic of Lithuania and the Lithuanian National Commission for UNESCO.

In the implementation of national policy, the State Service for Protected Areas (SSPA), under the Ministry of Environment, is actively involved. This body organises the preparation of special territorial planning documents; coordinates and consults relevant institutions; and oversees the implementation of measures for the protection of immovable cultural heritage within protected areas. The SSPA also serves as the National Focal Point for the implementation of the WH Convention.

The Department of Cultural Heritage, under the Ministry of Culture, is responsible for the protection of immovable cultural heritage and movable cultural assets registered in the Register of Cultural Heritage. In addition, it oversees the drafting of protection regulations, monitoring of cultural heritage sites and properties within protected areas and issuance of restoration permits.

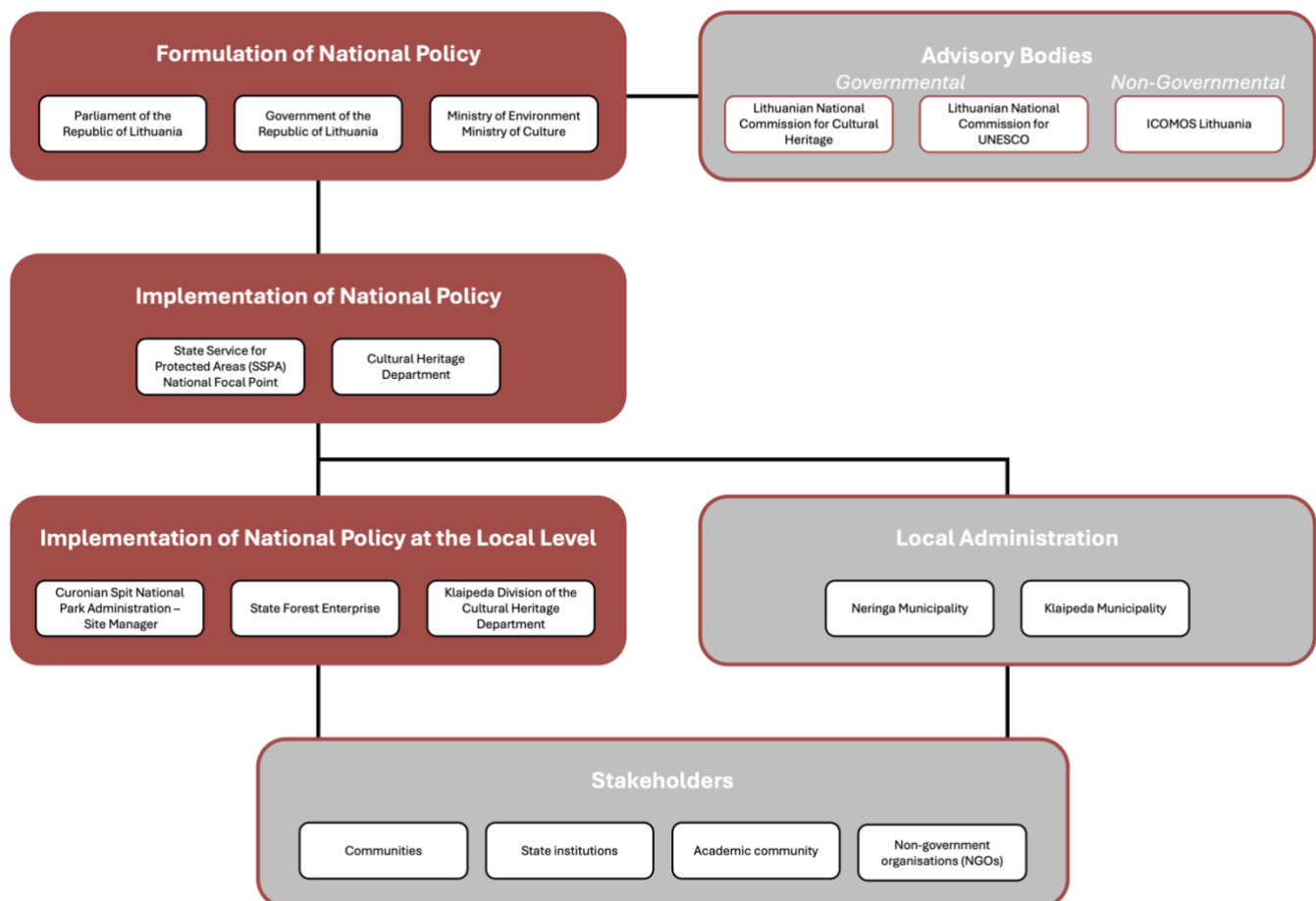


Figure 3.1 Management and governance framework for the Lithuanian component of the Curonian Spit, showing linkages between associated institutions and stakeholders.

Local Administration

As previously noted, the Curonian Spit WH property, coincides with the area of the Curonian Spit National Park that was established in 1991 (and has since been extended). The WH Site Manager is organisationally located within the administration of the National Park. In fulfilling the WH Convention, the park's administration is responsible for the management, monitoring, preservation, maintenance, information and interpretation of the Curonian Spit and its Outstanding Universal Value (OUV). In executing these functions, the park administration actively collaborates with the municipalities of Neringa and Klaipėda. The municipalities prepare and execute landscape development projects, manage forests within their jurisdictions and take part in handling emergency situations operations. In addition, they are responsible for the usage of cultural heritage, organisation of territorial planning, issuance of building and renovation permits and preparation of strategic documents that outline development priorities. They also organise the necessary infrastructure for recreation and regulate visitor flows.

Other Institutions Operating in the Curonian Spit

The management of the area also involves other institutions whose activities are directly related to monitoring and preserving the OUV of the property. These include the Environmental Protection Agency, the Environmental Protection Department, the Lithuanian Hydrometeorological Service and the State Forest Enterprise. Additionally, the Curonian Spit is a state border territory, which means that institutions under the Ministry of National Defence have administrative units in the area, while the State Border Guard Service, under the Ministry of the Internal Affairs, handles border security matters. Military exercises and continuous monitoring are conducted in the Curonian Spit. Nevertheless, established restrictions for the state protected area are adhered to.

The maritime area of the Curonian Spit WH property borders the Klaipėda State Seaport in the north. The Spit's northern tip, Koggalis, is popular with visitors.

Collaboration

The layered landscape of the Curonian Spit, marked by its biodiversity, cultural, geological and geographical uniqueness, necessitates the involvement of numerous institutions, including academic and cultural communities, in monitoring, conserving and raising awareness of the property's values. Scientific research is conducted by various branches of universities from Klaipėda, Vilnius and Kaunas; the Nature Research Centre; and representatives of international initiatives. Efforts to nurture cultural memory and educate both residents and visitors are undertaken through tourism, culture and information centres, as well as artist, writer and scientist residencies, museums, galleries, local communities and public figures.

3.2 Key considerations for management

A variety of threats to the OUV of the Curonian Spit has been identified through the UNESCO Periodic Reporting process. Many are addressed within the Special Management Plan of the Curonian Spit⁷ (hereafter Curonian Spit Special Plan). These are currently being examined as part of the development of the Curonian Spit Management Plan (planned for 2025 publication) in conjunction with various local and national institutions as well as field experts, researchers and stakeholders.

The key threats to the WH property are:

- Pollution of marine and lagoon waters
- Infrastructure development
- Impacts of tourism/visitation/recreation, such as related to increasing ground transportation
- Severe weather events, such as storms, temperature change and flooding
- Acute ecological or geological events, such as erosion and wildfire.

⁷ Curonian Spit National Park Management Plan (adopted 2012, last amendment 2022) via <https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/TAIS.428043/asr>

While some of these threats may seem to have minimal relevance to climate change, their potential to impact the natural and cultural values and the community is pertinent. This in turn may influence the social and ecological resilience of areas within the property to cope with a changing climate.

Pollution of marine and lagoon waters

According to data from the past decade, the condition of the Curonian Lagoon and the Baltic Sea is of concern. These water bodies have become eutrophic, with frequent exceedances of hazardous substance levels in water, sediment and living organisms. Biodiversity is disrupted by human activities and climate change-related effects. The most recent six-year assessment of the environmental status of the Baltic Sea region (based on data from 2012–2017)⁸ revealed that the Baltic Sea area under Lithuanian jurisdiction does not meet the criteria for good environmental status (GES) in 9 out of 11 qualitative assessment aspects. Two aspects—hydrographic conditions and underwater anthropogenic noise—were not analysed due to a lack of data and information. Monitoring of underwater noise in the Baltic Sea was initiated in 2022 with the aim to assess the current noise levels and determine what may be acceptable levels necessary to ensure no negative impacts on living marine organisms or the ecosystem as a whole⁹.

Measures to improve water quality in the Curonian Lagoon and the Baltic Sea are provided in the Comprehensive Plan of the Republic of Lithuania 2030¹⁰. To improve and maintain the state of the marine environment in the Curonian Lagoon and the Baltic Sea, it is necessary to reduce the release of nutrients that promote eutrophication into the environment, regulating the use of fertilising products and increasing the efficiency of wastewater treatment.

The northern part of the Curonian Lagoon is intensively used for the needs of the Klaipėda State Seaport (see below) and the adjoining city. One source

of concentrated pollution is wastewater discharged by companies operating in the port¹¹.

A further maritime threat is the approximately 40,000 tons of chemical ammunition and ~300,000 tons of conventional munitions dumped in the Baltic Sea after the Second World War. Their condition is unknown but they may pose a threat to the maritime regions of countries across the entire Baltic Sea region¹⁰.

Infrastructure development – maritime-based

The Klaipėda State Seaport does not fall within the property but, due to its immediate vicinity, it has a visual and physical impact on the northern part of the property. The Klaipėda State Seaport Development Plan 2030 includes several projects aimed at increasing the seaport's capacity, modernising its infrastructure, ensuring sustainable growth and adapting to changing maritime transport trends. The southern part of the seaport is scheduled to expand. The Curonian Spit Special Plan also regulates the construction of the northern gateway of the Klaipėda seaport (the southern pier and the breakwater) to protect the existing natural values.

The proximity of the Klaipėda seaport (Figure 3.2) poses potential environmental risks to the WH values of the Curonian Spit, which is why proper planning of the seaport is essential. Potential physical impacts on the property may result from intensive maritime use, which (though regulated) prioritises port-related activities such as anchorage, dredging and marine infrastructure. The absence of a protective buffer zone in the northern part of the Spit raises concerns about pollution, shoreline erosion and altered water currents. Additionally, the expansion of the cruise terminal may lead to a rise in single-day visitors, which threatens the fragile ecosystem of the Spit and highlights the potential conflicts between development and heritage conservation.

⁸ Vanduo. 8 dalis „Kuršių marių ir Baltijos jūros būklė, pagrindiniai poveikiai“

<https://experience.arcgis.com/experience/08b18f0d2704442cbd47c902f71f9a87/page/vanduo/>

⁹ Source: Environmental Protection Agency under the Ministry of Environment via <https://gamta.lt/vanduo/kursiu-mariu-ir-baltijos-jura/tarsos-saltiniai-ir-gresmes/71>

¹⁰ The Comprehensive Plan of the Republic of Lithuania 2030 via <https://www.bendrasisplanas.lt/>

¹¹ Environmental Protection Agency under the Ministry of Environment via <https://aaa.lrv.lt/lt/veiklos-sritys/vanduo/kursiu-mariu-ir-baltijos-jura/tarsos-saltiniai-ir-gresmes/tiesioginiai-isleistuvai/>

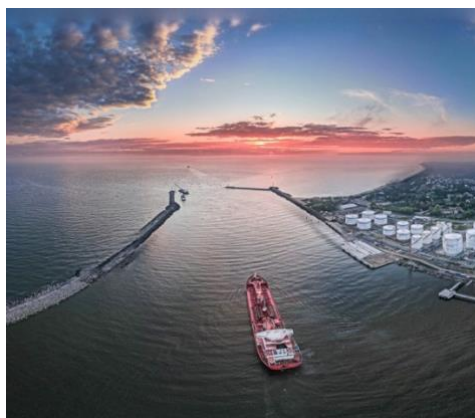


Figure 3.2 The sea gate spans approximately 150 m between the northern tip of the Spit (at left) and the Klaipėda Seaport, illustrating their proximity.

Source: Anzela Bazyk

Infrastructure development – land-based

Areas for development and infrastructure on the Curonian Spit are very limited. However, both the demand and pressure are high, which is why the local planning documents are very detailed. Part 2 of the General Plan for the Municipality of Neringa¹² (hereafter Neringa General Plan) and large parts of the Curonian Spit Special Plan are devoted to the development of built-up areas. These plans regulate the protection of historic buildings and sites, the regeneration and redevelopment of areas that are not protected for cultural heritage values and areas previously developed but now derelict. Both documents have a strong focus on detailed regulations covering individual plots, not just zones. Considerable attention is paid to aesthetic, functions, spatial configuration, height and volume of buildings. However, despite the strict regulation, violations occur from time to time, often causing major reactions not only in the Curonian Spit but nationwide.

Impacts of tourism/visitation/recreation related to increasing ground transportation

Tourism is the primary use of the Curonian Spit. While tourism offers opportunities for awareness-raising and education, it also presents risks, such as excessive use and unsustainable transportation practices. One concerning issue is the growing number of single-day visitors, especially during the high season (May to

August), that strains local resources and the environment.

Currently, there is no approved methodology to accurately determine the annual number of visitors to the Curonian Spit. According to data from the Department of Statistics, which accounts for individuals spending at least one night in official accommodation establishments, the total number of overnight tourists in the Neringa municipality was 55,847 in 2013. By 2023, this number had grown significantly to 90,995, representing a 63% increase. Over the past decade, domestic tourism has surged, with the number of Lithuanian tourists increasing by more than 2.5-fold, while international tourism has declined by almost half.

Nevertheless, the total number of visitors to the Curonian Spit in 2023 – including tourists, day-trippers, residents, and service personnel – transported via the two Smiltynė ferry crossings in both directions reached an impressive 2,706,602 travellers.

Before the COVID-19 pandemic, in 2019, 65% of the tourists were Lithuanian, and 35% were foreign visitors. However, by 2023, this ratio had shifted to 86% Lithuanians and 14% foreigners, reflecting changes in travel patterns due to the pandemic and its aftermath.

In terms of recreational activities, around 85% of visitors engage in passive leisure activities like relaxing on the beaches and walking in nature (Neringa Visitors Survey, 2020). The most popular forms of active recreation include cycling, jogging and Nordic walking. Other favoured activities include nature exploration, birdwatching, fishing, boating, visiting museums and galleries, attending events, and rowing or sailing.

The Neringa General Plan assesses the recreational capacity of different areas of the property according to their specific characteristics, with the aim to ensure appropriate protection of the property. The main objectives include improving the quality of the recreational system, reduction of seasonality, greater accessibility, environmental sustainability, enhanced cycling and water tourism, adaptation of cultural heritage sites, promotion of cultural tourism and

¹² The General Plan for the Territory of the Municipality of Neringa and Parts Thereof (adopted 2012, amended 2023) via <https://neringa.lt/veiklos-sritys/teritoriju-planavimas-ir-statyba/bendrasis-planas/508>

better links with the eastern Curonian Lagoon coast. The Neringa General Plan identifies a car traffic problem, which it proposes to address by regulating parking and improving the public transport system. The Curonian Spit Special Plan also focuses on the regulation of tourism infrastructure, and the development of water tourism and eco-camping, highlighting areas that are inaccessible by car.

Severe weather events

Storm events and heatwaves have resulted in impacts to the Spit. Sections of the protective coastal foredune ridge damaged during windstorms require repair and maintenance works (Figure 3.3), while heatwaves are associated with increased fire risk. However, both the Curonian Spit Special Plan and the Neringa General Plan currently lack measures or strategies to address acute or extreme weather events. The Neringa General Plan acknowledges the Spit is a significant cultural heritage asset and provides guidelines for its protection and use.



Figure 3.3 Maintenance of foredune ridge after a storm event.

Source: Curonian Spit National Park Administration

Acute ecological or geological events

For protection against coastal erosion, nature-based traditional protective measures (regeneration of the protective coastal foredune ridge, beaches, etc.) are recommended rather than synthetic measures (e.g., reinforced concrete), although there may be exceptions for settlements. The Curonian Spit Special Plan also addresses coastal management, setting more detailed measures in line with the Neringa General Plan, along with additional measures such as removing objects that degrade the lagoon shoreline

(unused structures, debris, etc.) and limiting visitor numbers.

Another major ecological threat is unplanned forest fire. The forests, covering over 70% of the land, are classified as Level 1 – the highest fire risk. This classification and the lessons following the major fires of 2006 and 2014 (which destroyed over 330 hectares of forest on the Spit), necessitate rigorous and appropriate forest management practices in the area. Consequently, the Neringa General Plan and the Curonian Spit Special Plan include measures to minimise forest fires. Fire safety plans are also recommended for cultural heritage properties (primarily wooden architectural structures), providing preventive measures in accordance with the identified possible risk factors.

The Forest Fire Protection Rules and Internal Forest Management Project for the Curonian Spit National Park, approved by the Lithuanian Minister of Environment, requires the State Forest Enterprise to implement the national forest fire protection system, and mandates the implementation of preventive measures and actions to mitigate the risk of forest fires:

"Over 70% of the Curonian Spit is covered by forests, making the area especially prone to fires due to lower relative humidity, as well as the forests' composition, age, and structure. To mitigate this risk, the Kretinga Regional Division of the State Forest Enterprise implements annual fire prevention measures, focusing on increasing the resilience of forest stands to fires and strengthening fire prevention infrastructure, such as access roads and water intake points. Residential land in the area is managed by the municipalities of Neringa and Klaipėda, while state-owned forest plots are overseen by the State Forest Enterprise. Unformed plots remain under the jurisdiction of the National Land Service, part of the Ministry of Environment."

[Representative of the Kretinga Regional Division of the State Forest Enterprise]

Additionally, during the high fire-risk period (March 15 to October 1), two fire response teams are on standby for firefighting in the Curonian Spit (Figure 3.4).



Figure 3.4 Fire management requires significant attention given that forests cover over 70% of the Spit.
Source: G. Grazulevicius.

3.3 Economic aspects of the Lithuanian component of the Curonian Spit

The high degree of seasonality in visitor numbers (greatest in the summertime) drives seasonality in many economic sectors of the Curonian Spit.

Tourism is the primary economic driver on the Curonian Spit and offers opportunities for awareness-raising and education; however, it also presents risks, such as excessive use and unsustainable transportation practices. A particularly concerning issue is the growing number of one-day visitors, especially during the high season (May to August), which strains local resources and the environment.

Recreation – many visitors engage in leisure activities (see Section 3.2) that directly link to economic opportunities, including bicycle rental; nature exploration and birdwatching tours; boat cruises and vessel hire (sailing, fishing); and museum and gallery entrance.

Water-based tourism is becoming increasingly popular for the Curonian Spit. However, the growth of interest is outpacing the development of the necessary pier infrastructure. While more water routes are being established, the development of local pier and intercity ferry infrastructure has been slow, limiting the area's capacity to accommodate growing demand and offer alternatives to car mobility.

Klaipėda State Seaport is a strategic asset for Lithuania, is committed to sustainable growth by implementing green policies and innovative technologies. The port's long-term strategy prioritises environmentally friendly solutions to support the blue economy while aiming to preserve the region's ecological balance. However, as described in Section 3.2, the proximity of the seaport to the Curonian Spit poses significant environmental risks.

Real Estate Development on the Curonian Spit is highly controlled to maintain the area's unique value. New constructions are only allowed on historically settled land or within areas designated by spatial planning documents. However, pressure from real estate developers seeking to capitalise on the area's prestige makes regulation increasingly difficult.

Due to the limited land area, real estate prices continue to rise, and the living space per inhabitant is relatively small compared to other municipalities. This makes it challenging for young families to settle in the region, as well as for local authorities to attract skilled professionals to live and work on the peninsula. Additionally, the accommodation market has shifted towards individual rentals, which are increasingly popular but have led to a decline in traditional accommodations such as hotels and bed-and-breakfasts, making it harder to accommodate large groups for events like conferences or group tours (as seen in Smiltynė).

Local Business – Neringa municipality boasts one of the highest employment rates in Lithuania, with most workers employed in micro-enterprises within the service sector, including accommodation, food services, and real estate. According to the 2023 Innovation Agency report, Neringa has the highest entrepreneurship level in the country, 2.5 times above the regional average, indicating strong labor market resilience.

The area shows favorable conditions for business growth, with rising GDP, investments, and cultural tourism. Between 2020 and 2023, there was an increase in cultural center participation (4.07%), museum visitors (81.82%), and attendees at sports and wellness events (292.75%). However, Neringa captures only a small portion of overall investments compared to national and regional trends, potentially

hindering future infrastructure modernization. High tourism seasonality, reflected in fewer off-season overnight stays, affects investment appeal. Although traditional tourism services dominate, a growing share of real estate activities may indicate shifts in the demand, reducing group accommodation options and increasing one-day visits, often redirecting tourists to stay in Klaipėda.

Fisheries – for centuries, fishing was the primary economic activity for the residents of the Curonian Spit. During the Soviet era, fishing became a key part of the national and Soviet Union-wide economy. However, as of 2023, commercial fishing has been restricted with a view to improving several fish stocks, forcing many local fishers to either abandon the trade or adapt to new realities.

The strategic development plan for the Neringa municipality raises concerns that traditional fishing may soon disappear altogether, as more profitable economic activities take precedence. The collapse of the fishing industry would represent a significant loss for the settlements of Neringa, as it is a vital part of their identity and cultural heritage. This loss could negatively impact the long-term development of the area, as the traditional fishing trade is a valuable asset for the region's tourism industry.

Forestry – about 72% of the land within the Lithuanian component of the Curonian Spit is covered by forests, many of which were planted. However, forestry has minimal economic significance on the Spit due to high costs associated with managing the fragile soil and low profitability. Regulations under the *Natura 2000* program focus more on nature management rather than economic exploitation of the forests. Nonetheless, forests still provide for some local heating needs, as wood is used for both town-wide and individual heating systems.

3.4 Social and Cultural Context

The narrow strip of land between the Baltic Sea and the Curonian Lagoon has created a unique environment that has long shaped the lives and survival strategies of its residents.

By the early 15th century, individual Curonians had begun settling on the Spit, and by the 16th century,

they had become the dominant population. The early inhabitants were forced to adapt; when threatened by shifting sands, they dismantled their homes and moved to safer areas, establishing new villages. Unfortunately, much of their cultural heritage was left buried beneath the sand dunes.

Isolated from mainland communities, the inhabitants developed a distinct dialect and culture, earning the name *Kuršininkai*. Due to the striking dune landscapes, the early inhabitants of the Curonian Spit, the *Kuršininkai*, were referred to as 'dune dwellers' (*kopininkai*) by people from across the lagoon. The Curonian Lagoon has always played a crucial role as both fishing grounds and a transportation route. The *Kuršininkai* often crossed the lagoon to barter their fish for food, goods, wood or livestock. Interactions with the mainland extended to marriage, with Curonian men frequently marrying women from the opposite shore.

The *Kuršininkai* preserved their traditions, language and beliefs for over 500 years. Despite periodic influxes of settlers from Lithuania or Germany, those who adopted fishing as a livelihood integrated into local traditions and adopted the *Kuršininkai* dialect. This dialect, derived from Latvian, incorporated Lithuanian, German, Prussian, and Samogitian elements and became the essential language of fishermen. While Lithuanian was commonly spoken at home and in church (where sermons were delivered in Lithuanian or German), the *Kuršininkai* dialect dominated fishing activities, as no other language provided the vocabulary needed for this trade.

At the end of 19th century, after more than a century, the large-scale dune afforestation works on the Curonian Spit sand dunes concluded. A new cultural era of resort development started bringing changes in architectural planning, and the artistic and scientific approach to the Spit. This period at the beginning of the 20th century is referred to as 'The Golden Age'.

However, human conflict became a turning point for the peninsula. Seven hundred years ago, the Curonian Spit first appeared in historical records due to its strategic military importance as a wartime route. At the advent of World War II in the mid-20th century, it again became a wartime route, including the forced exodus of the region's indigenous inhabitants. The *Kuršininkai* resettled elsewhere (many in Germany), with only 13% later returning to the peninsula. They became the sole custodians of the local cultural

heritage, preserving its memories for newcomers. During the Soviet era, profound political, cultural and demographic changes reshaped the region. In the immediate post-war years, settlers from various Soviet Republics began moving to the Spit, followed later by Lithuanians from different parts of the country. Over time, these newcomers became the dominant population. The transition brought both opportunities and challenges. The post-war period was marked by harsh living conditions and a lack of resources, which hindered the development of a cohesive community identity. However, efforts were made to preserve fragments of Curonian culture, with traditional arts, crafts and fishing practices documented despite the pressures of the Soviet regime.

Today, the Curonian Spit's demographic landscape continues to shift. The year-round population is approximately 3,000; in addition, many wealthy individuals from elsewhere maintain second homes in the area. This has created a dynamic but complex situation, characterised by an aging population, a declining number of schoolchildren and challenges in maintaining a cohesive local identity. Seasonality in visitation and, linked to that, the economy also has implications for society, particularly in the variable need for social services.

Since Lithuania regained independence, significant efforts have been made to celebrate and revitalise the unique cultural heritage of the Curonian Spit. Research and community initiatives focus on rediscovering Curonian culture; restoring traditional crafts and gastronomy; protecting historical architecture; and organising year-round festivals rooted in both Curonian and Lithuanian traditions. These activities honour the Spit's rich past while fostering a renewed sense of identity and belonging for its inhabitants. The Curonian Spit stands today as a testament to resilience, blending natural beauty with a vibrant cultural legacy.

3.5 Intertwined cultural and natural values

The Curonian Spit's distinctive cultural landscape is formed by harmoniously intertwined cultural and

natural heritage values. Two national laws refer to and regulate the integrity and complexity of immovable cultural heritage and natural assets (*Law on the Protection of Immovable Cultural Heritage* and the *Law on Protected Areas*). The general understanding had been that the former law was to protect built heritage and the second was to protect natural areas. Only since 2020 has sub-legislation come into force allowing for joint planning and management of these areas¹³.

Overlaps between the natural and cultural register locations can be seen in the example of the area around Nida. Cultural heritage sites (Figure 3.5) intersect with various levels of protected areas (Figure 3.6). Consequently, careful planning is needed to ensure that the protection of some values does not lead to the loss of others (e.g., restricted fishing in the Curonian Lagoon could lead to the disappearance of the traditional fishermen's way of life in the Curonian Spit). There is also a potential conflict in understanding the values and the application of different legal regimes for the protection of urban heritage sites, as the regulations for urban reserves under the two laws differs.

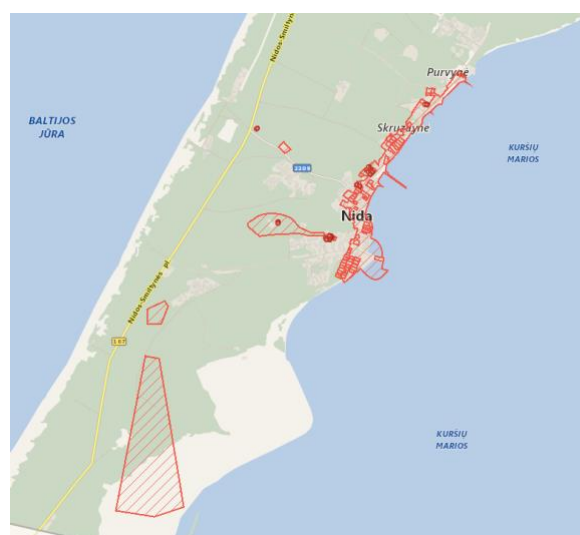


Figure 3.5 Cultural heritage areas (red hatching) around Nida.

Source: Register of Cultural Heritage

¹³ Order on the Adoption of Rules for the Preparation of Special Plans for Protected Areas, adopted by the Minister of Environment and the Minister of Culture, 2020

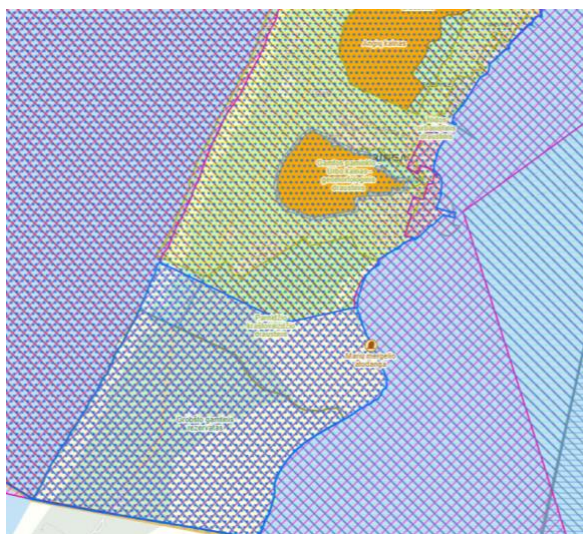


Figure 3.6 Natura 2000 important sites for bird conservation (pink), coastal strip (blue) and geomorphological reserves (orange) near Nida.
Source: State Cadastre of Protected Area

Sources

- Curonian Spit (Lithuanian component) Management Plan (to be adopted in 2025).
- Curonian Spit National Park Administration (2013) *The Internal Forest Management Project of the Curonian Spit National Park for 2013–2022*.
- Curonian Spit National Park Management Plan (territorial planning) (adopted 2012, last amendment 2022). Available at: <https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/TAIS.428043/asr>.
- Environmental Protection Agency under the Ministry of Environment (2023) *Pollution sources and threats*. Available at: <https://aaa.lrv.lt/lt/veiklos-sritys/vanduo/kursiu-marios-ir-baltijos-jura/tarsos-saltiniai-ir-gresmes/tiesioginiai-isleistuvai/>.
- Environmental Protection Agency under the Ministry of Environment (n.d.) *Pollution sources and threats*. Available at: <https://gamta.lt/vanduo/kursiu-marios-ir-baltijos-jura/tarsos-saltiniai-ir-gresmes/71>.
- Extracts from the Register of Cultural Heritage.
- Extracts from the State Cadastre of Protected Areas.
- Government of the Republic of Lithuania (2010) *Resolution No. 544, dated May 19, 2010, "On the Appointment of Institutions Responsible for the Protection of UNESCO World Heritage List Sites in Lithuania"*.
- Klaipėda State Seaport Authority (2023) *Activity report*.
- Klaipėda State Seaport Authority (2024) *Q1 activity report*.
- Law on Protected Areas (1993, amended 2024-07-01).
- Law on the Protection of Immovable Cultural Heritage (amended 2022-07-16).
- National Energy and Climate Action Plan 2021–2030. Available at: <https://enmin.lrv.lt/public/canonical/1727959588/5212/Galutinis%20atnaujintas%20NEKSV%20.pdf>.
- National Climate Adaptation Plan. Available at: [https://enmin.lrv.lt/public/canonical/1720157918/4839/Priedas%20Nr.%205%20\(Nacionalinis%20prisitaikymo%20klimato%20kaitos%20planas\).pdf](https://enmin.lrv.lt/public/canonical/1720157918/4839/Priedas%20Nr.%205%20(Nacionalinis%20prisitaikymo%20klimato%20kaitos%20planas).pdf).
- Ravaiyte-Meyer R. (2019) Kuršių nerijos istorija - kitu žvilgsniu. Su prof. dr. Vasilijumi Safronovu kalbasi Raimonda Ravaiytė-Meyer, Kultūros almanachas Dorė. Spaustuvė Druka, Klaipėda. https://www.neringosvb.lt/wp-content/uploads/2021/01/DORE_2019_7.pdf.
- Safronovas V. (2018) Migrantai ir pabėgėliai Kuršių nerijoje XX amžiaus viduryje, Klaipėdos universiteto Baltijos regiono istorijos ir archeologijos institutas, Vilniaus dailės akademijos leidykla.
- Sereika, R. (2021) *Curonian Spit Travel Guide*. Curonian Spit National Park Administration, Didakta, Vilnius. Available at: https://nerija.lrv.lt/uploads/nerija/documents/files/Vadovas_po_Kursiu_nerija_EN.pdf.
- State Service for Protected Areas (2006) *Regulations of the Curonian Spit National Park*. Approved by the Director of the State Service for Protected Areas under the Ministry of Environment, Order No. 113 V, June 30, 2006, revised November 14, 2016 (Order No. V-194).
- State Service for Protected Areas (2023) *Regulations of the Curonian Spit National Park Directorate*. Approved by the Director of the State Service for Protected Areas under the Ministry of Environment, Order No. V-124, November 26, 2023.
- Strakauskaitė, N. (2001) *Curonian Spit – European Postal Route*. Klaipėda.
- The Comprehensive Plan of the Republic of Lithuania 2030. Available at: <https://www.bendrasisplanas.lt/>.
- The General Plan for the Territory of the Municipality of Klaipėda and Parts Thereof (2021).
- The General Plan for the Territory of the Municipality of Neringa and Parts Thereof (adopted 2012, amended 2023). Available at: <https://neringa.lt/veiklos-sritys/teritoriju-planavimas-ir-statyba/bendrasis-planas/508>.
- The Ministry of Environment (2023) *General information about climate change*. Available at: <https://am.lrv.lt/lt/veiklos-sritys-1/klimato-politika/klimato-kaita/bendra-informacija-apie-klimato-kaita/>.
- The Seimas of the Republic of Lithuania (2021) *Resolution No XIV-490 of 30 June 2021: National Climate Change Management Agenda*. Available at: <https://www.e-tar.lt/portal/lt/legalAct/abae1620db3311eb9f09e7df20500045>.
- Order on the Adoption of Rules for the Preparation of Special Plans for Protected Areas, adopted by the Minister of Environment and the Minister of Culture (2020).

CLIMATE, ITS INFLUENCE AND RELATED POLICY



Winter extremes are still apparent, though less frequent
(Renata Kilinskaitė)

4.1 Current climate

The unique characteristics of the Curonian Spit extend beyond its nature and geography to also include meteorology and climate. The Curonian Spit has a maritime climate with a later onset of spring and warmer and longer autumns than elsewhere in Lithuania.

Two climate data records provide information relevant to the Curonian Spit. The first location is on the coast of the Curonian lagoon at Nida (see Figure 2.2), near the southernmost extent of the Lithuanian component; the Nida Meteorological Station was established on May 1, 1898. The second location is close to the Baltic Sea at Klaipėda, across the channel from the northern tip of the Curonian Spit on the Lithuanian mainland; the data record for the Klaipėda Meteorological Station began in 1881. Although not all meteorological data have survived and the meteorological stations had to stop their activities for certain periods, they provide an extensive amount of data on the climate of the Curonian Spit. Nida and Klaipėda are, on average, the warmest places in Lithuania.

The annual-average air temperature values (1991-2020) for Nida and Klaipėda were 8.5°C and 8.2°C, respectively. The climatologically warmest month in Nida was July (19.0°C), whilst for Klaipėda both July and August (18.3°C) were warmest (Figure 4.1). Monthly-averaged daily maximum temperatures in the

warmest months exceeded 22°C in both locations. In contrast, the climatologically coldest months have occurred in January and February for both Nida (-1.0°C) and Klaipėda (-0.9°C; Figure 4.1). Daily minimum temperatures in these months were, on average, below freezing (-3.2°C in January/February for Nida; -5.0°C in January for Klaipėda). On average, 28 days each year remained below freezing at Nida (27 days at Klaipėda) over the 30-year period.

For the period 1991-2020, the average annual rainfall for Nida was 765 mm and for Klaipėda was 761 mm. October was the wettest month (95-97 mm), with the least precipitation in April (31-34 mm).

Noting the similarities in temperature and rainfall records, the Nida meteorological station better represents the climatic conditions of the Curonian Spit. As such, additional climate data and descriptions focus on this location.

Nida is warmer than most of Lithuania from the second half of summer (August) until March. Summer weather lasts longer in Nida (into September) than elsewhere in Lithuania, with the greatest number of 'tropical' nights (with overnight minimum temperature remaining above 20°C). Nida holds the Lithuanian record for the warmest night in July 2006 at 24.4°C, linked to warm waters of the surrounding Baltic Sea

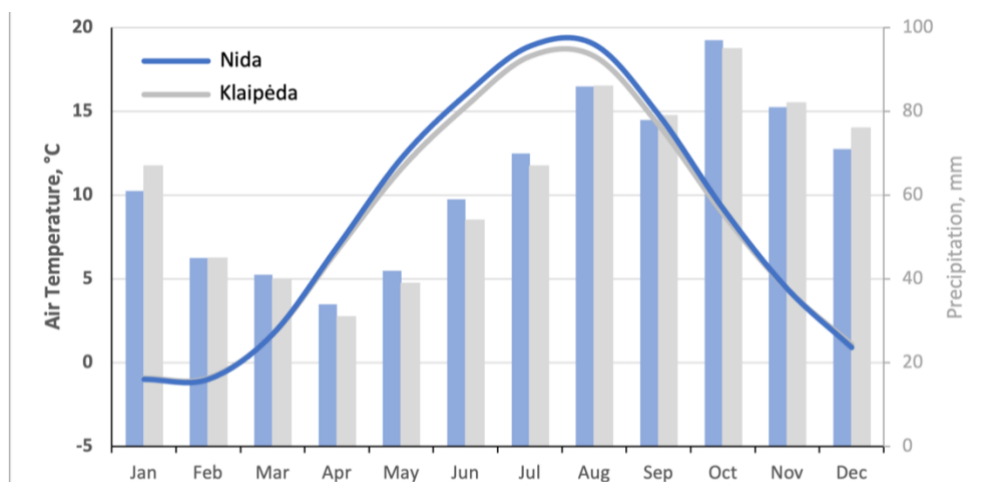


Figure 4.1 Monthly-averaged air temperature (solid lines) and precipitation (columns) for the period 1991-2020 from data recorded at the Nida (blue) and Klaipėda (grey) meteorological stations.

and Curonian Lagoon. Warm autumn temperatures allow the vegetation to remain green for longer than in other parts of Lithuania.

Since frosts occur least frequently in Nida (compared with the remainder of the Spit and, indeed, Lithuania), the first snow falls and the formation of permanent snow cover occur later in Nida than elsewhere. In contrast, spring melt occurs earlier in Nida than elsewhere in Lithuania, so that Nida's winter, generally speaking, is the shortest in Lithuania. Despite this, rapid snowfalls occur in Nida and its surroundings from clouds formed due to the sea effect¹⁴, which can produce a thick layer of snow in a short time. The influence of the Curonian Lagoon on weather events is also apparent in late summer, when waterspouts are often reported near Nida, as cooler air masses move across the warm Lagoon waters.

Nida is the location for various other weather extremes for Lithuania. It is the sunniest place in Lithuania, with an average of 2,076 hours per year (5.7 hours/day), and among the windiest regions in Lithuania, with an annual-average wind speed of 3.7 m/s (seasonally highest in winter and lowest in summer). Winds of 18 m/s have been recorded at Nida at least once every year. The strongest wind recorded at Nida was 40 m/s in December 1999 during hurricane 'Anatolijus'. The wind speed may have been

as much as 45-50 m/s but was not recorded due to an electrical failure. The hurricane wind caused waves 5-6 m high on the coast, destroying a protective dune ridge along a 25 km stretch, and the sea level rose by 1.65 m. The Nida–Klaipėda road was blocked with trees, road signs were toppled and the famous Nida Sundial was demolished.

Other Lithuanian climate records in Nida include:

- Highest annual-average air temperature of 10.4°C in 2020;
- Highest monthly-average air temperature of 23.1°C in July 2021;
- Lowest monthly precipitation of 0.0 mm in April 2019;
- Heaviest snowfall of 66 mm in 12 hours on 25 November 2008.

4.2 Observed climate trends

Data informing historical trends were obtained from the Lithuanian Hydrometeorological Service under the Ministry of Environment.

In the 73 years spanning 1951 to 2023, the annual-average air temperature in Nida increased by 2.7°C (Figure 4.2-left), corresponding to an average rate of 0.38°C/decade.

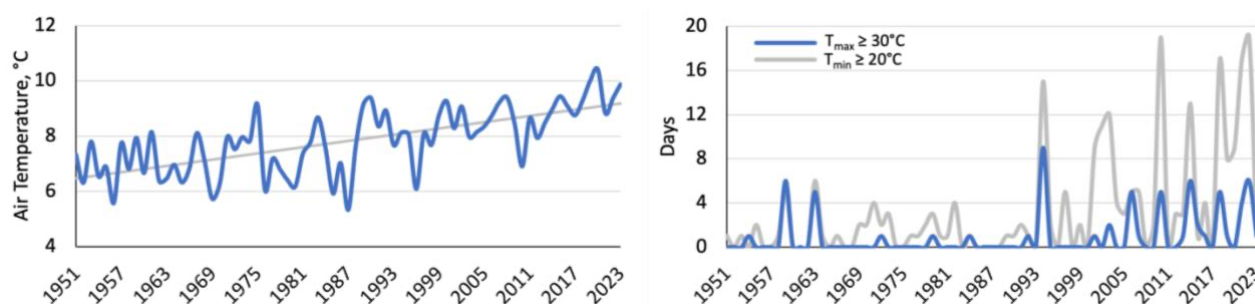


Figure 4.2 Historical trends in temperature variables at Nida for the period 1951–2023. (left) Annual-average air temperature; (right) Annual number of hot days (maximum temperature $\geq 30^{\circ}\text{C}$) and tropical nights (minimum temperature $\geq 20^{\circ}\text{C}$).

¹⁴ The sea effect occurs when very cold air masses move over relatively warm waters, the air warms and thus rises causing condensation of clouds that can subsequently release heavy snowfall.

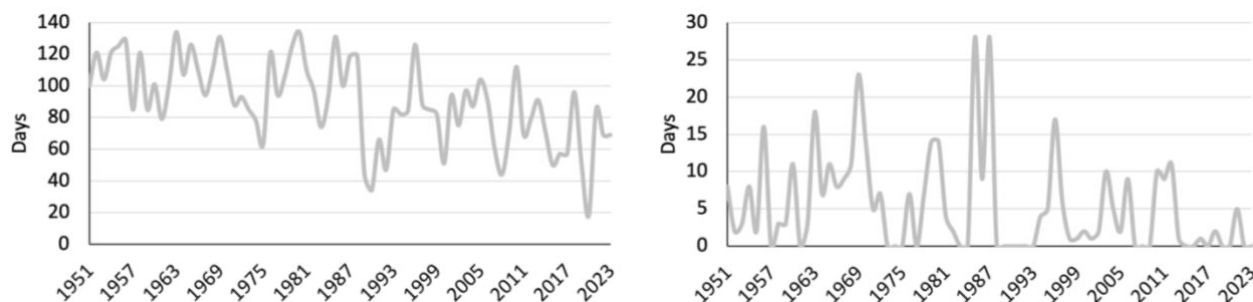


Figure 4.3 Historical trends in temperature variables at Nida for the period 1951–2023. (left) Annual number of freezing nights (minimum temperature $\leq 0^{\circ}\text{C}$); (right) Annual number of very cold nights (minimum temperature $\leq -15^{\circ}\text{C}$).

Associated with this, the annual number of days that exceeded 30°C ('hot days') increased by 1.9 through that period, while the annual number of days for which the daily minimum was above 20°C ('tropical nights') increased by 8.3 (Figure 4.2-right). Moreover, the number of days annually for which the minimum temperature was below 0°C ('freezing nights') reduced by 52 days – more than one-third lower than in the 1950s (Figure 4.3-left). The number of very cold nights (i.e., with minimum temperature $\leq -15^{\circ}\text{C}$) has decreased by 6.6 days (from 10.0 days in the 1950s; Figure 4.3-right).

Annual precipitation in Nida increased during the period 1951–2023 by 173 mm (cf. 765 mm for 1991–2020; Figure 4.4). The number of days with precipitation ($> 0\text{ mm}$) increased by 13 days, while days with very heavy precipitation ($\geq 20\text{ mm}$) increased by 1.7 days.

No significant change was apparent in wind speed.

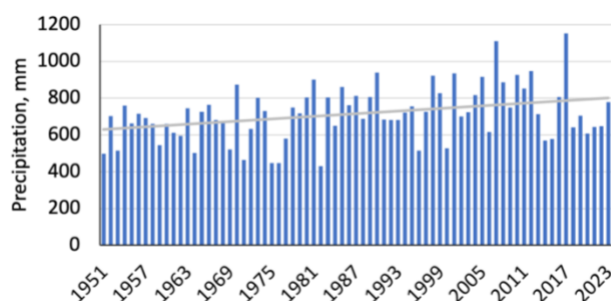


Figure 4.4 Historical annual precipitation totals have increased by 24 mm per decade in the period 1951–2023.

Consistent with the global trend, the sea level in the Baltic adjacent to the southern Curonian Spit has risen (Figure 4.5); however, the rate of increase (4.9 mm/year^{15}) is more than 50% greater than the global trend (3.6 mm/yr ; Hamlington et al. 2024). Sea level varies seasonally – higher during the storm season (October–January) and lower in spring (April–May).

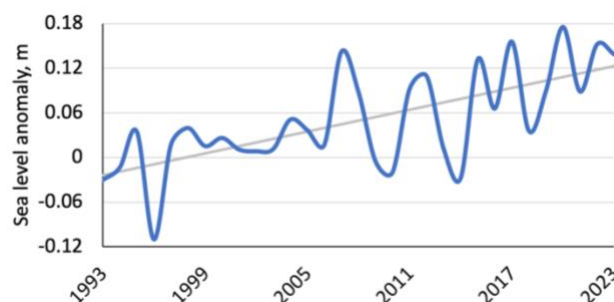


Figure 4.5 Sea level anomaly for the Baltic coast adjacent to Nida, from satellite altimetry with reference period 1993–2012. Source: Copernicus¹³.

4.3 Future change to 2100

Climate projections for the Neringa Municipality from the ClimAdapt-LT project¹⁶ were used to inform future conditions for the Curonian Spit. Two climate scenarios were examined: (i) a high-emissions scenario that reflects continued dependence upon fossil fuels (RCP8.5); and (ii) an emissions stabilisation scenario under which emissions peak mid-century (RCP4.5). Projections of climate variables from the Coupled Model Intercomparison Project Phase 5

¹⁵ European Seas Gridded L4 Sea Surface Heights and Derived Variables Reprocessed 1993 Ongoing; accessed at https://data.marine.copernicus.eu/product/SEALEVEL_EUR_PHY_L4_MY_008_068/download

¹⁶ <https://klimatokaite.lt/adaptation-to-climate-change/project-climadapt-lt/>

(CMIP5; Taylor et al. 2012), as used for the Intergovernmental Panel on Climate Change (IPCC) 5th Assessment Report (AR5), were downscaled for regions of Lithuania.

Temperature

By the end of this century, annual-average air temperature in the Neringa Municipality is expected to increase by 1.3°C (RCP4.5) to 2.8°C (RCP8.5) from 1991-2020 levels. The greatest warming is expected in winter (December-January, 1.3–3.7 °C), while the least increase is projected for late-spring and early-summer (May-July, 1.2–2.3 °C). The highest daily air temperature will also increase by 1.2–2.7 °C.

As the climate changes, the number of heat waves (three or more consecutive hot days with daily maxima $\geq 30^{\circ}\text{C}$) is projected to increase from the current 0.9 days to 4 days per year by 2100. Tropical nights (on which the temperature remains $\geq 20^{\circ}\text{C}$) will become more frequent – at present, one tropical night occurs every four years, on average; by the end of the century, projections indicate 7 (RCP4.5) to 21 (RCP8.5) tropical nights per year. Concomitantly, the number of cold days, when daily minimum temperature is $\leq -15^{\circ}\text{C}$, is projected to decrease by about 1 day from the current 3.4 days.

Precipitation

Annual precipitation in the Neringa Municipality is projected to increase by 6–20% (RCP4.5–8.5) from current levels. All months show increases in the range 19–43% under RCP8.5, with the exception of small decreases (up to 4%) for July and August. The annual number of days with precipitation (currently 168 per year) is forecast to increase slightly (up to 5 days more) by 2100. However, the number of days with very heavy precipitation ($\geq 20\text{ mm}$) shows a projected increase by up to 3 days from the current average of 4 days per year.

The number of days with snow cover will decrease by 13 (RCP4.5) to 16 (RCP8.5) by the end of the century, while the maximum snow cover thickness will increase slightly (up to +1 cm). Together, this means that the volatility of the snow cover will increase – shorter in

duration but consistent in the maximum thickness. Snow is particularly important to shield the dunes from erosion by strong winter winds.

Wind

A slight increase (by 0.1 m/s) is projected by 2100 for annual-average wind speed (currently 4.5 m/s) and maximum wind gusts (currently 18 m/s). The number of days with maximum wind speed $\geq 15\text{ m/s}$ shows no change under RCP4.5 but is projected to increase to 5 days under RCP8.5. This suggests current levels of impacts (Figure 4.6) are likely to continue.



Figure 4.6 Major storms resulted in forest damage (top, 1999) and dune erosion (bottom, 2025).

Source: Curonian Spit National Park Administration archives

Drought and fire

Projections of drought and fire risk combine factors of temperature, relative humidity, wind speed and precipitation. Despite projected increases in precipitation, the number of days with drought is projected to increase slightly (by 1 day) to 8 days per year by 2100. Projections indicate an increase in the number of days with fire intensity¹⁷ of class 3 (Moderate) and 4 (High, four-point scale) of between 4.4 days (RCP4.5) and almost 10 days (RCP8.5) by the end of the century (currently 21 days), likely leading to increased frequency of fire impacts (Figure 4.7).



Figure 4.7 Fire impacts, such as that shown here from 2014, are projected to increase with climate change.
Source: Curonian Spit National Park Administration archives

Sea level

Sea level rise in the Baltic Sea is projected to range from 22 cm (RCP4.5) to 35 cm (RCP8.5) by 2100. Sea level varies seasonally: higher during the storm season (October–January) and lower in spring (April–May).

4.4 Related policy

Globally, Lithuania is considered one of the countries least affected by climate change¹⁸. However, the Lithuanian National Climate Adaptation Plan¹⁹ identifies the following sectors as the most vulnerable to climate change: public health; agriculture; forestry; ecosystems and biodiversity; water resources; energy; buildings and infrastructure; and cultural heritage and tourism. In Lithuania, the Baltic Sea region has been identified as the most vulnerable to climate change.

The Ministry of Environment is responsible for policy development on climate change including the preparation of strategic documents, drafting legislation and the coordination of mitigation and adaptation measures. The Ministry of Culture is responsible for related implementation measures in the culture sector and for improving the resilience of culture heritage. An overview of some key climate change documents is given below.

National Climate Change Management Agenda

In 2021, the National Climate Change Management Agenda²⁰ (hereafter the Agenda) was approved as the main document regarding adaptation to climate change in Lithuania. The goals of the Agenda seek to reduce the current and foreseeable vulnerability of the country's natural ecosystems and economic sectors, to strengthen adaptive capacity, to cost-effectively mitigate risks and damage and to maintain and increase resilience to climate change. These are to be pursued with a view to securing a favourable environment for public life and sustainable economic activity, so as to ensure food production is not

¹⁷ <https://cwfis.cfs.nrcan.gc.ca/background/summary/fwi>

¹⁸ <https://gain.nd.edu/our-work/country-index/rankings/>

¹⁹ [https://enmin.lrv.lt/public/canonical/1720157918/4839/Priedas%20Nr.%205%20\(Nacionalinis%20prisiitaikymo%20klimato%20kaitos%20planas\).pdf](https://enmin.lrv.lt/public/canonical/1720157918/4839/Priedas%20Nr.%205%20(Nacionalinis%20prisiitaikymo%20klimato%20kaitos%20planas).pdf)

²⁰ <https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/219a2632a6b311ecaf79c2120caf5094?jfwid=-56ckr0gcc>

endangered. It also sets out short-, medium- and long-term mitigation and adaptation goals and targets for individual sectors. The Ministry of Environment is the coordinator of this Agenda, which is being implemented by different ministries.

In the cultural sector, the target is to increase the resilience of cultural heritage sites to natural and catastrophic meteorological events¹⁸. The key objectives for achieving the set target are as follows:

- to identify the sensitivity and vulnerability of cultural sites to climate change;
- to enhance the resilience of cultural sites through climate change adaptation measures.

*National Energy and Climate Action Plan 2021-2030*²¹

The targets and objectives set out in the Agenda for the period 2021-2030 are to be pursued through the National Energy and Climate Action Plan (NECP). This implementation complies with EU requirements of Regulation (2018/1999) on the Governance of the Energy Union and Climate Action and covers all climate and energy measures that Lithuania will implement until 2030.

The National Climate Adaptation Plan

The National Climate Adaptation Plan is an attachment within the overarching NCEP that recognises climate change as a direct and indirect threat to built cultural heritage. Sudden direct damage may be caused by extreme weather events, while slow deterioration of the heritage asset may result from rising average annual temperatures and increasing precipitation. All measures related to climate adaptation and other information under the EU requirements of Regulation are contained within the Adaptation Plan.

Changes in climatic conditions can have both positive and negative effects on tourism. Increasing annual average temperature, decreasing relative humidity and decreasing average wind speed are predicted to

positively affect tourism across Lithuania. However, the negative impacts of climate change on green spaces and water bodies may lead to the decline or loss of some natural tourist attractions.

The Adaptation Plan provides an overall risk projection for cultural heritage and tourism, which are identified as low for 2050 and medium for 2100. The Adaptation Plan has only one objective specifically related to cultural heritage –to identify, during the period 2024-2026, cultural heritage sites most vulnerable to climate change in Klaipėda Municipality and develop a list of actions to increase their resilience.

Comprehensive national planning

The Comprehensive Plan of the Republic of Lithuania 2030 establishes guidelines for the implementation of the spatial development of the country's territory, including mandatory provisions for the use of the territory, and other related decisions for sustainable development. The Plan aims to:

- promote responsible consumption and use of resources;
- protect and enhance natural and heritage assets;
- create a local, municipal, regional and national identity, and a high quality of life;
- ensure the country's progress and competitiveness, and the transition to a circular economy;
- adapt to climate change; and
- build resilience to global challenges.

The action plan for the Comprehensive Plan instructs the Ministry of Culture and the Ministry of Environment to develop and implement programmes and plans to minimise the impact of climate change on cultural heritage, and to monitor the impact of climate change on protected cultural landscapes and cultural heritage.

²¹ <https://enmin.lrv.lt/lt/veiklos-sritys-3/neksvp-atnaujinimas/>;
<https://enmin.lrv.lt/public/canonical/1727959588/5212/Galutinis%20atnaujintas%20NEKSVP.pdf>

Sources

Project ClimAdapt-LT information (2024) Available at:

<https://klimatokaita.lt/adaptation-to-climate-change/project-climadapt-lt/>.

APPLYING THE CLIMATE VULNERABILITY INDEX



Decorative weathervanes are an icon of the Curonian Spit and provide a conduit for maintaining traditional craft methods
(Andrius Kundrotas, Nida Culture and Tourism Information Centre 'Agila')

5.1 Background to the CVI

The Climate Vulnerability Index (CVI) is a systematic and rapid tool that was developed to assess the vulnerability to climate change for all types of WH properties (natural, cultural and mixed). It considers the vulnerability of the Outstanding Universal Value (OUV) and of the associated community (local, national and international). The CVI framework (Figure 5.1) builds upon the vulnerability framework approach described in the 4th Assessment Report of the Intergovernmental Panel on Climate Change (IPCC 2007). As the CVI was being developed, input was sought from many experts around the world, including from within the International Council on Monuments and Sites (ICOMOS) and the International Union for Conservation of Nature (IUCN), the two primary advisory bodies to the WH Committee.

The OUV Vulnerability is determined by assessing the exposure, sensitivity and adaptive capacity with respect to prioritised climate stressors. The OUV Vulnerability becomes the exposure term to assess the

vulnerability of the community associated with the property, combining with assessments of economic-social-cultural dependency (sensitivity) and adaptive capacity (Figure 5.1). A customised spreadsheet-based worksheet is used to determine outcomes based on user inputs. A more detailed outline of the CVI methodology is provided by Day et al. (2020).

The foundation for the CVI process is the Statement of OUV for a property (Appendix 1), from which key values are summarised (Table 2.1). The key climate stressors most likely to impact the key values (and attributes) are identified for a defined and agreed time scale (e.g., by 2050) from a list of possible stressors (Table 5.1). Once this foundation is established, the CVI process is initiated.

As the first phase of the CVI process (assessing the OUV Vulnerability) leads into the second phase (assessing the Community Vulnerability), this second assessment considers the impact on the community of a decline in WH values (i.e., it is not evaluating direct impacts of climate change upon the community).

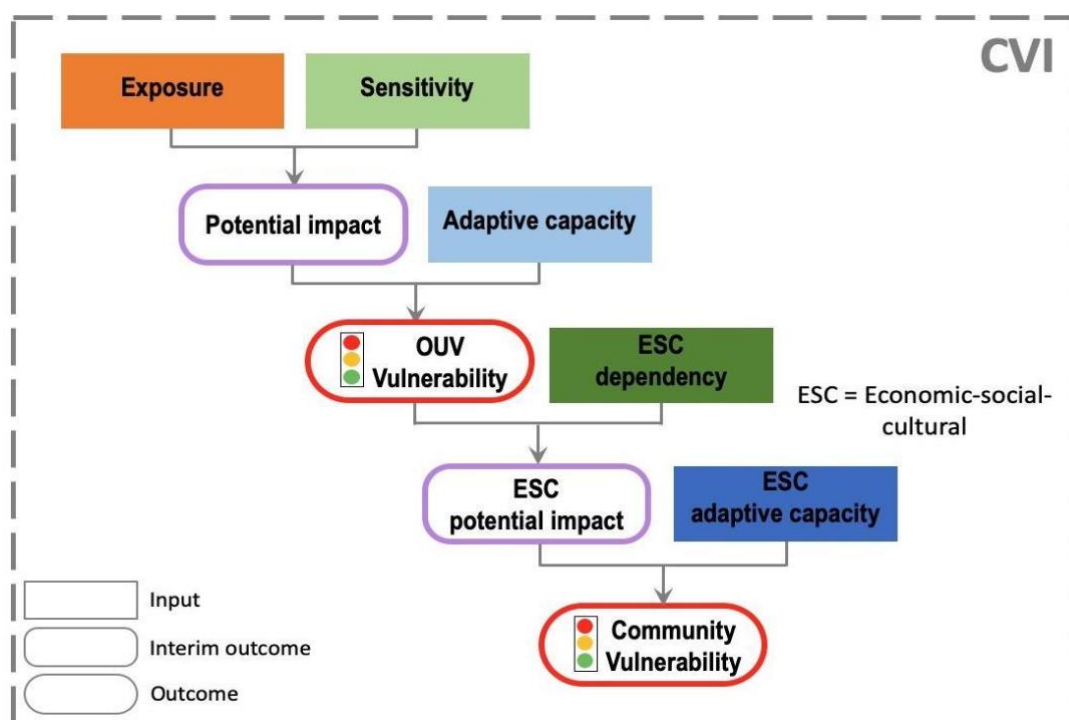


Figure 5.1 The CVI framework used to undertake rapid assessment of climate change vulnerability of World Heritage properties and the associated community.

Adapted from: Day et al. (2020)

5. Applying the Climate Vulnerability Index

At the time of this report, the CVI had been applied in natural WH properties in Australia, Germany/Netherlands/Denmark, Finland/Sweden, the Seychelles, and South Africa, and in multiple diverse cultural WH properties in Scotland, Norway and Africa²².

5.2 Preparatory steps and the CVI workshop

Prior to application of the CVI framework for the Curonian Spit, the following preparatory steps were undertaken:

- 1 The Statement of OUV for the Curonian Spit was analysed and distilled into five key values and their accompanying attributes (see Table 2.1);
- 2 Background information was prepared outlining key aspects of climate change for the area;
- 3 A list of other Significant Property Values (SPVs) was commenced prior to the workshop, and continued during and completed following the

workshop (see Appendix 3);

- 4 An overview of information related to economic, social and cultural connections was compiled and presented during the workshop; and
- 5 A diverse array of participants was identified by the Steering Committee for the workshop (see list at Appendix 5).

The CVI workshop for the Curonian Spit was conducted at the Smiltynė Yacht Club, 26th – 30th August 2024 (see Appendix 4). Information presented during the workshop enabled the OUV Vulnerability and the Community Vulnerability to be assessed. The workshop used four breakout groups to assess preliminary outputs which were then reported back to subsequent plenary sessions for discussion and synthesis (Figure 5.2). Outcomes for each component were recorded in a customised spreadsheet to determine the final results.



Figure 5.2 Plenary presentations and discussions and breakout groups (top panels) were complemented by descriptions from expert participants during the field visit.

Credit: Kristin Heron (CVI).

²² <https://cvi-heritage.org/resources>

5.3 Key climatic stressors

A list of 15 climate stressors typically considered in the CVI process was provided to participants at the workshop (Table 5.1). Two additional climate stressors (Wildfire, Salinity change) were determined as potentially relevant to the specific context of the Curonian Spit and also considered. Participants analysed those stressors likely to have the most impact on each of the key values (Table 2.1). The workshop selected the time scale to consider impacts as ca. 2070 and considered future effects under a high-emissions climate scenario (RCP8.5, SSP5-8.5) – decisions consistent with CVI applications previously undertaken in other WH properties.

The climate stressors were ranked by considering the top three stressors likely to impact each key value (Table 5.1; Figure 5.3). Workshop participants assessed Temperature Trend as likely to impact all five

key values. Four other climate stressors (Coastal Erosion, Intense Precipitation Events, Storm Intensity & Frequency and Wildfire) were assessed as likely to impact three key values. After some discussion (and recognition that there are connections between some stressors), the workshop participants selected the three key climate stressors to be considered in the CVI analysis for the Curonian Spit as:

- Temperature Trend (air and/or water) – TT;
- Coastal Erosion – CE; and
- Intense Precipitation Events – IPE.

It is important to note that impacts resulting from each of these three key climate stressors (i.e., long-term changes in temperature and effects of coastal erosion and heavy rainfall) have already occurred to some degree. Furthermore, future impacts may not be coincident but instead become apparent at different future times.

Table 5.1 Climate stressors identified as likely to have the greatest future impact upon each of five key values of OUV. Marked cells indicate that a climate stressor was in the top three responses (including equal-third) for each key value. Stressor impacts were assessed for ca. 2070 and a high-emissions climate scenario.

	Temperature trend (air and/or water)	Extreme temperature events	Precipitation trend	Intense precipitation events	Flooding (fluvial, pluvial)	Drought (severity, duration, frequency)	Mean wind trend	Storm intensity and frequency	Sea/lake ice change	Snow cover change	Sea level rise (trend)	Coastal flood	Storm surge	Coastal erosion	Changing currents	Wildfire	Salinity change
Key values of OUV	Climate stressors																
Unique and vulnerable coastal cultural landscape	x			x				x			x	x	x	x		x	
Human efforts to restore suitable living conditions	x	x				x		x		x				x		x	
Natural heritage	x			x		x			x		x			x		x	
Authentic historical cultural heritage	x			x				x									
Traditions, spirituality and local lifestyle	x		x						x								
Total	5	1	1	3	0	2	0	3	2	1	2	1	1	3	0	3	0

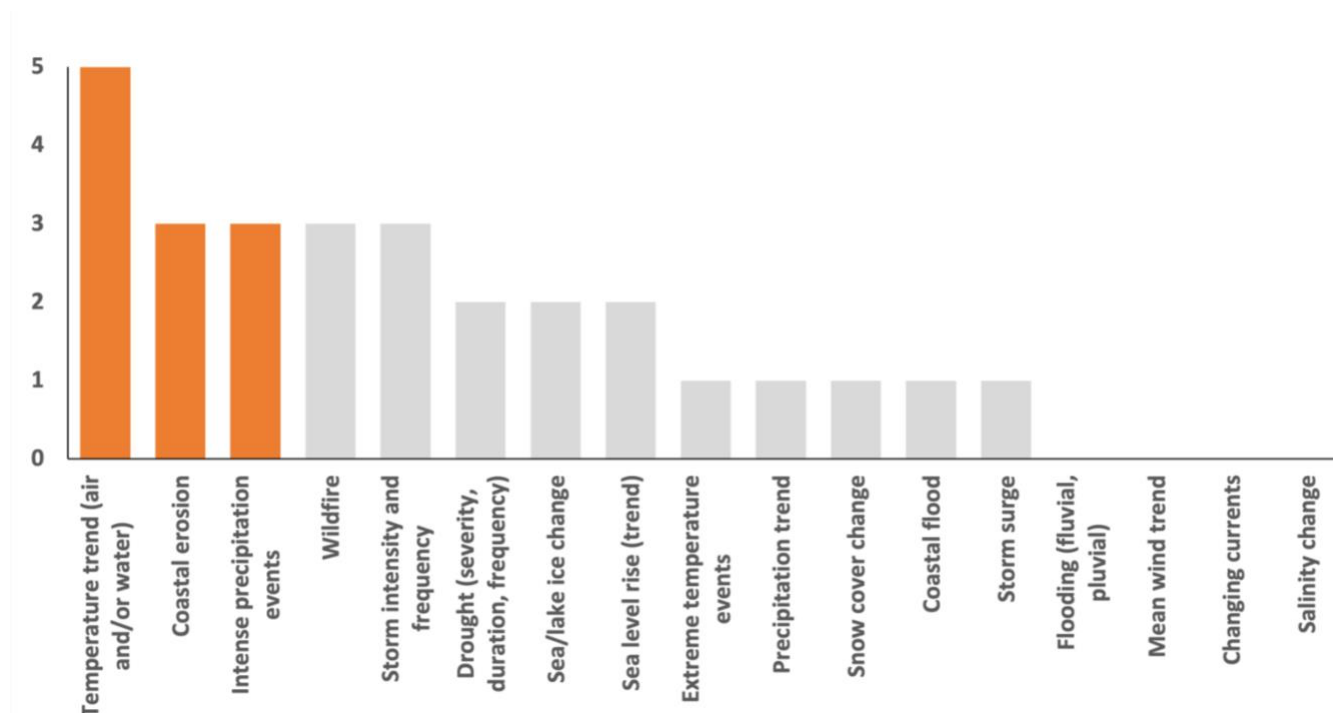


Figure 5.3 Histogram of the number of key values of OUV for the Curonian Spit for which each of 15 climate stressors was among the top three likely to cause impacts (ca. 2070, high-emissions scenario).

5.4 OUV Vulnerability

Assessments of **exposure** and **sensitivity** of the OUV system to each of the identified three key climate stressors were undertaken using a five-point categorical scale, adapted from categories used by IPCC and IUCN analyses (Day et al. 2020). Modifiers were applied to the initial assessments to include effects of temporal scale and trend (for exposure), and spatial scale and compounding factors (for sensitivity).

Results from exposure and sensitivity assessments undertaken in breakout groups were synthesised in plenary. Exposure to Temperature trend was assessed to be Very likely (>90%, highest category). The initial assessments of exposure to Coastal erosion and Intense precipitation events were determined to be Likely (67-90%, second highest category). The inclusion of modifiers incremented the Exposure for Coastal erosion to the transition point between the Likely and Very likely categories (Table 5.2) but did not change the category for either of the two other key stressors. Participants noted that that warming in Lithuania has occurred faster than the global average, both of which have accelerated in recent decades; and that impacts of Coastal erosion on the lagoon side are

already apparent and this was the focus for assessing future change, in contrast to the Baltic Sea coast, for which Coastal erosion is part of the natural processes of sand transport.

Sensitivity of OUV to Temperature Trend was initially determined as High (second highest category), and after including modifiers was incremented to the transition point between the High and Very high categories, indicating potential for loss or alteration of many key values (Table 5.2). The Sensitivity assessments for Coastal erosion was at the Moderate level (middle category of five), indicating potential for some loss or alteration of some key values (but not causing a significant reduction to OUV), and was not altered with the inclusion of modifiers. In contrast, whilst Sensitivity of the WH values regarding Intense precipitation events was also initially assessed to be Moderate, the modifiers raised this to the transition between the Moderate and High categories.

Assessments particularly noted effects of (i) warming on water quality, circulation and ice cover, wildfire and drought risk, loss of snow cover, and flora and fauna species change; (ii) erosion, particularly on the lagoon side; and (iii) impacts of heavy rainfall on dunes and

Table 5.2 Rapid assessment of OUV Vulnerability to identified three key climate stressors. Assessed values of exposure, sensitivity and adaptive capacity contribute to derived outcomes for potential impact and OUV Vulnerability. Colours correspond with elements of the CVI framework (Figure 5.1)

Key Climate Stressors:	Temperature trend (air and/or water)	Coastal erosion	Intense precipitation events
Exposure	Very likely	Likely	Likely
Temporal scale	On-going	Frequent/On-going	Frequent
Trend	Moderate increase	Slow/Moderate increase	Slow increase
Exposure	Very likely ○○○○●	Likely/V. likely ○○○●●	Likely ○○○●○
Sensitivity	High	Moderate	Moderate
Spatial scale	Widespread	Localised	Extensive
Compounding factors	High probability	Mod/High probability	Low/Moderate probability
Sensitivity	High/V. high ○○○●●	Moderate ○○●○○	Moderate/High ○○○●○
Potential impact	Extreme ○○○●	High ○○○○	High ○○○○
Local management response	Moderate	Moderate/High	Low/Moderate
Scientific/technical support	Moderate	Moderate/High	Low
Effectiveness	Moderate	Moderate/High	Moderate
Adaptive capacity	Moderate ○○●○	High ○○○●	Moderate ○○●○
OUV Vulnerability	Moderate ○●○	Low ●○○	Moderate ○●○
Combined OUV Vulnerability	Moderate ○●○		

buildings, and flooding in populated areas. Various compounding factors were noted including the increasing risk of invasive species throughout the WH property, pressure from increased tourist visitation (with the longer tourist season), forest and dune change, and the deepening of the lagoon as part of port development activities. The potential impact, derived from exposure and sensitivity, was determined as extreme (highest on a four-point scale, low to extreme) for Temperature trend and High (second-highest) for Coastal erosion and Intense precipitation events (Table 5.2).

The **adaptive capacity** of a system to respond to stress can reduce the potential impacts. Adaptive capacity of the OUV system was assessed for each key climate stressor by considering the levels of local management response and scientific/ technical support (four-point scale), as well as the effectiveness of these to address impacts from each stressor (four-point scale).

In breakout groups, workshop participants brainstormed adaptation strategies; where similar ideas were proposed, these were subsequently grouped in plenary. Several of the brainstormed ideas were considered monitoring/research opportunities and policy considerations; whilst these can appropriately be considered as adaptation strategies, the focus for the adaptive capacity assessment was on on-the-ground activities.

Nine adaptation strategy groupings were identified (Table 5.3) and used for the adaptive capacity assessment. Forest maintenance and management incorporated aspects of tree maintenance (specifically noting this for Mountain Pine); replanting (in cooperation with the arboretum); and fire protection (through prompt replanting efforts after fires and improvement of fire detection systems and response services). Dynamic dune management included the restoration of dunes and dune vegetation; and controlling visitor access (which may

Table 5.3 Strategies for adaptive capacity brainstormed during the workshop, prioritised by feasibility or likelihood for implementation, noting the relevant key climate stressors (TT: Temperature Trend (air and/or water); CE: Coastal erosion; IPE: Intense precipitation events) and key values (numbered in Table 2.1) for each.

	Activities	Key climate stressors			Relevant key value/s				
		TT	CE	IPE	1	2	3	4	5
Adaptation strategies	Forest maintenance and management, including enhancing fire protection	X							
	Dynamic dune management	X		X					
	Managing of number of visitors, for the Spit and for specific areas		X	X					
	Water management in settlements and hard surface areas [3,4; IPE]	X	X	X					
	Increase trees in urban areas	X							
	Improving traditional knowledge about maintaining and restoring heritage buildings	X		X					
	Ongoing coastal maintenance on sea and lagoon sides		X	X					
	Restoration of structures on mainland Lithuanian riverbanks to gather sediment, reducing load into the lagoon								
	Awareness raising and climate education at local, regional and national levels	X	X	X					

involve allowing access to some dunes while restricting other areas, potentially with a rotation of access and closures). Managing visitation was identified more broadly for the property through limiting access (to the Spit or specific areas); encouraging sustainable tourism activities; and implementation of improved public transport options (e.g., electric ferry, rail and bus). This need was raised particularly concerning heatwave periods, when risks of impacts to the environment and for visitor health (and emergency response) can be amplified.

Three strategies related directly to built-up areas – water management, tree cover increase and building restoration. Water management in settlements identified better drainage of hard-surface areas and adaptation of sewerage systems (in response to heavy rainfall events and sea-level rise). Increasing tree cover in urban areas would moderate temperature effects (through providing shade as well as retaining soil moisture), whilst also slowing winds to reduce evaporation. Maintenance and restoration of heritage buildings would benefit from improved

documentation and transmission of traditional knowledge and techniques (which represent aspects of intangible heritage).

Coastal management along the lagoon shore, including adjacent to settlements, could counter threats from erosion, particularly during heavy rainfall, and complement coastal maintenance of dunes on the Baltic seashore. Broader benefit to the lagoon quality could arise through reducing sediment load into the lagoon from mainland Lithuania through restoration of riverbank structures that capture terrestrial inputs.

The final adaptation strategy encompasses aspects of all other strategies – increasing the awareness of potential impacts of climate change education for the community and other stakeholders at local, regional and national levels. This could incorporate citizen science projects to foster deeper engagement of members of the public. Importantly, activities to raise awareness often encourage support for strategic actions in response to climate change that can be influential in their success.

Raising awareness can also contribute to support for research opportunities and uptake of policy changes (Table 5.4). Improved monitoring of various conditions through projected climate change can be used to evaluate implemented adaptation strategies and may lead to new research questions (and their investigation). These in turn can inform policy directions, which may relate to better communication between agencies and for heritage stakeholders; practices for environmental sustainability; and public engagement.

The adaptive capacity was determined to be Moderate (second highest on a four-point scale, very low to high) with respect to Temperature trend and Intense precipitation events; and High (highest) for Coastal erosion. Participants noted the importance of evaluating strategies with respect to existing national

adaptation plans, combining identified needs with the existing national policies to frame them within the national plans. For some stressors and values, such mapping was considered fairly easily; however, for others (including those related to cultural buildings), there is not currently a clear way to frame these within the existing national policies. This could be a new policy to explore.

Combining the determined Potential impact with the assessed Adaptive capacity for each climate stressor revealed the OUV Vulnerability (three-point scale, low to high) as Moderate with respect to Temperature trend and Intense precipitation events; and Low for Coastal erosion. As a result, the combined **OUV Vulnerability** for the Lithuanian component of the Curonian Spit WH property was determined as **Moderate** (Table 5.2).

Table 5.4 Monitoring, research and policy change activities identified during the workshop linked to relevant key climate stressors and key values (see Table 5.3 caption for details).

	Activities	Key climate stressors			Relevant key value/s				
		TT	CE	IPE	1	2	3	4	5
Monitoring and research	Unify monitoring and research procedures; harmonisation of data	X	X	X					
	Increasing monitoring of invasive species	X							
	Increase knowledge about how wooden architecture will react to the climate stressors	X		X					
	Satellite imagery for continuous monitoring and evaluation		X	X					
Policy change	Increase the effectiveness of cooperation, collaboration and capacity-building between institutions, from local to national	X	X	X					
	Communication with the port authorities	X	X						
	Simplification of procedures, consultation procedures related with maintenance of cultural heritage in the perspective of climate change	X	X	X					
	Nature-based approaches integrated in planning systems	X	X	X					
	Avoid plantations with one single species	X							
	Strategy for sustainable tourism flow management	X							
	Longer school vacations, to spread the pressure from national visitors	X	X	X					

5.5 Community Vulnerability

The assessment of Community Vulnerability considers the economic, social, and cultural (ESC) aspects of the community associated with the property using two metrics:

- **Dependency** reflects the extent to which a decline in WH values may affect ESC indicators in the future. These effects can be positive or negative. Separate assessments for economic, social and cultural dependency are combined to give an overall ESC dependency.
- **Adaptive capacity** reflects the current level of capacity within each component to adapt in the face of a decline in WH values due to key climate stressors and only has a positive directionality. As for dependency, separate assessments for economic, social and cultural adaptive capacity are combined to give an overall ESC adaptive capacity.

Assessments were undertaken in small breakout groups, which again resulted in a spectrum of responses for each group that was resolved in plenary.

A specific scenario was provided to participants to guide assessment of likely climate change impacts on the economic, social and cultural aspects. The selected scenario elements, based on climate projections for ca. 2070 under a high-emissions projection scenario (Section 4), were:

- Temperature trend: an increase in air temperature of 2.4°C above 2024 (a locally-relevant greater increase in summer and winter than in autumn and spring). Associated increased risk of wildfire.
- Coastal erosion: No change in winds and storms; however, dynamic Baltic coast likely to absorb change (balance of accumulation and erosion). Lagoon may be more vulnerable to coastal erosion. Local rise in mean sea level (18 cm in past 100 years) may be ~20cm in the next 50 years (accelerated increase to be as much as 60cm by 2100).
- Intense precipitation events: Globally, heavy events ~1.3x more likely and 7% wetter than 2024; for Lithuania, high-rain days to increase by +8 days/year by 2100 (from current). Global model indicates ~5% increase in average

precipitation for Lithuania. There is a local projected increase in annual precipitation of ~9% but a decrease in the July/August average precipitation by ~10%.

The economic component considers the economic effects on economic activities/business types that are directly associated with the WH property. In preparation for the workshop, the Steering Committee developed a list of eight such activities:

- Tourism
- Goods and services (e.g., shops, restaurants)
- Recreation
- Forest products
- Fisheries
- Klaipėda seaport
- Current and potential energy activities
- Real estate development

Participant responses to an online poll, conducted at the end of the third workshop day, ranked these business types by their dependence upon the WH values. This analysis revealed Tourism; Recreation; and Goods and services as the most dependent on the values, whilst the Klaipėda seaport and Current and potential energy activities were the least dependent (Figure 5.4).

Assessments of economic dependency and adaptive capacity were undertaken by each breakout group, drawing upon the baseline information on economic valuation that had been presented to the workshop. Economic dependency was assessed for each business type on an eight-point scale with four categories from High-positive down to Minimal-positive, then four more categories from Minimal-negative down to High-negative; adaptive capacity was assessed only with a positive directionality with the four-point scale from High down to Minimal. Participant rankings of relative dependency (Figure 5.4) were considered for the final assessment (in plenary). Six of the eight business types were assessed as likely to experience a minimal positive economic effect, the exceptions being Forest products and Fisheries. Overall, the economic dependency term was assessed as Minimal-negative (i.e., a negative impact at a minimal level). The adaptive capacity varied across the business types, from minimal capacity (Fisheries) to high capacity

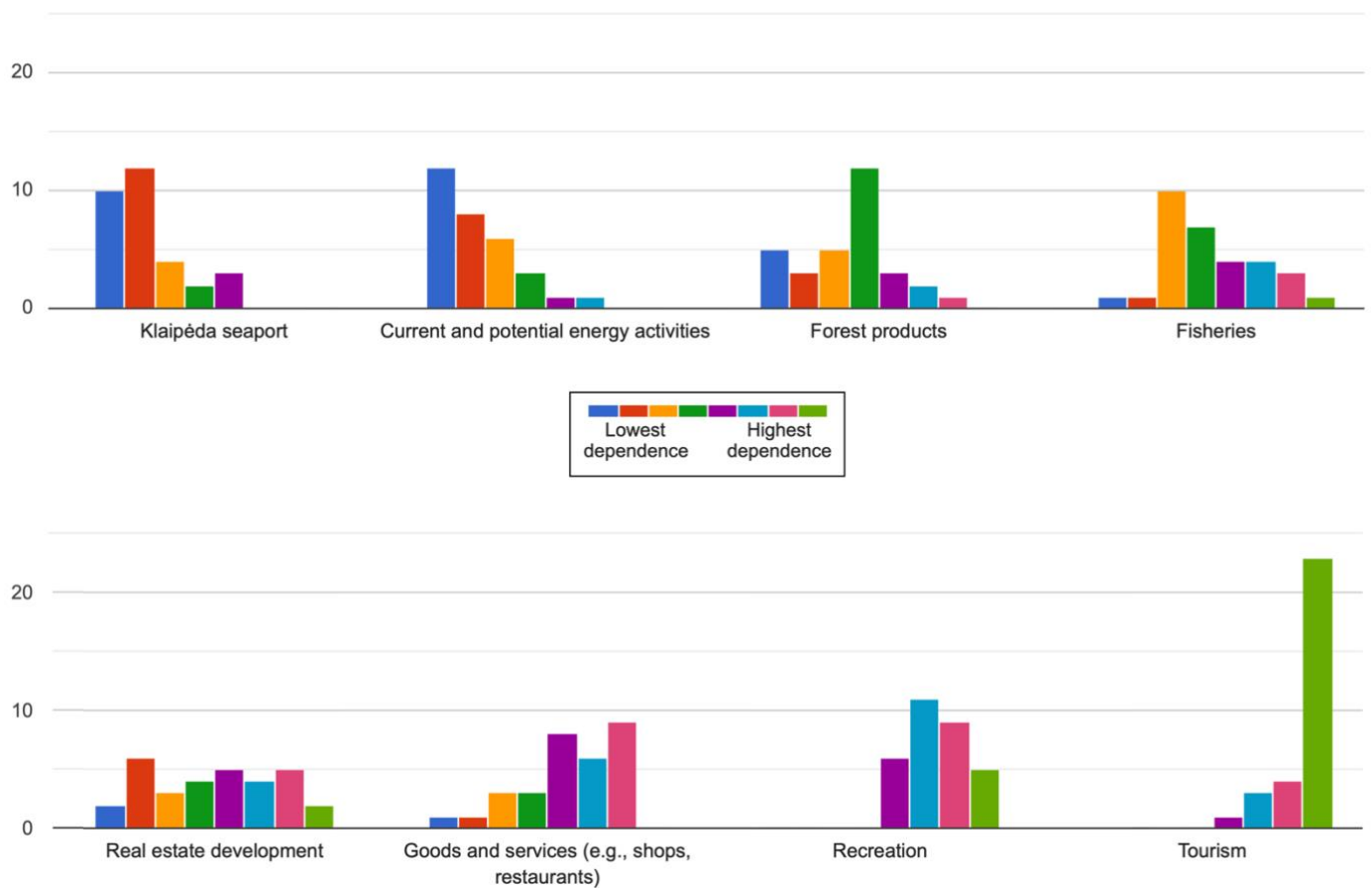


Figure 5.4 Participant rankings of eight business types by their dependence upon the Curonian Spit key values.

(Tourism), which led to the overall assessment of economic adaptive capacity as Moderate (Table 5.4).

Intangible effects (e.g., social cohesion, aesthetics) were considered within the social and cultural components. An important distinction between these components is that social connections require a physical interaction with the property (i.e., a visit), whereas cultural connections can exist without a physical interaction. For each component, three groupings of people (local, domestic, and international) were considered to assess dependency and adaptive capacity. Importantly, the definition for 'locals' was agreed to include year-round locals and part-year residents who participate in the community. Workshop participants determined that it was valuable to give a balanced consideration in the assessments across these three groups, particularly noting that some internationals (e.g., from Germany) have been visiting the Curonian Spit for generations.

Social indicators used to inform the assessments can be considered within four categories: Human capital; Social capital; Natural capital; and Built capital (after Costanza et al. 2007). Social dependency (eight-point scale, as for economic) assessments revealed variability between the small groups that required discussion and resolution in plenary, most notably for the assessment for locals that spanned from moderate-negative (recognising challenges to the community) to high-positive (as community spirit was considered to flourish in times of difficulty) in terms of the effects of a future decline in WH values. Variability was apparent but to a lesser degree for the other two people groups (domestic and international), which together culminated in an overall social dependency assessment of Low-negative (Table 5.4). Social adaptive capacity responses (4-point scale, positive-only) were also more variable for locals – for whom adapting was considered to involve substantial

challenges but also that they had historically demonstrated capacity to adapt – than the other two people groups. The overall assessment of social adaptive capacity was Moderate (Table 5.4).

Cultural indicators were also considered within four categories pertaining to: Self; People; Environment; and Pleasure (after Marshall et al. 2019). Cultural connections were also assessed equitably across the three groupings. While cultural connections can exist irrespective of location, participants indicated cultural impacts upon locals and other Lithuanians (dependency) would be worse than for those in the other people groupings. Regarding adaptive capacity, participant observations that the creativity of locals is already apparent in maintaining cultural connections despite declining values (e.g., reduction in ice for traditional ice-fishing); however, with decreasing

numbers of young people in the community, upholding the strength of traditions and adapting in the future may become increasingly challenging. Overall, cultural dependency was assessed as Moderate-negative, whilst the adaptive capacity was Moderate (Table 5.4).

Combining the three components, the overall ESC dependency was determined as Low-negative, which, combined with the OUV Vulnerability (as the exposure term), resulted in the ESC potential impact being assessed as Low (three-point scale, low to high; Table 5.4). The combined ESC adaptive capacity was assessed as Moderate (three-point scale, low to high). These outcomes determined the **Community Vulnerability** as **Low** (three-point scale, low to high; Table 5.4).

Table 5.4 Rapid assessment of Community Vulnerability linked to the identified three key climate stressors. Assessed values of economic, social and cultural (ESC) dependency (sensitivity, ranging from negative to positive) and adaptive capacity contribute to derived outcomes for ESC potential impact and Community Vulnerability.

Economic	Minimal-negative
Social	Low-negative
Cultural	Moderate-negative
ESC dependency	[-] ○ ○ ● ○ Low-negative ○ ○ ○ ○ [+]
ESC potential impact	Low ○ ● ○
Economic	Moderate
Social	Moderate
Cultural	Moderate
ESC adaptive capacity	Moderate ○ ● ○
Community Vulnerability	Low ● ○ ○

5.6 Summary

The workshop results indicate the changes that might be expected over the next 50 years (ca. 2070 scenario) are anticipated to have significant effects on the values that comprise the OUV of the property. Temperature trend (air and/or water), Coastal erosion and Intense precipitation events were identified as the three climate stressors likely to pose the greatest threat to the WH values of Curonian Spit around 2070, though noting the diverse array of climate stressors that were identified as impacting one or more WH values. Potential impact from the key stressors was scored in the Extreme or High categories, with adaptive capacity to mitigate impacts being assessed as High (for erosion) or Moderate (for the other two stressors). As a result, the **OUV Vulnerability** was determined to be in the middle category (**Moderate**). Impacts from the key climate stressors upon WH values were assessed as likely to lead to a negative future impact at a Low level on the economic, social and cultural aspects of the wider community associated with the Curonian Spit. As the adaptive capacity of the community to the climate stressors was determined to be at a Moderate level, the overall **Community Vulnerability** was assessed to be **Low** (in the lowest category).

Sources

- Costanza R, Fisher B, Ali S, Beer C, Bond L, Boumans R, Danigelis NL, Dickinson J, Elliott C, Farley J, Elliot Gayer D, MacDonald Glenn L, Hudspeth T, Mahoney D, McCahill L, McIntosh B, Reed B, S. Abu Turab Rizvi, Rizzo DM, Simpatico T, Snapp R (2007) Quality of life: An approach integrating opportunities, human needs, and subjective well-being. *Ecological Economics* 61: 267–276. doi:10.1016/j.ecolecon.2006.02.023
- Day JC, Heron SF and Markham A (2020) Assessing the climate vulnerability of the world's natural and cultural heritage. *Parks Stewardship Forum* 36: 144–153.
- IPCC [Intergovernmental Panel on Climate Change] (2007) Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, Pachauri, R.K and Reisinger, A.(eds.)]. IPCC, Geneva, Switzerland, 104 pp.
- Marshall NA, Thiault L, Beeden A, Beeden R, Benham C, Curnock MI, Diedrich A, Gurney G, Jones L, Marshall PA, Nakamura N, Pert P (2019) Our Environmental Value Orientations Influence How We Respond to Climate Change. *Frontiers in Psychology* 10:938. doi: 10.3389/fpsyg.2019.00938
- Osipova E, Emslie-Smith M, Osti M, Murai M, Åberg U, Shadie P (2020) IUCN World Heritage Outlook 3: A conservation assessment of all natural World Heritage sites, November 2020. Gland, Switzerland: IUCN. x + 90pp. <https://doi.org/10.2305/IUCN.CH.2020.16.en>

CONCLUSION



A rich variety of wildlife brings vibrancy to the natural setting
(Vytautas Knyva)

6.1 Outcomes from the CVI process

Effects of each of the three key climate stressors identified in the workshop (i.e., long-term change in temperature, coastal erosion and heavy rainfall) are already occurring to some degree. Other stressors, such as changes in storm intensity and frequency and drought are also having impacts upon heritage.

All the climate stressors, acting singularly as well as synergistically, are likely to cause impacts upon both the cultural and natural heritage of the Curonian Spit. As an example of synergistic impacts, increasing temperature and drought together with changes in humidity and winds gusts may combine to influence the intensity and extent of wildfires, putting some infrastructure and cultural features at a heightened risk of damage and potential loss.

Climate projections for the Curonian Spit indicate that a variety of interrelated climate stressors, including those mentioned above, are expected to change over coming years and decades. Future impacts may also become apparent at different times.

In the marine environment, Baltic Sea level is predicted to increase. Ocean currents around the Spit may also change for reasons related to climate change as well as changes to maritime infrastructure. There is a recognised need for ongoing coastal maintenance on both the sea and lagoon sides.

The CVI process has shown that aspects of the natural environment of the cultural landscape (terrestrial and marine) and of the local community are vulnerable to projected climate change. While various adaptive strategies have been proposed (Table 5.3), the ability to adapt to climate change is optimistic, however uncertain. In addition, various areas for further investigation were identified through the workshop (Section 6.2).

6.2 Gaps Identified

The results from the CVI workshop are important for adaptive management, especially as climate change is recognised (along with unsustainable practices) as one of the two biggest threats to Curonian Spit.

In addition to the recommended adaptive strategies in Table 5.3, the CVI workshop also identified the following gaps for possible further investigation:

Knowledge gaps

- Need a better understanding of the local community and its involvement in decision making process.
- Tourism/visitor analysis - where they are going, how long they're staying and how they are getting around.
- Need for a special report on drought and increasing wildfire risk.

Research opportunities

- Expand wind monitoring stations on the coast. The current wind monitoring is based on a single meteorological station (Klaipėda).
- Introduce better sand dune monitoring tools, which could be LIDAR-based/photogrammetry.
- Connect efforts of researchers and community via citizen science to improve continuous monitoring and data collection.
- Need for more sustainable solutions for transportation flow management – parking issues in new real estate development projects; public transport to reach key areas.
- Look for intersectional solutions to extend seasonality to distribute visitor flows and diminish negative effects of mass tourism visiting key OUV-related sites.
- Need for more-comprehensive research on climate change impacts upon built heritage and cultural landscape.
- Make contracts with experts to complete interpretation, analysis and recommend outcomes of existing data.
- Cruise ship tourism flows – need for management modelling (regional).
- Further assess the aesthetic/perception value of the landscape that is the main driver for many actions.
- Involve professional photographers and introduce them to the visual monitoring of the National Park, especially for the elements of OUV.

Policy needs

- The ability to get legislation exemptions for the Curonian Spit from national policies, when existing national policies do not fit.
- Explore policy regarding the climate impacts on the heritage wooden buildings – there is a complex process for resourcing, which needs to be simplified.
- Preparedness for the growth of cruise ship tourism (emissions in the lagoon, water/greywater treatment, lagoon shore reinforcement; allocate part of the tourist taxes for management of WH site, control traffic and improve the infrastructure).

Management requirements

- Limit access to the Great Dune Ridge Area near Juodkrantė - provide alternative routes, educate with early signs (early and often), control maritime areas near the dunes with water police.
- Keep people to paths, rather than walking elsewhere, even in the non-strict nature reserves.
- Set up at least two campsites to eradicate illegal camping in natural areas, to prevent pollution and reduce wildfire risk.
- Focus and work with social groups who are influencing the Curonian Spit – especially local inhabitants, businesses, tourists, sailors, fishermen, scientists, government agencies.
- Be mindful of different value systems represented by different interest groups; how might these different sets of values be communicated?
- Need a revision of the marine spatial planning and management of the marine component of the Curonian Spit WH property.
- Introduce special events for rethinking 'human-nature interactions' – a more contemporary assessment of the cultural landscape; possible discussions and 'walk and talk' excursions.
- Make science and scientists a part of the Curonian Spit story.

Any research priorities should be closely linked to the priority management requirements. Conservation decisions that respond to the threats of climate change begin with understanding the key areas of

climate vulnerability. The research opportunities identified through the CVI process are a starting point and will require appropriate resourcing, as will the management activities informed by research outcomes. Continuing to link research with management-relevant outcomes is essential.

The significant extent of the WH property that is in the Baltic Sea (38%) and the recognised biodiversity (Section 2.3), together with the identified threats (Section 3.2), warrant further consideration of knowledge gaps, research opportunities, policy needs and management requirements, potentially within the scope of HELCOM activities.

6.3 Management Implications

The outcomes and recommendations from the CVI workshop will be incorporated into the Management Plan, currently in preparation and with publication anticipated in 2025. Continued collaboration of stakeholders will be essential to the success of the implementation of the Plan and the effective management of the Curonian Spit to climate change and other pressures. As this is the first CVI in Lithuania, these connections (e.g., between government agencies, management authorities, communities and industries) may inform future assessments of climate vulnerability and support resulting management actions.

Management of climate impacts upon heritage should also consider synergistic effects, including between climate stressors and with non-climate stressors. Heritage impact assessments should be undertaken for all proposed management actions, including the identified adaptation strategies, to avoid unintended consequences on the property. The identified key values (plus other SPVs; Appendix 3) should be considered to ensure that impact assessments are comprehensive. A precautionary approach to management should be the rule – new activities, infrastructure development and major works on and around the Curonian Spit should not be implemented until sufficient knowledge of the potential impact is understood.

An important aspect of effective management is to implement a monitoring program for the key values

(potentially with some priority SPVs; Appendix 3). Monitoring is an essential element to better understand the impacts of climate change (and other pressures) and may take several forms (e.g., in-house monitoring within the managing agencies; as part of co-operative monitoring programs with specific relevant partners, such as universities; and through 'citizen science' activities). Monitoring also enables the evaluation of outcomes from implementing recommended adaptive strategies (Table 5.3) and other management activities.

6.4 Lessons for other European heritage places

As outlined in section 1.3, the CVI assessment was only applied to the Lithuanian side of the transboundary WH property; however, this CVI report and its recommendations are pertinent for all parts of the transboundary property and potentially for WH properties with similar key values elsewhere. One possible suggestion is that a thematic analysis would enable other WH properties with similar or shared values, and/or likely to be exposed to comparable climate stressors, to benefit from the experiences elsewhere. While the need to address specific requirements for each property would remain, a thematically-based programme has the potential to inform other heritage places and inform a systematic monitoring programme.

The CVI workshop for the Curonian Spit provided an opportunity for an exchange of knowledge and experience for all participants. Workshop attendees were encouraged to take the learnings elsewhere and focus further on climate change and the special challenges facing other heritage places, such as national parks and listed cultural landscapes. It is also hoped the outcomes will lead to a more responsive approach including a more informed planning and management system for cultural heritage along with potential changes to national legislation.

There is an ongoing need for improved liaising between managers and experts/researchers (e.g., universities and research agencies) for more effective

monitoring and research. This begins with identifying and prioritising those research activities that are needed (building upon Table 5.4 and Section 6.2) followed by effective and ongoing communication with researchers. Bringing researchers from different and relevant fields together with site managers and stakeholders at local, regional and national levels can broaden perspectives; however, experience-based and local knowledge remains foundational for minimising local impacts and adapting to climate change at the property level.

6.5 Revisiting the CVI Process in the Curonian Spit

Through the CVI process, Lithuania now has a baseline and a systematic basis for reporting to UNESCO on the status of climate vulnerability for the Curonian Spit (e.g., via periodic reporting).

It is recommended that the CVI process be repeated on a periodic basis to systematically assess system changes on the Curonian Spit as well as the effectiveness of management responses. Furthermore, new research and knowledge will inform managers and aid future workshop participants in their discussions. A CVI application should occur prior to any review of the Management Plan which is expected in approximately 8 years' time. This will add to the role that WH properties can play in climate mitigation and adaptation efforts and contribute to the mobilisation of global efforts on climate action.

Input for formal Periodic Reporting could involve one of the shorter delivery modes of the CVI (i.e., Snapshot or Consult) rather than repeating the full Workshop mode, and with local facilitation. To ensure that trends and results are comparable, it is proposed that future CVI workshops apply the same methodology, beginning with a systematic review of the 2024 workshop assumptions. One suggestion might be to consider whether a public event might be included in a future workshop schedule – involving the community may enable more local perspectives and knowledge to be better considered in the workshop or provide different perspectives on relevant issues.

ACKNOWLEDGEMENTS



Harvesting of amber from the Baltic Sea is part of the local custom for which the Curonian Spit is renowned
(*Andžela Bazyk*)

We are very grateful to the organisations and people whose active involvement made the CVI project for Curonian Spit a success, including:

- The Norwegian Directorate of Culture Heritage (*Riksantikvaren*):
 - Vegard Berggard for introducing the idea of a CVI project to the Ministry of Culture of the Republic of Lithuania as a bilateral initiative between Norway and Lithuania, and for consistent and dedicated participation in all the project activities.
- The Ministry of Culture of the Republic of Lithuania:
 - Sigita Bugenienė for ambitious support of the project idea, the formation of the Steering Committee, and the commitment to all the project activities, incl. preparation and implementation of the workshop, and providing essential material for the report.
 - Rimante Dėringytė for organising the workshop, all preparations, and arrangements to ensure its successful implementation.
- The Ministry of Environment of the Republic of Lithuania for excellent cooperation:
 - Especially thanks to Judita Liukaitytė-Kukienė, an insightful member of the Steering Committee, who contributed information on climate change in Lithuania and specifically for the Curonian Spit.
 - Additional thanks to the staff of the Lithuanian Hydrometeorological Service, under the Ministry of Environment, that provided data for the analyses in Sections 4.1 and 4.2.
- The Secretariat of the Lithuanian National Commission for UNESCO and the Curonian Spit National Park Directorate for participation in the Steering Committee activities and providing extensive resources on Curonian Spit management:
 - Renata Kepežinskienė for justifying the need for a CVI project in Lithuania, critical insights and review comments on the report.
 - Juste Zavišaitė for making the Curonian Spit's values accessible in a variety of ways: a presentation, a guided tour, bicycles, photographs and other resourceful ways of showcasing this unique place.
- The CVI team members from James Cook University:
 - CVI developers Scott Heron and Jon Day for background presentations and the new methodology introduced to the culture heritage and climate sectors in Lithuania.
 - Kristin Heron for assistance and note-taking during the workshop and assisting with the report production.
- Egidijus Rimkus and Hans Olav Kvaal Hygen for background presentations on climate science during the workshop.
- The workshop participants (Appendix 5) who provided their time and expertise from a diverse range of perspectives, with sincere thanks from the Steering Committee.
- The *Smiltynė jachtclub* and its staff for their hospitality and providing all the necessary facilities.
- The EEA and Norway grants bilateral fund for funding support for the project.



Traditional fishing vessels (*kurėnai*) feature in local festivals and are popular with tourists
(*Renata Kilinskaitė*)

Appendix 1: Statement of Outstanding Universal Value for the Curonian Spit World Heritage Property

Inscribed by the UNESCO World Heritage Committee in 2000. <https://whc.unesco.org/en/list/994>

Brief synthesis

The Curonian Spit is a unique and vulnerable, sandy and wooded cultural landscape on a coastal spit which features small Curonian lagoon settlements. The Spit was formed by the sea, wind and human activity and continues to be shaped by them. Rich with an abundance of unique natural and cultural features, it has retained its social and cultural importance. Local communities adapted to the changes in the natural environment in order to survive. This interaction between humans and nature shaped the Curonian Spit cultural landscape.

The history of the Curonian Spit is dramatic: 5,000 years ago, a narrow peninsula (98 km in length and 0.4-3.8 km in width), the Great Dune Ridge separating the Baltic Sea from the Curonian Lagoon, was formed on moraine islands from sand transported by currents, and later covered by forest. After intensive logging in the 17th and 18th centuries, the dunes began moving towards the Curonian Lagoon, burying the oldest settlements. At the turn of the 19th century, it became evident that human habitation would no longer be possible in the area without immediate action. Dune stabilisation work began, and has continued ever since. By the end of the 19th century, a protective dune ridge was formed along the seashore to prevent inland sand migration, and the Great Dune Ridge was reinforced using trees and brushwood hedges. Currently, forests and sands dominate the Curonian Spit. Urbanised areas (eight small settlements) cover just about 6% of the land.

The most valuable elements and qualities of the Curonian Spit cultural landscape are its unique size and general spatial structure, demonstrating the harmonious coexistence between humans and nature; the characteristic panoramas and the silhouette of the Curonian lagoon; cultural elements including the remains of postal tracks, trade villages from the 10th and 11th centuries, traditional fishermen villages and other archaeological heritage covered by sand; the spatial-planned structure and architecture of ancient fishermen villages turned into resort settlements (ancient wooden fishermen houses, professionally designed buildings of the 19th century, including lighthouses, piers, churches, schools, villas); and elements of marine cultural heritage; natural and

human-made elements including the distinctive Great Dune Ridge and individual dunes, relics of ancient parabolic dunes; a human-made protective coastal dune ridge; relics of moraine islands, seacoast and littoral forests and littoral capes; ancient forests, mountain pine forests and other unique sand flora and fauna including a bird migration path; and the social-cultural traditions, spirituality, and the social perception of the area, which reflect the local lifestyle formerly centred on fishermen, artists, scientists, yachtsmen and gliders, travellers and other visitors.

Criterion (v): The Curonian Spit is an outstanding example of a landscape of sand dunes that is under constant threat from natural forces (wind and tide). After disastrous human interventions that menaced its survival, the Spit was reclaimed by massive protection and stabilization works that began in the 19th century and are still continuing to the present day.

Integrity

The entire area of the Curonian Spit cultural landscape reflects valuable qualities and underlying processes, retains historical functions and specific sustainable land use methods related to the peculiarities of the natural environment, and reflects the unique spiritual bond between humans and nature. The boundaries of the World Heritage property are sufficient to express all the attributes of its Outstanding Universal Value. Some of these attributes, such as the fishermen houses, need careful maintenance. In general, these attributes are particularly sensitive to pressures such as climate change, severe weather events, fire, excessive development and tourism. Because of the continuous evolution and development of the cultural landscape, it is very important to regulate the number of visitors to the property. New developments and other economic activities must be regulated to avoid any irreversible changes that may threaten the Outstanding Universal Value. The most vulnerable elements of the Curonian Spit cultural landscape are the oldest wooden fishermen's houses, the wooden decor of professionally designed buildings, and the human-made protective coastal dune ridge, which is influenced by the natural coastal processes under the influence of global climate change.

Authenticity

The Curonian Spit showcases high landscape values. It is an example of a special landform subjected to human intervention and natural phenomena such as climatic variations. The former has been both catastrophic, as with the drastic deforestation in the 16th century, and beneficial, as demonstrated in the 19th century with the creation of artificial barriers against further incursions by the sea. The cultural, natural and human-made elements of the Curonian Spit cultural landscape illustrate the most important features of its formation through their shapes, volumes, materials, and functions. The authenticity of the landscape is reflected by the tangible and spiritual values of the different historical periods that shaped its identity.

The vitality, spirituality and special mood of the cultural landscape and its unique characteristics is further highlighted by authentic forms of local intangible heritage. These include the marine cultural heritage; traditional trades, folklore and artistic traditions; the ethnographic elements of the fishermen's lifestyles; unique methods of protective coast and dune ridge management and forest maintenance; sustainable recreational activities and a cultural leisure tradition dating back to the 19th century.

Protection and management requirements

The Curonian Spit is situated in the Curonian Spit National Park in Lithuania and the Kurshskaya National Park of the Russian Federation. The status of these National Parks guarantees the protection of the cultural landscape. Both National Parks have the common goal of preserving the natural and cultural attributes that express the Outstanding Universal Value of the property. A very important prerequisite for the protection of the Outstanding Universal Value is state land ownership by the National Parks.

The governments of both states are responsible for the conservation of the Curonian Spit: in the Republic of Lithuania through the Ministry of Environment and authorised agencies, and in the Russian Federation through the Ministry of Natural Resources and Environment. The protection of immovable cultural heritage is the responsibility of the cultural Heritage Department under the Ministry of Culture of the Republic of Lithuania and the State Service for

Protection of cultural Heritage of the Kaliningrad region of the Russian Federation. The Governments have created the National Parks authorities, who play a key role in the conservation of the property, forest and coastal management.

The territory of the Curonian Spit is administered by Neringa and Klaipėda City municipalities of the Republic of Lithuania; and by the Federal State corporation National Park Kurshskaja kosa, along with the municipal unit of Kurshskaja kosa of the Zelenogradsk area of the Kaliningrad region of the Russian Federation. The local authorities in the Republic of Lithuania determine the main trends of socio-economic development, manage and plan settlements, and generally take care of the protection and management of the territory by implementing territorial planning documents in the Lithuanian part of the Curonian Spit. The local community is directly involved in the conservation of the property's tangible heritage and also carries the region's intangible heritage.

For the effective management and protection of the property's Outstanding Universal Value, closer collaboration of all institutions and stakeholders is needed within and between States.

In the Republic of Lithuania, any activity posing a threat to the Outstanding Universal Value of the Curonian Spit is prohibited by the Law on Protected Areas (2001), and Protection Regulation of the Curonian Spit National Park (2002). In the Russian Federation, the relevant laws are the Federal Law of Specially Protected Nature Territories of the Russian Federation (1995) and the Law on Federal State Enterprise (FSBA, 2012), implemented through territorial planning documents.

Different attributes of the property require different protection regimes and management activities. Therefore, different zones have been established in the National Parks for various specific purposes, such as strict reserves, reserves, recreational, residential and other zones. All these measures are outlined in the territorial planning documents.

The main territorial planning documents in the Republic of Lithuania are the Special Management Plan of the Curonian Spit (a territorial planning document adopted by the government in 2012), and the National Park Borders Plan (adopted by Parliament in 2010). Klaipėda's municipal General Plan has been

in place since 2007, while Neringa's General Plan was adopted by the municipality in 2012.

The preparation of a single territorial planning document for the management of the area, aiming to ensure the preservation of the property's Outstanding Universal Value in Lithuania is foreseen. The main territorial planning document in the Russian Federation is the Development Plan for the National Park Kurshskaja Kosa for 2009-2013.

The coordination of actions between the States is necessary to protect the Outstanding Universal Value of the property. Once finalised and agreed upon, an integrated Curonian Spit Management Plan covering

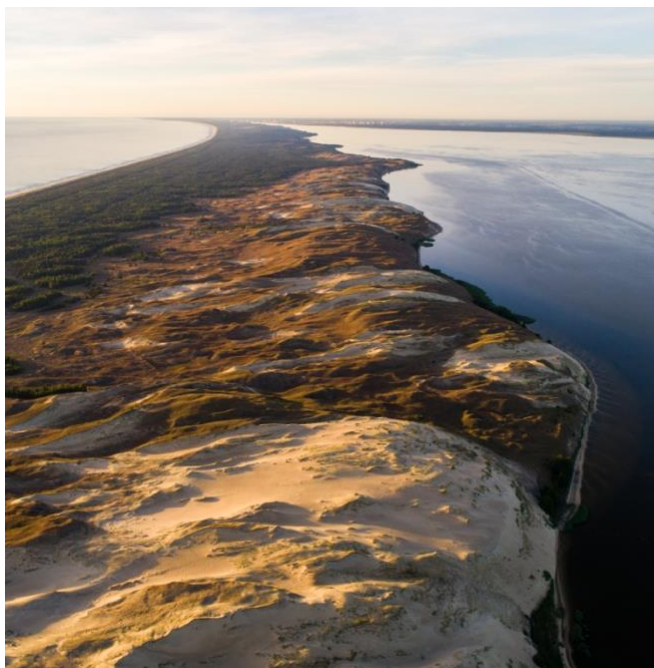
the whole property will be implemented in order to ensure the conservation of the Outstanding Universal Value, to improve cooperation between all institutions in both States, and to reach joint agreements on future activities. The preparation of this Management Plan is an essential step in the appropriate management of the property and particular attention should be paid to including a Tourism Management Plan and addressing the other major pressures potentially affecting the property. The implementation of territorial planning documents and the safeguarding of the implementation of existing legislation are high priorities.

Appendix 2: Images illustrating the key values for the Curonian Spit

Images depicting Key Value #1 - Unique and vulnerable coastal cultural landscape

Images by Renata Kilinskaite, unless otherwise noted

Aerial view of the unique size and form of the Curonian Spit



The 'Italian view' panorama near Thomas Mann house



Iconic view from the Parnidis Dune



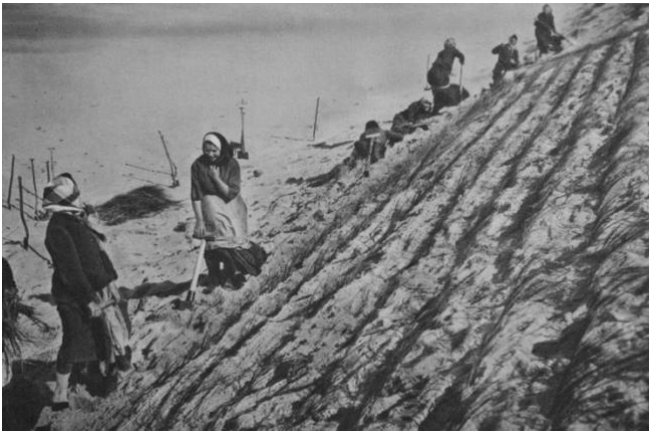
Nida settlement and forested dune landscape



Images depicting Key Value #2 – Human efforts to restore suitable living conditions

Images by Renata Kilinskaite, unless otherwise noted

Formation of the protective foredune ridge in 19th century
(CSNPa archives)



Human-made protective foredune ridge



Great Dune Ridge with planted mountain pine forests



The Great Dune Ridge afforestation in the 19th century
(CSNPa archives)



Images depicting Key Value #3 - Natural heritage

Images by Renata Kilinskaite, unless otherwise noted

Old-growth forests



Bird migrations (Vytautas Knyva)



White shifting dunes (Kazimieras Mizgiris)



Grey Dunes of Nagliai



Images depicting Key Value #4 - Authentic historical cultural heritage

Traditional wooden fishermen's house (*Neringa Museums*)



Kurėnas – the historic flat bottom sailing boat of the lagoon
(*Andrius Kundrotas, Nida Culture and Tourism Information
Centre 'Agila'*)



Colourful weathervanes depicting sailing boats (*Andrius
Kundrotas, Nida Culture and Tourism Information Centre
'Agila'*)



Krikštai – exclusive burial monuments (*Andrius Kundrotas,
Nida Culture and Tourism Information Centre 'Agila'*)



Images depicting Key Value #5 – Traditions, spirituality and local lifestyle

Images by Renata Kilinskaite, unless otherwise noted

*Rasos – St. John's Feast of the shortest night of the year
(Nendrė Žilinskaitė, Nida Culture and Tourism Information
Centre 'Agila')*



Local fisherman at the lagoon



*Expression of cultural memory in contemporary festivals
(Donatas Bielkauskas, Nida Culture and Tourism Information
Centre 'Agila')*



Catching amber in the Baltic Sea (*Andžela Bazyk*)



Appendix 3: List of other Significant Property Values (SPVs) for Curonian Spit

Other SPVs (that are locally, regionally or nationally significant) are listed as either tangible (T), intangible (I) or with elements of both.

Broad groupings of SPVs	Other SPVs (list in a prioritised order based on significance)	Additional justification
Active and vibrant community	Education (I)	Education (from early years and throughout life) fosters awareness, preservation, and sustainable management of cultural landscape, ensuring its protection. The decreasing number of children poses a risk to maintaining the town's kindergartens and gymnasium.
	Residents living year-round in the Curonian Spit (I)	This helps maintain the site's cultural integrity, supports local economies, and ensures continuous stewardship and protection of the heritage, preventing it from becoming solely a tourist destination.
	Institutional cooperation and good governance (I)	The absence of effective governance and institutional cooperation hampers the alignment of efforts to safeguard the cultural heritage of the Curonian Spit, while simultaneously pursuing the sustainable development of the resort area.
	Sustainable businesses supporting the community (T, I)	They help balance economic growth with environmental preservation. They ensure that the unique landscape and cultural heritage are protected, while providing livelihoods for locals, fostering community well-being, and promoting responsible tourism.
	Fishing (T, I)	Fishing traditions reflect the way local communities have adapted to and lived in harmony with their environment for centuries, shaping their identity, customs, and daily life. Preserving fishing practices also helps maintain cultural continuity and ensures that the knowledge of sustainable resource use is passed down to future generations.
	Community-engaging activities (I)	These are crucial for restoring and passing on the cultural memory of the area, as they strengthen local identity, promote intergenerational knowledge transfer and ensure active participation in the preservation of traditions, history, and cultural values of the Curonian Spit.
	Living between two waters (I)	The unique geographical location reflects a special relationship with nature. The proximity to the Baltic Sea and the Curonian Lagoon shapes the cultural identity, traditions, livelihoods, and the necessity to care for the fragile landscape.

Broad groupings of SPVs	Other SPVs (list in a prioritised order based on significance)	Additional justification
Natural uniqueness and vulnerability	Biological diversity (T)	<i>Natura 2000</i> protects a variety of habitats including coastal dunes, wetlands, and forests, along with species such as the natterjack toad, European mink, and several rare bird species like the great crested grebe and white-tailed eagle.
	Natural heritage objects (T)	According to the data of the State Cadaster of Protected Territories of the Republic of Lithuania, there are 10 geomorphological natural monuments and one geological natural monument in the National Park, making 7% of all natural monuments and 36% of all geomorphological monuments in Lithuania.
	Baltic coast and sea (T)	The length of Lithuania's coastline is only 90.66 km (the shortest among all Baltic countries), of which 51.03 km stretches along the Curonian Spit. This is of special value at the national level, encompassing not only opportunities for tourism and recreation but also biodiversity, endless panoramas, and marine and underwater heritage.
	Curonian Lagoon and coastline (T)	The Curonian Lagoon is the largest inland water body in the country reflecting cultural and ecological significance both locally and nationally.
	Terrestrial mammal species (T)	The proximity to wildlife and especially mammals (such as moose, foxes, roe deer, hares, and others) is one of the natural phenomena of the protected area, which provides a memorable experience, as well as knowledge of and respect for nature.
	Waterway to the Curonian Spit/ Island feeling (T)	Enhances the unique sense of isolation and natural fragility, fostering an 'island' experience for visitors and residents.
	Locations with sunrise and sunset over different waters on the same day (T)	Offers a rare natural spectacle of sun over the waters happening in the lagoon in the morning and in the sea in the evening that enhances the site's appeal and sense of place.
	Natural phenomena (I)	The unique geographical location and prevailing maritime climate result in sudden and frequent weather changes, while the open coastal and lagoon panoramas reveal impressive natural phenomena rarely seen in cities. Here, the seasons are still distinct, with wind variations, low fog, water icicles, a freezing lagoon, and the greatest number of sunny days in Lithuania.
	Natural resources (T)	Naturally growing medicinal herbs and mushrooms; and naturally occurring amber fosters the intersection of human activities with nature, while also contributing to the region's recreational and cultural values.
	Fresh Air (I)	Nerija is not just an area separated from large cities by vast waters; here, settlements make up only 6% of the territory. The result is clean air, one of the values that attracts visitors and creates favorable conditions for a healthy lifestyle for local communities.

Broad groupings of SPVs	Other SPVs (list in a prioritised order based on significance)	Additional justification
Inspiring space for creativity and science	Traditional and contemporary cultural events and their diversity (I)	Festivals, celebrations, traditional fests connecting past and present, highlighting the region's living culture: Shortest Night's fest, Old Sailing Boat regatta, Festival of Old crafts, Autumn Equinox, etc.
	Variety of scientific research fields (I)	The history of the Curonian Spit, its cultural and biological diversity, geographical position, and the mosaic of its spatial structures form a multi-layered field of scientific research. The continuous activities of scientists in the area and the interrelation of their studies significantly contribute to the understanding of the Curonian Spit at local, national, and international levels.
	Residency programs (I)	Residency programs and spaces for artists, scientists, writers, and others promote cultural and academic exchanges, enhance understanding and education, and foster the connection between research and art. The support of residencies contributes to the preservation of the area's cultural memory.
	Academic music events (I)	Promote high-quality cultural experiences, enriching the region's cultural life in sacral, cultural and open spaces.
	Painting and photography plein-air events and exhibitions (T, I)	Foster artistic expression and preserve the cultural heritage through visual arts locally and internationally.
Recreation	Sustainable tourism (I)	Ecological/nature experiences (e.g., bird watching, hiking), cultural heritage, sustainable tourism, culinary experiences, water tourism possibilities that benefit both visitors and local communities without harming the environment.
	Blue Flag and wild white sand beaches (M)	The public beaches of the Curonian Spit, annually awarded the Blue Flag certification, along with the wild coastal beaches, are the epitome of a clean, safe and natural beach experience that can be enjoyed on the Curonian Spit.
	Eco-friendly outdoor sports opportunities and infrastructure (M)	Hiking trails, bicycle paths, wind sports, sailing, orienteering, running, tennis and other activities promote sustainable recreation, encouraging a healthy lifestyle while minimising environmental impact.
	Waterways and piers (T)	These are vital for transportation across the lagoon, fishing, and recreation, reflecting the area's maritime heritage.
	Calmness and silence (I)	Enhances the natural peace of the Spit, for a retreat-like experience for residents and visitors, adding to the area's natural charm.
	Stargazing (I)	The Curonian Spit has minimal light pollution, allowing for breathtaking celestial views.
	Authentic culinary traditions (T)	Area-typical fish preparation (salting, smoking, drying) and dishes (fish soup, raw fish, bream ribs) preserve the region's gastronomic heritage, connecting locals and visitors to traditional ways of life.
	Museums and visitor centers (T)	Amber Museum, Thomas Mann Museum, Cultural and visitors' centers, Nature school, Crafts house of Eduardas Jonušas, the Sea Museum; all of these educate the public about the region's history, culture, and natural environment.

Broad groupings of SPVs	Other SPVs (list in a prioritised order based on significance)	Additional justification
Cultural Heritage	Resort architecture of the 20 th century (T)	The examples of resort architecture that developed in the Curonian Spit in the 20th century reflect the dynamics of ethnocultural changes, resort development, and cultural intersections of that era. By adopting and modernising the architectural features of fishing villages, the resort architecture of the last century acquired a unique style not found in other areas.
	Legacies of public figures of the 19 th –20 th century (T, I)	Thomas Mann, Herman Blode, Wilhelm and Alexander von Humboldt, Wilhelm Franz Epha and many other scientists, artists, architects, writers, sportsmen and engineers left legacies that give an understanding of the fragile and vulnerable peninsula, made significant research and shaped Curonian Spit cultural and intellectual history.
	Nature protection history, knowledge and documentation	These provide a comprehensive record of conservation efforts, challenges, and successes over time. This documentation helps to identify effective strategies for preserving the area's unique ecosystems and cultural landscapes, informs future management practices, and fosters awareness and appreciation for the property's values. It also serves as a vital resource for educating the community and stakeholders about the importance of ongoing protection and sustainable practices.
	Lighthouses (T)	The lighthouses of Nida, Pervalka, and Juodkrantė are symbols of the industrialization era and maritime cultural heritage. Their architectural elements and the signals of historical lamps (especially the old Fresnel lamp of the Nida lighthouse) have become part of the silhouette and identity of the Curonian Spit.
	Underwater heritage (T)	To this day, the preserved artifacts in the Baltic Sea and the Curonian Lagoon, which have been little studied, can reveal significant facts about past communities.
	Museum artifacts, movable values (T)	These hold cultural and historical significance, preserving the memory of past societies, ethnicity, cultural changes and adaptations to the unique environment.
	Memorial of the gliding school (T)	These honors the region's aviation history and its contribution to technological advancement.
	Military heritage (T)	This tells the painful story of the region's strategic importance and historical events of the 20 th century, enriching the cultural narrative.

Appendix 4: CVI workshop schedule, 26th–30th August 2024

Day 1 – Monday 26 August 2024 (start 12:45)

- 1 Welcome, Introduction to Curonian Spit.
- 2 Overview of workshop aims, logistics.
- 3 Introductions of participants.

AIM 1: Understand the Climate Vulnerability Index (CVI) framework and its application to the Curonian Spit.

- 4 Brief overview of the CVI process.

AIM 2: Understand the significant values that comprise the OUV for Curonian Spit; and assess condition and trend. Discuss other significant values (i.e., Significant Property Values, SPVs).

- 5 Ensure all participants are aware of the Statement of OUV for the Curonian Spit and how the table of key values and attributes were derived from the Statement of OUV.
- 6 Undertake high-level assessment of current condition of key values and the recent trend in those values (i.e., since the date of inscription, 2000).
- 7 Discuss other values that are significant at a local/regional scale (i.e., other SPVs) but are not part of OUV.

Wrap up discussion, review Day 1; preview Day 2

Day 2 – Tuesday 27 August 2024

AIM 3: Background info on Curonian Spit and future climate change facing the Curonian Spit.

- 8 Introduction to climate change (CC) globally, regionally and locally.
- 9 Provide overview of CC projections for Curonian Spit. Agree upon the climate scenario and time scale for the assessment (e.g., *Business-as-usual for 2050*).

AIM 4: Assess the climate stressors impacting the values of Curonian Spit and select key climate stressors.

- 10 Show list of climate stressors – check for (i) understanding; and (ii) timescales. Demonstrate selection of top three climate stressors impacting each key value.
- 11 Using the list of climate stressors provided, small groups brainstorm what are the top three climate stressors impacting the key values of OUV.

- 12 Bring outputs from #11 back to plenary and ensure all participants agree on which climate stressors are impacting the attributes of OUV.

Field trip of Curonian Spit (bus, walk and boat, 11:30 - 17:00).

Day 3 – Wednesday 28 August 2024

- 13 Revisit process for exposure, including detail of categories, and review modifiers.
- 14 Participants in breakout groups assess the exposure term (and modifiers) for each of the three key climate stressors.
- 15 Bring outputs from #14 back to plenary and discuss any variation in assessments of exposure.
- 16 Introduction of CVI process for sensitivity (including categories and modifiers) and review potential impact matrix that combines sensitivity with exposure. Remind all of climate scenario for analysis.
- 17 Participants in breakout groups assess the sensitivity (and modifiers thus determining potential impact) for the key CC stressors.
- 18 Bring outputs from #17 back to plenary and review the potential impact matrix that combines sensitivity with exposure. Discuss any variation in assessments of exposure or sensitivity.
- 19 Introduction to adaptive capacity and task to identify existing strategies used to mitigate climate related impacts and potential adaptive capacities.
- 20 Participants in breakout groups assess the adaptive capacity (thus determining OUV vulnerability) for the key CC stressors.
- 21 Bring outputs from #20 back to introduce adaptive capacity assessment.
- 22 Participants in breakout groups assess the adaptive capacity (thus determining the OUV Vulnerability) for the key CC stressors.
- 23 Bring outputs from #22 back to plenary and discuss any variation in assessments of adaptive capacity.

Wrap up discussion, review Day 3; preview Day 4

Day 4 - Thursday 29 August 2024

AIM 5: Evaluate vulnerability of OUV to key climate stressors, considering exposure, sensitivity and adaptive capacity for a selected climate scenario (e.g., 'Business as Usual' or 'Paris Agreement').

- 24 Plenary discussion of assessments of exposure, sensitivity and adaptive capacity and any effect on OUV Vulnerability.

AIM 6: Consider economic, social and cultural dependencies (sensitivity) and adaptive capacity, to determine Community Vulnerability.

- 25 Revisit process for analysing economic, social and cultural (ESC) dependency. Prioritise these in terms of feasibility.
- 26 ESC overview for Curonian Spit.
- 27 Discussion of business types for analysis and introduction to Economic breakout groups.
- 28 Participants in breakout groups assess the economic dependency and adaptive capacity for Curonian Spit.
- 29 Bring outputs from #28 back to plenary and discuss any variation in assessments of economic dependent and adaptive capacity.
- 30 Introduction to Social dependency breakout groups.
- 31 Participants in breakout groups assess the social dependency and adaptive capacity for Curonian Spit.
- 32 Bring outputs from #31 back to plenary and discuss any variations of social dependencies and corresponding adaptive capacities.

- 33 Introduction to cultural dependency breakout groups.

- 34 Participants in breakout groups assess the cultural dependency and adaptive capacity (thus determining Community Vulnerability) for Curonian Spit.

Wrap up discussion, review Day 4; preview Day 5

Day 5 - Friday 30 August 2024 (end 12:00)

This day commenced with a brief presentation to the Lithuanian Minister for the Environment, followed by an address from the Minister.

- 35 Bring outputs from #35 back to plenary and discuss any variation in assessments of cultural dependencies and corresponding adaptive capacities.

AIM 7: Summary, feedback and next steps.

- 36 Summarise outcomes from workshop and present final analysis.
- 37 Discussion of items 'parked' during the workshop.
- 38 Discussion of next steps.
- 39 Receive feedback from participants on CVI framework and workshop process.
- 40 Complete workshop evaluation forms; receive other feedback from participants.
- 41 Thanks and close.

Appendix 5: List of workshop participants

Workshop Steering Committee members indicated by *.

Name	Role	Organisation
Agnė Jasinavičiūtė	Director	State Service of Protected Areas, Ministry of Environment
Ainis Vincevičius	Hydrologist	H Consulting
Aistė Kubiliūtė	Environmental Coordinator	Development and Environmental Department, Port of Klaipėda
Algirdas Kurtinaitis	Forest inspector	Juodkrantė Forest Inspectorate, Office of State Forest
Almantas Mureika	Head of Division	Klaipėda Territorial Division, Department of Cultural Heritage, Ministry of Culture
Christian Løchsen Rødsrud	Adviser	Norwegian Directorate for Culture Heritage (<i>Riksantikvaren</i>)
Dominykas Chlebinskas	Founder	Schwarzort Heritage & Arts
Donatas Norkus	Forest inspector	Juodkrantė Forest Inspectorate, Office of State Forest
Donatas Pupienis	Professor of the Department of Hydrology and Climatology	Vilnius University
Egidijus Rimkus	Professor of the Department of Hydrology and Climatology	Vilnius University
Eglė Stonkė	Managing Director	Klaipėda Region Association
Giedrė Godienė	Assistant Professor in Geography and Landscape Studies	Vilnius University
Gintaras Stauskis	Professor of the Department of Urban Design	Vilnius Gediminas Technical University
Hanna Lønning Gjerdi	Advisor	Norwegian Directorate for Culture Heritage (<i>Riksantikvaren</i>)
Hans Olav Hygen	Head of Climate Services	MET Norway (<i>Avdelingsleder for klimatjenester ved Meteorologisk institutt</i>)
Inga Dailidienė	Professor of Geography, Oceanology and Climatology	Klaipėda University
Inga Gaižauskaitė	Founder	Schwarzort Heritage & Arts
Jon Day*	CVI Developer; Adjunct Senior Research Fellow;	James Cook University, Australia (a former Director at Great Barrier Reef Marine Park Authority)
Judita Liukaitytė-Kukienė*	Senior Advisor	Ministry of Environment of the Republic of Lithuania
Jurgita Mikšytė	Nature Conservation Specialist	Office of State Forest
Justas Kazlauskas	Senior Tourism Specialist	Municipality of Neringa
Justė Zavišaitė*	Specialist for UNESCO-Related Matters	Curonian Spit National Park Administration
Lina Dikšaitė	Director	Curonian Spit National Park Administration

Name	Role	Organisation
Margarita Kirkliauskaitė	Synoptic	Lithuanian Hydrometeorological Service, Ministry of Environment of the Republic of Lithuania
Modestas Bružas	Senior Specialist	Curonian Spit National Park Administration
Monika Dobrovolskytė	Local entrepreneur	Mingės poilsis
Ole Søre Eriksen	Senior Advisor	Norwegian Directorate for Culture Heritage (<i>Riksantikvaren</i>)
Rasa Goštautaitė	Senior Researcher	<i>The Critical</i> (Curonian Spit Management Plan contractor)
Renata Kepežinskienė*	Head of Heritage Programmes	UNESCO National Commission for Lithuania
Rimantė Dėringytė*	Coordinator of EEA Grants Culture Programme	Ministry of Culture of the Republic of Lithuania
Rugile Puodžiūnienė	Senior Officer of Memory Institutions Policy Group	Ministry of Culture of the Republic of Lithuania
Scott Heron*	CVI Developer; Professor of Physics	James Cook University, Australia
Sigita Bugenienė*	Head of Cultural Heritage Group	Ministry of Culture of the Republic of Lithuania
Vegard Berggård	Senior Advisor	Norwegian Directorate for Culture Heritage (<i>Riksantikvaren</i>)
Vilija Augutavičienė	Head of Climate Policy Group	Ministry of Environment of the Republic of Lithuania
Vilija Ralytė	Senior Advisor	State Commission for Culture Heritage
Viltė Janušauskaitė	Head of Cultural Heritage Sites Maintenance and Consulting group “FIXUS Mobilis”	Cultural Infrastructure Centre
Žemartas Budrys	Partner and Sustainability lead	<i>The Critical</i> (Curonian Spit Management Plan contractor)
Žygimantas Valiuška	Biologist	Curonian Spit National Park administration

Appendix 6: Glossary and Acronyms

Adaptive capacity	The ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences.
Anthropogenic	Resulting from or produced by human activities.
Citizen science	The collection of (typically) environmental data by members of the general public, usually in collaboration with professional scientists
Climate	The composite or generally prevailing expected weather conditions of a region (e.g., temperature, air pressure, humidity, precipitation, sunshine, cloudiness, winds) throughout the year, averaged over a series of years.
Climate change	A change in the pattern of weather, and related changes in oceans and land surfaces, occurring over time scales of decades or longer.
Climate projection	A projection of the response of the climate system to emission or concentration scenarios of greenhouse gases and aerosols, or radiative forcing scenarios, often based upon simulations by climate models. Projections from the Coupled Model Intercomparison Project Phase 6 (CMIP6), which include societal decisions and effects are referred to in this report.
Community	The human population/s associated with an area of significance.
Compounding factors	Interacting stressors (both climate and non-climate) whose combined effect (synergy) is greater than the sum of individual effects.
Current condition and recent trend	Assessment of the present status of values and their attributes; and how that has changed since the time of recognition (e.g., since World Heritage inscription)
Exposure	A measure of the contact between a system (whether physical or social) and a stressor.
Sensitivity	The degree to which a system is affected, either adversely or beneficially, by climate variability or change.
Extreme weather event	A weather event that is rare at a particular place and time of year. Definitions of 'rare' vary, but an extreme weather event would normally be as rare as or rarer than the 10 th or 90 th percentile of the observed probability.
Intergovernmental Panel on Climate Change (IPCC)	The United Nations body, established in 1988, for assessing the science related to climate change; it was created to provide policymakers with regular scientific assessments on climate change, its implications, and potential future risks, as well as to put forward adaptation and mitigation options. The IPCC is the most authoritative international body on climate science and is an essential component of the world's response to climate change.
Mitigation (of climate change)	A human intervention to reduce emissions or enhance the sinks of greenhouse gases (GHGs). Mitigation measures in climate policy are technologies, processes or practices that contribute to mitigation, for example renewable energy technologies, waste minimisation processes, public transport commuting practices, etc.
Restoration (in a cultural heritage context)	Involves human interventions to authentically maintain the values of cultural heritage that has been degraded, damaged or destroyed.
Restoration (in an environmental context)	Involves human interventions to assist the recovery of an ecosystem that has been previously degraded, damaged, or destroyed.
Weather	The state of the atmosphere – its temperature, humidity, wind, rainfall and so on – over hours to weeks.

CCRT	Current condition and recent trend
CE	Coastal erosion
CVI	Climate Vulnerability Index
ICOMOS	International Council on Monuments and Sites
IPCC	Intergovernmental Panel on Climate Change
IPE	Intense precipitation events
IUCN	International Union for Conservation of Nature
KVs	Key Values
OUV	Outstanding Universal Value
RCP	Representative Concentration Pathway
SIF	Storm Intensity & Frequency
SOUV	Statement of Outstanding Universal Value
SPVs	(Other) Significant Property Values
SSP	Shared Socioeconomic Pathway
TT	Temperature trend
UNESCO	United Nations Educational, Scientific and Cultural Organization
WH	World Heritage

CVI



LIETUVOS RESPUBLIKOS
KULTŪROS MINISTERIJA



JAMES COOK
UNIVERSITY
AUSTRALIA



unesco

Lithuanian
National Commission



Ministry of
Environment
Republic
of Lithuania

Iceland
Liechtenstein
Norway grants

A snow-covered Great Dune Ridge of the Curonian Spit is not seen by summertime visitors. In winter, this frosty layer becomes a vital shield for the sandy terrain against the powerful northwestern winds that once shaped these famous dunes but now threaten to wear them away. As winters grow shorter and warmer, the loss of this protection increases the vulnerability of the dunes.

