Interreg
Baltic Sea Region

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BLUE ECONOMY
BEACH-SOS

Køge Bay: Climate-Smart Beaches for Sustainable Coastal Tourism

BEACH-SOS INTERREG BALTIC SEA REGION PROJECT

The stakeholder workshop held in Havhytten, Denmark, on May 2nd, 2024, was a pivotal event within the broader context of the BEACH-SOS Baltic Sea Region project. This project aims to address the multifaceted challenges faced by Køge Bay, where environmental changes intersect with social and economic dynamics. Shifting weather patterns, and an expanding tourism industry necessitate collaborative efforts to ensure the long-term sustainability of this coastal region.

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Cite as: Køge Bay: Climate-Smart Beaches for Sustainable Coastal Tourism. 1st Stakeholders Workshop Report, BEACH-SOS Interreg Baltic Sea Region. Climate Service Center Germany (GERICS). Helmholtz-Zentrum Hereon GmbH, Foundation for Environmental Education -Blue Flag Program, Danish Outdoor Council (Friluftsrådet). David Cabana, Louis Celliers, Bjarke Lembrecht Frandsen, Alessandro Venti, Johan Durand. Hamurg - May 2024.

Acknowledgements: This workshop would not have been possible without the essential contributions of participating organisations: Strandparken I/S, Brøndby Kommune, Vallensbæk Kommune, and Dansk Kyst- og Naturturisme. Their expertise and collaborative spirit were instrumental in shaping the discussions and fostering a successful event. We also thank all individual participants for their valuable insights.

Køge Bay: Climate-Smart Beaches for Sustainable Coastal Tourism

1 Introduction

Køge Bay, a Danish coastal location known for its scenic beauty, faces a confluence of environmental and social challenges. Rising sea levels, environmental changes, and a burgeoning tourism industry all contribute to a complex situation requiring careful management. However, a promising new initiative, the BEACH-SOS project, aims to provide a platform for open dialogue and collaborative solutions regarding these pressing issues.

This report details a collaborative effort aimed at crafting climate-smart solutions for Køge Bay's future. It chronicles a stakeholder meeting held on May 2nd, 2024, at Havhytten, Denmark. Representatives from diverse sectors – government, environmental organizations, businesses, academia, local communities, and potentially international bodies – convened to discuss the impact of climate change and brainstorm strategies for sustainable coastal tourism development.

Through presentations, interactive mapping exercises, and creative vision-building activities, participants delved into the intricate factors shaping Køge Bay's destiny. The discussions illuminated potential threats from climate change, like rising tides and disrupted ecosystems. However, the focus ultimately shifted towards a shared vision: a future where Køge Bay thrives as a vibrant tourist destination in harmony with its natural environment.

The following pages will take you on a journey into the heart of this workshop. We'll explore the current state of Køge Bay, envision its potential in 2050, and identify the crucial steps needed to ensure its long-term resilience. Join us as we chart a course for a sustainable future for this beloved coastal region.

2 Climate Change Signals and Impacts in Koge Bay, Denmark.

The workshop commenced with a warm welcome to all participants and a round of thre presentations. The first on introduced the Strand Park in Køge Bay, folwed by the presentation of the BEACH-SOS project and a presentation on the future climate signast in Køge Bay "Climate Change Signals and Impact in Køge Bay, Denmark."

This last presentation delved into the complex picture climate change presents for tourism and beach management in the Bay and in Denmark. A warmer climate has the potential to extend the tourist

season and make Denmark more attractive to visitors seeking relief from scorching temperatures in southern Europe. Studies suggest Denmark's position as a temperate region with good beaches positions it well to benefit from these shifts. However, these potential gains come with challenges.

Key Themes at the Intersection: Climate Change, Coastal Tourism, and Coastal Management

Rising sea levels threaten existing coastal tourist areas, potentially rendering some holiday destinations less atractive. Additionally, increased frequency of heavy downpours may necessitate investments in climate protection measures for outdoor attractions. Køge Bay, a specific area of focus, faces well-documented risks from both rising sea levels and potential erosion.

Beyond physical infrastructure, public health is another concern. Warmer sea surface temperatures can increase the risk of Vibrio infections, a bacterial illness spread through contact with contaminated water. The low-salinity Baltic Sea, where Køge Bay is located, is particularly susceptible to becoming a breeding ground for these bacteria.

One key factor influencing tourist satisfaction is thermal comfort. The Universal Thermal Climate Index (UTCI) is a metric used to measure how people experience outdoor temperatures. Understanding how climate change will affect UTCI is crucial for the tourism industry to adapt and maintain competitiveness.

In conclusion, climate change presents a mixed bag of opportunities and challenges for Danish tourism. While warmer weather could attract new visitors, rising sea levels, increased risk of infections, and changes in thermal comfort require adaptation strategies to ensure the long-term success of the industry.

3 Køge Bay in 2050: A Shifting Landscape

This section explores the future of Køge Bay in 2050, considering both potential realities and aspirational possibilities.Through a combination of mapin exersices and brainstorming sessions with local stakeholders,we paint a picture of:

- Section 3.1. Tackles the parcticipants perception on what the bay might look like under a "business as usual" scenario.
- Section 3.2. Presents the desired future for Køge Bay, informed by the hopes, dreams, and priorities shared by community members. This collaborative vision considers environmental sustainability, economic prosperity, and social well-being.
- Section 3.3 confronts the realities of achieving this desired future. Leveraging insights from stakeholder discussions, we identify specific barriers such as environmental challenges, economic considerations, or infrastructure limitations that must be addressed to bridge the gap between the forecasted and desired future of Køge Bay.

Ultimately,this report aims to build a basis for future workshops to develop comprehensive understanding of the bay's potential pathways and the steps needed to navigate towards a more sustainable and desirable future.

3.1 How will be Køge Bay in 2050 considering business as usual (Forecasted)

The diferent Workinng Groups explored the potential impacts of climate change on Køge Bay, considering both the challenges and opportunities that lie ahead. Their discussions yielded a range of possibilities:

Working Group 1

- Rising Waters: Increased sea levels will reshape the bay, potentially inundating low-lying areas.
- Fortified Coast: Dikes will likely be raised or extended to protect against rising water levels.
- Nature-Based Solutions: More natural solutions like restored wetlands or nourished sand dunes may be implemented alongside dikes for a more sustainable approach.

- Offshore Power: Wind farms located offshore could become a prominent source of renewable energy.
- Shifting Species: Rising sea temperatures and changing water conditions could lead to the arrival of new marine species, while some existing species may struggle.
- Green Corridors: Maintaining and improving existing green corridors that connect natural areas will be crucial for wildlife movement and habitat preservation.
- Warming Waters: Higher average water temperatures could impact the bay's ecosystem and potentially lead to more frequent algal blooms.
- Allergy Season: Increased pollen dispersion due to warmer temperatures could worsen allergies for some residents.
- Underwater Havens: More stone reefs could be built to create habitats for marine life and help break wave energy,protecting the coastline.
- Hidden Threats: Increased pollution from microplastics, pesticides, and other sources could pose a risk to the bay's health.
- Emerging Threats: The spread of vector-borne diseases carried by insects or other animals might become a concern with changing climatic conditions.

Working Group 2

- Shrinking Shores: Rising sea levels will claim beach space, forcing the coastline inward.
- Fortified Coastline: Increased dike construction will be necessary to protect against rising water.
- Urban Squeeze: As coastal populations move inland due to sea level rise, competition for space will intensify.
- Limited Leisure: More frequent swimming bans and beach closures may occur due to extreme weather events or water quality concerns.
- Weathering the Storm: Advanced infrastructure, like storm surge barriers, will be crucial for managing extreme weather.
- Infrastructure Under Strain: Existing infrastructure will face challenges due to increased population density and extreme weather events.

Working Group 3

- Enhanced Protections: Dikes will be significantly reinforced, safeguarding the bay from future weather events.
- Improved Accessibility: Transportation infrastructure will be upgraded, making Køge Bay easier to reach and explore for visitors.

- Booming Tourism: Increased accessibility, coupled with no major investments in hospitality, could lead to a surge in visitors seeking a more natural experience.
- Thriving Community: Køge Bay's population is expected to rise with more residents drawn to the beautiful location.
- Upgraded Amenities: Public toilet facilities will be modernized, improving comfort and hygiene for residents and visitors.
- Environmental Recognition: Køge Bay could achieve Blue Flag status, an international eco-label for clean and sustainable marinas and beaches.
- Potential Challenges: Increased tourism could strain existing resources and potentially harm the natural environment if not carefully managed.

Based on the Woriking Groups discuison if current trends continue (business-as-usual), Køge Bay in 2050 could face a significantly altered landscape with rising sea levels, increased infrastructure needs, and potential for a tourism boom alongside environmental challenges.

3.2 How would you Like Køge bay to be in 2050 (Desired)?

Moving beyond the challenges of "business as usual," this section explores the collective vision for Køge Bay's future as articulated by the working groups. Here, we delve into their aspirations for a Køge Bay that is not only resilient to climate change but also thrives as a vibrant center for sustainable tourism and a healthy environment.

Working Group 1

- Developing sustainable tourism - hostels, camping, Shelters.
- More mobile constrictions that can be moved before floods/storms/rains
- Early warning systems for bad weather.
- Better ecological standard in all of Køge Bay.
- Increasing public/local involvement
- Local value for the inhabitants
- Local joy about having implemented the modernization
- Added value, multifunctional access to the public, better nature.

Working Group 2

- Beskyt og Benyt Naturen! (Protect and Enjoy Nature!)
- More Regulated Areas, Less Disruption: Wildlife needs space to thrive. Let's create more protected areas and minimize disturbances to their habitats.

- Nature-Based Solutions We can combat enviroment degrdation through innovative solutions.
- National Strategy with Local Voices: Develop a comprehensive national strategy for nature protection that incorporates local community engagement.
- Strengthen Political Commitment: Increase political focus on protecting our natural world.
- Education and Information on Littering: Raise awareness about the littering problem through education and information campaigns.
- Clean Water and Abundant Marine Life: Achieve cleaner water and a richer marine ecosystem for the benefit of all.

Working Group 3

Rejuvenation and Resilience:

- Modernize facilities with a focus on sustainability for a lighter footprint.
- Implement gradual, science-based restoration plans for long-term success.

Shared Spaces, Shared Future:

- Designate protected areas for vulnerable ecosystems while creating dedicated zones for responsible recreation.
- Foster a sense of co-existence between humans and nature.

Engaging All Audiences:

- Diversify visitor demographics through targeted outreach and inclusive programming.
- Develop all-season recreational activities that are nature-friendly and cater to a wider range of interests.

The collective vision for Køge Bay in 2050 paints a hopeful picture: a bay where nature thrives alongside responsible human interaction, attracting visitors while safeguarding its ecological health. By embracing sustainable practices, fostering community engagement, and prioritizing environmental protection, stakeholders can turn this vision into reality, ensuring a flourishing Køge Bay for generations to come.

Workshop participants engaged in a lively sharing their knoledge and thougrhs about Køge Bay's ecosystem and economic activities.

3.3 Barriers to desired future of Køge Bay in 2050

The collective vision for Køge Bay in 2050, as outlined by the working groups, presents a roadmap for a sustainable and vibrant future. However, the path forward is not without its obstacles. This section delves into the key barriers identified by the working groups, encompassing financial constraints, policy limitations, knowledge gaps, and potential social and environmental concerns. Recognizing these challenges is the first step towards overcoming them. Through collaborative efforts, innovative solutions, and a commitment to long-term sustainability, stakeholders can work together to transform the desired future into a reality for Køge Bay.

Working Group 1

- Financial Constraints: Securing funding for large-scale sustainable projects can be difficult.
- Policy Hurdles: Outdated or inadequate legislation can hinder progress in areas like renewable energy adoption.
- Knowledge Gaps: A lack of public and industry awareness about sustainable solutions can slow down implementation.
- Community Concerns: Local environmental groups may raise valid concerns about specific projects that need to be addressed.
- Sustainable Resource Challenges: Sourcing materials like sand in an environmentally friendly way can present logistical difficulties.
- Time Crunch: The urgency of the climate crisis requires accelerated action, and delays could be detrimental.

Working Group 2

- Dominance of special interest groups: This replaces "uses groups with own narrow agendas". It's more specific and highlights the potential for these groups to prioritize short-term gain over long-term sustainability.
- Devaluing of natural capital: This replaces "Low priority for nature" and emphasizes the economic perspective that often undervalues the intrinsic worth of nature.
- Focus on short-term economic benefits: This clarifies the economic view on nature value and highlights the prioritization of immediate profits over long-term environmental health.
- Limited future planning: This replaces "Difficulty to project ourselves in the future" and emphasizes the lack of long-term vision.
- Short-term decision-making: This clarifies "Short decision cycle" and emphasizes the focus on quick results over long-term consequences.
- Environmental illiteracy: This replaces "Lack of awareness towards the quality of nature" and highlights the lack of knowledge about environmental issues.
- Overemphasis on economic growth: This clarifies "Economy" and highlights the potential for economic growth to come at the expense of the environment.

Working Group 3

Environmental:

- Sea level rise [This can be combined with storms and floods for a more concise term]
- Invasive species
- Erosion

Financial:

- Funding limitations

Regulatory:

- Legal hurdles (permits, regulations)
- Social and Political:
- Slow decision-making and implementation processes
- Public opposition or lack of awareness

Additional Considerations:

- Infrastructure limitations (existing infrastructure may not support the desired future)
- Climate change impacts (beyond sea level rise, consider changes in weather patterns).

While the vision for Køge Bay in 2050 is inspiring, achieving it requires navigating a series of hurdles. Working Groups 1, 2, and 3 identified various barriers, ranging from financial constraints and policy limitations to knowledge gaps and potential community concerns. Addressing these challenges head-on through collaborative efforts and innovative solutions will be crucial for transforming the desired future into reality.

4 Conclusions. Køge Bay: 2050 Crossroads

This workshop explored potential futures for Køge Bay in 2050, considering both a business-as-usual scenario and desired outcomes.

The Future's Murky: Rising seas, stressed ecosystems, and booming tourism paint a complex picture for Køge Bay.

- **Brace for Impact:** Expect rising sea levels to reshape the bay, likely requiring fortified defenses. Nature-based solutions like restored wetlands could be part of the mix.
- **A Changing Bay:** Warmer waters may bring new marine life, but also more frequent algal blooms. Increased development could squeeze out nature if not carefully managed.
- **The Dream**
    - **Sustainable Tourism:** Eco-friendly stays, camping, and responsible visitor behavior are the way to go.

  - **Nature Wins:** More protected areas for wildlife and thoughtful recreation are key.
  - **Future-Proofed Bay:** Sustainable upgrades and science-backed restoration plans ensure a healthy bay.
  - **Sharing is Caring:** Protected areas for ecosystems coexist with zones for responsible recreation.
  - **Locals at the Helm:** Public engagement and local community involvement are crucial.
- **Roadblocks Ahead:**
  - **Budget:** Funding big, sustainable projects is a challenge.
  - **Policy Paradox:** Outdated policies and regulations can slow progress.
  - **Knowledge Gap:** A lack of awareness about sustainable solutions needs to be addressed.
  - **Special Interests Collide:** Groups prioritizing short-term gains over long-term health pose a threat.
  - **Goblal change:** Rising seas, invasive species, and erosion all threaten the bay's well-being.
  - **Slow and Steady Loses the Race:** Delays in planning and implementation could be costly.

The workshop established a foundation for a flourishing future for Køge Bay. Open dialogue and a shared vision among stakeholders highlighted the collective responsibility for the Bay's well-being. Striking a harmonious balance between economic development and environmental protection emerged as key to success.The workshop served as a testament to the collective desire for Køge Bay to be a beacon of environmental responsibility.The envisioned Køge Bay of 2050 welcomes visitors while fiercely safeguarding its natural wonders for future generations. Realizing this vision hinges on innovative solutions, continued collaboration among stakeholders, and an unwavering commitment to long-term sustainability.

The BEACH-SOS project will return to Denmark, armed with valuable climate change indicators, presents an exciting opportunity. By working together and leveraging these indicators, significant improvements can be made to beach management and coastal tourism practices. This presents a chance to shape a sustainable future for Køge Bay, one that reflects the passionately articulated collective vision.Through continued collaboration, stakeholders can ensure Køge Bay remains a remarkable region – a thriving ecosystem that continues to inspire and benefit all for years to come.

Following a productive workshop, participants enjoy a refreshing coastal walk.

5 Annex

5.1 Workshop Agenda

Køge Bay. Climate-Smart Beaches for Sustainable Coastal Tourism

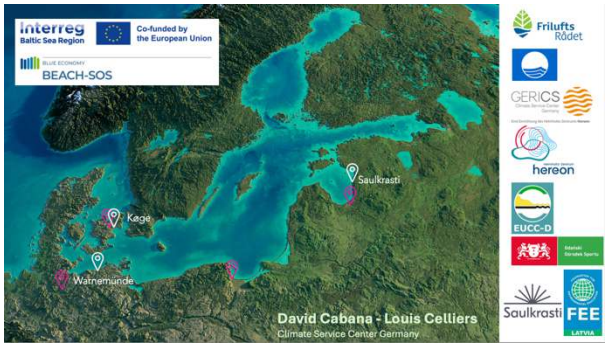
BEACH-SOS Project Meets Køge Bay

Location: Havhytten, Skovvej 53, 2635 Ishøj, Denmark
Date: May 2
Time: 10.00 – 15.30

- **09:30** Bread and Coffee
- **10:00** Welcome and Introductions
- **10:15-10:35** Introduction to BEACH-SOS
- **10:35-10:55** Climate Change in the Baltic Sea and Køge Bay
- **10:55-11:10** Coffee break
- **11:10-12:25** Charting Køge Bay: Exploring Interactions Between Nature and Coastal Tourism.
- **12:25-13:00** Lunch
- **13:00-14:00** Køge Bay by 2050. Climate Change Adaptation and Coastal Tourism
- **14:00-14:10** Coffee break
- **14:10-14:40** Wrap-Up and Next Steps
- **14:40-15:30** Coastal walk

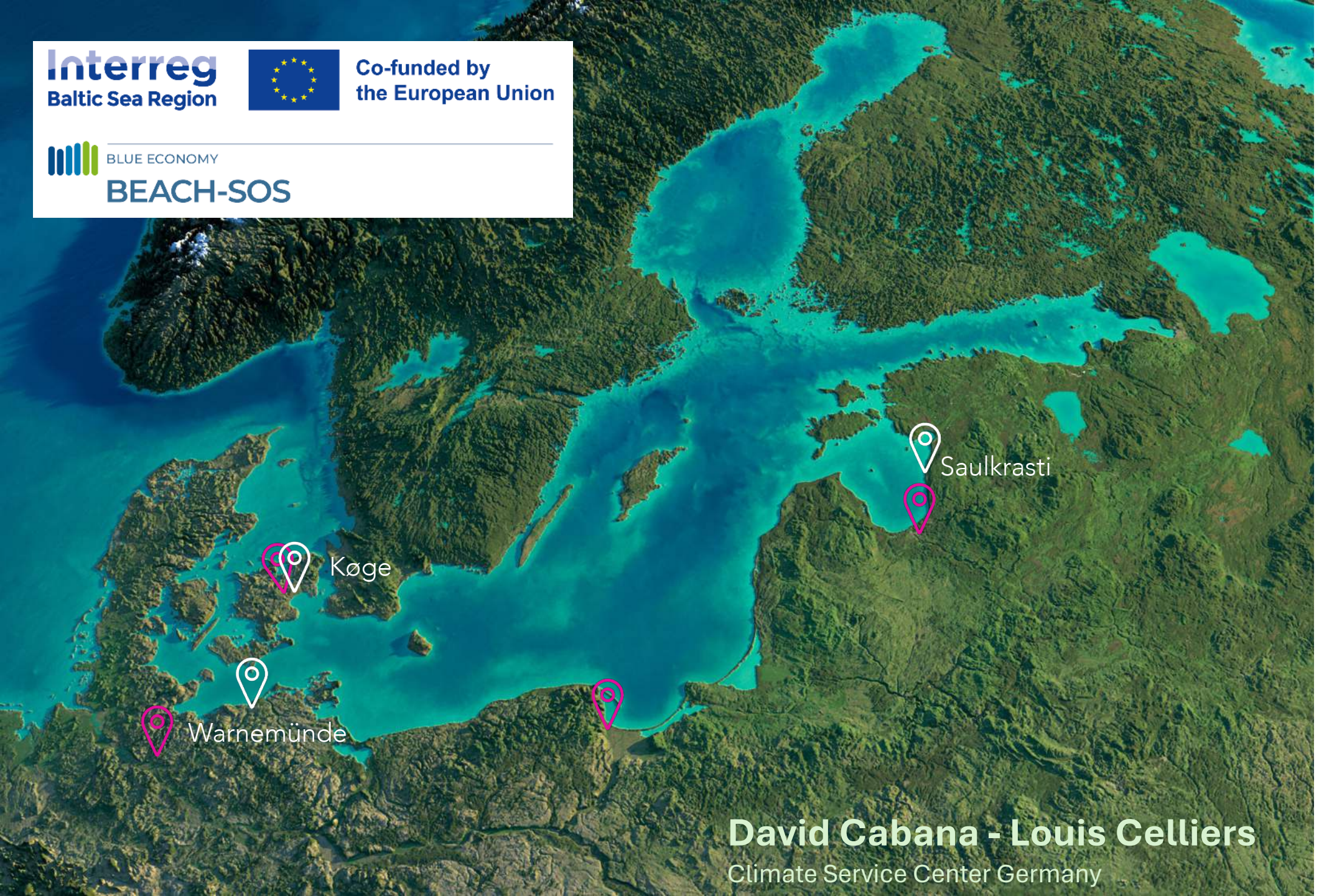
https://interreg-baltic.eu/project/beach-sos/

5.2 Presentations



The BEACH-SOS project

Climate Change in Køge Bay



Friluftsrådet

GERICS
Climate Service Center
Germany
Eine Einrichtung des Helmholtz-Zentrums Hereon

Helmholtz-Zentrum
hereon

EUCC-D

Gdański
Ośrodek Sportu

Saulkrasti

FEE
LATVIA

Blue Economy Sectors

Blue Economy Report 2022

Established Sectors

- Marine Living Resources
- Marine Non-Living Resources
- Marine Renewable Energy
- Port Activities
- Ship Building
- Marine Transport
- Coastal Tourism

Emerging sectors

- Blue Biotechnology
- Desalination
- Marine Minerals
- Maritime Defence
- Ocean Energy
- Submarine Cables

Climate Threatens Beach and Coastal Tourism

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Coastal areas becoming less attractive


Reduction of biodiversity and degradation of the landscape


Decreased tourist satisfaction related to human comfort


Increase emerging infectious diseases

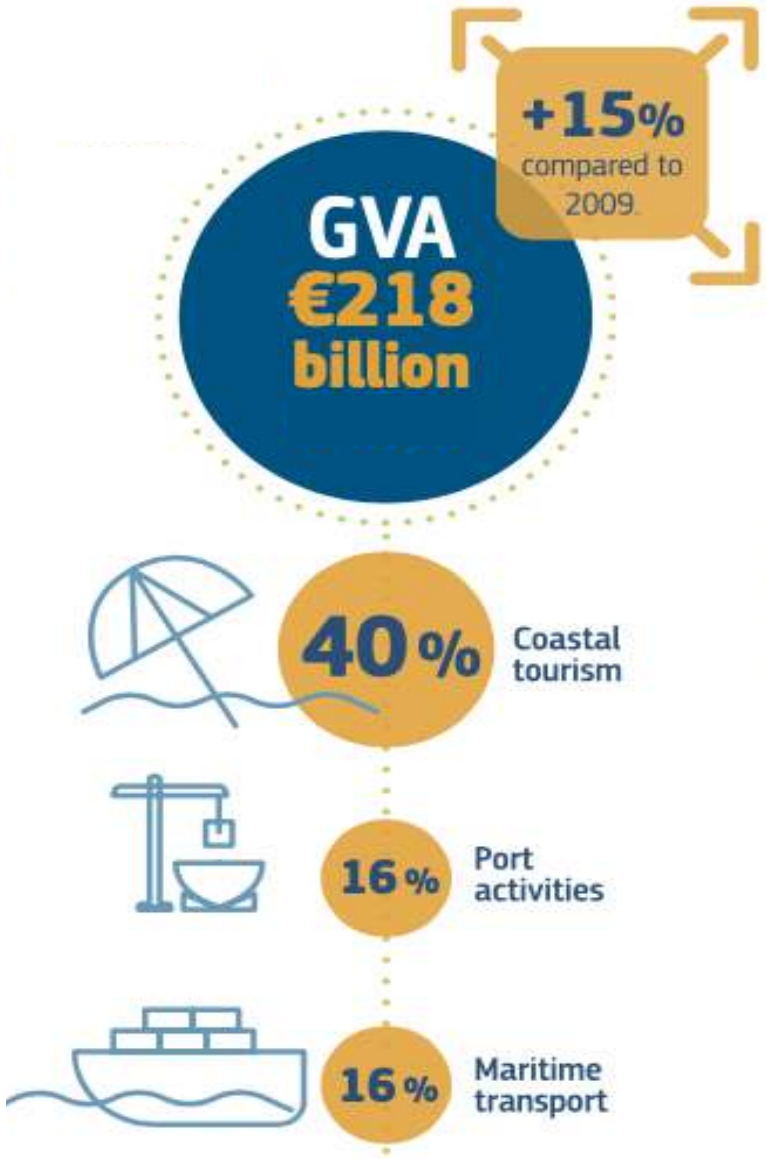

Change in the quality of the infrastructures and facilities

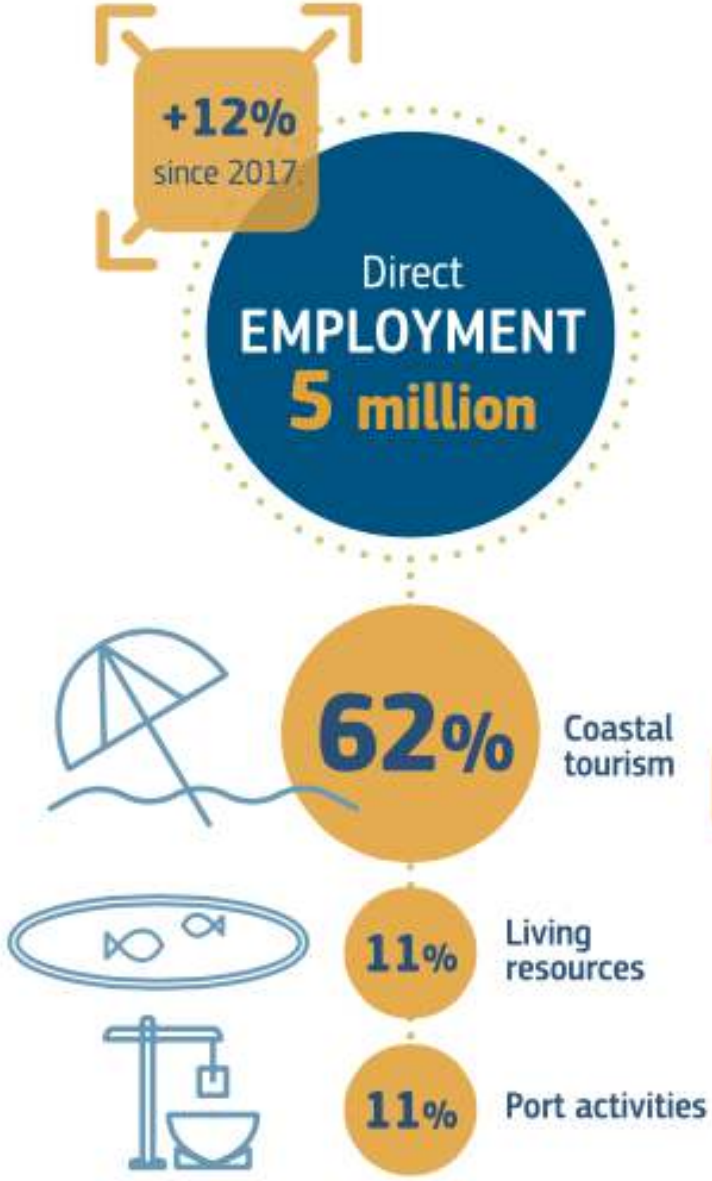

The availability and/or cleanliness of domestic water

(Arabadzhyan et al., 2020).

Top Three Industries

The EU Blue Economy Report 2020





Coastal tourism, gaps to climate change adaptation

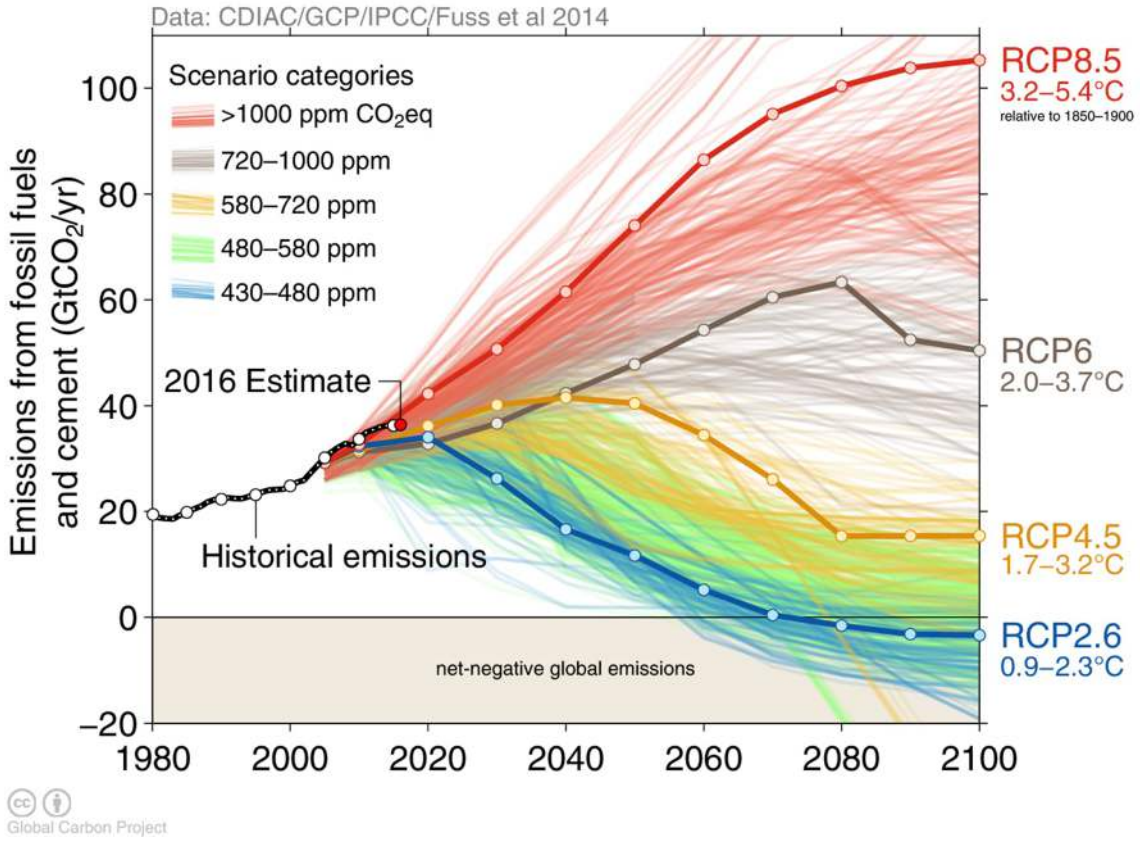
Limited integration of climate-related information into decision-making processes within the beach and coastal tourism industry.

1. Lack of ad-hoc, easy to access information
2. Low level of awareness amongst the key stakeholders
3. Lack of sense of urgency
4. Short decision cycle

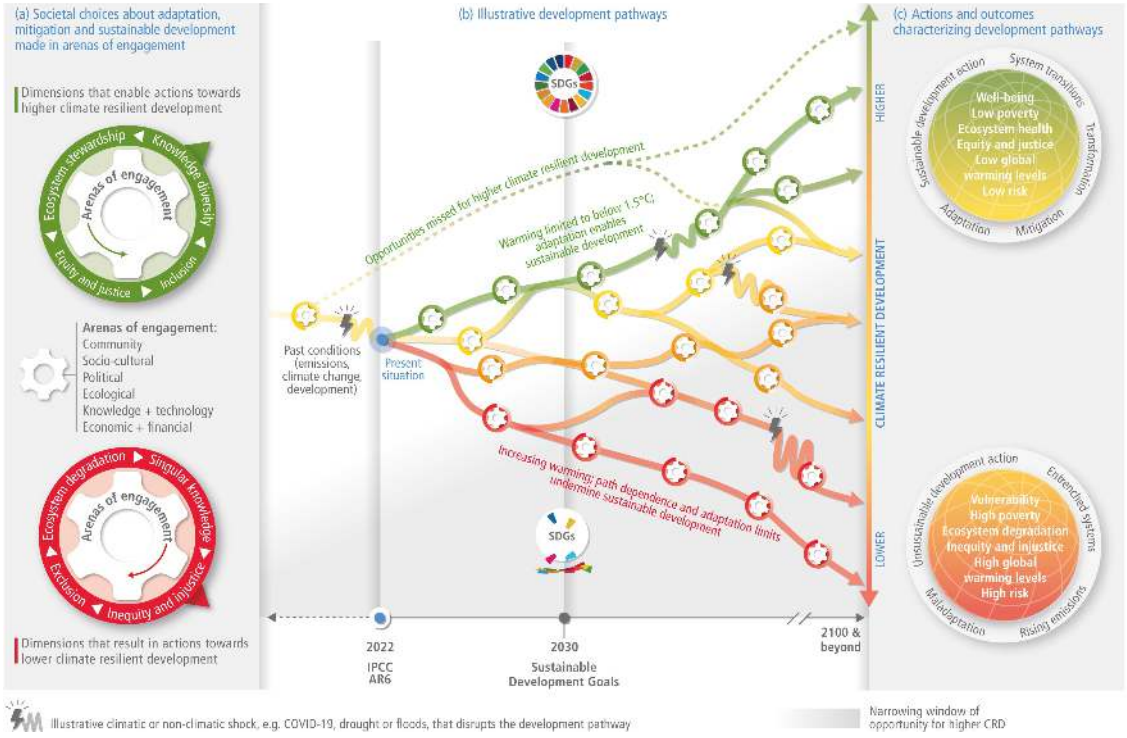
(Damm et al., 2020).

Future climate is uncertain: So is resilient development

Climate Futures and Greenhouse Gases



Climate Resilient Development Window



The information on climate change that is out there is not clear to the decision-maker. It is fuzzy, and there is also a degree of uncertainty.

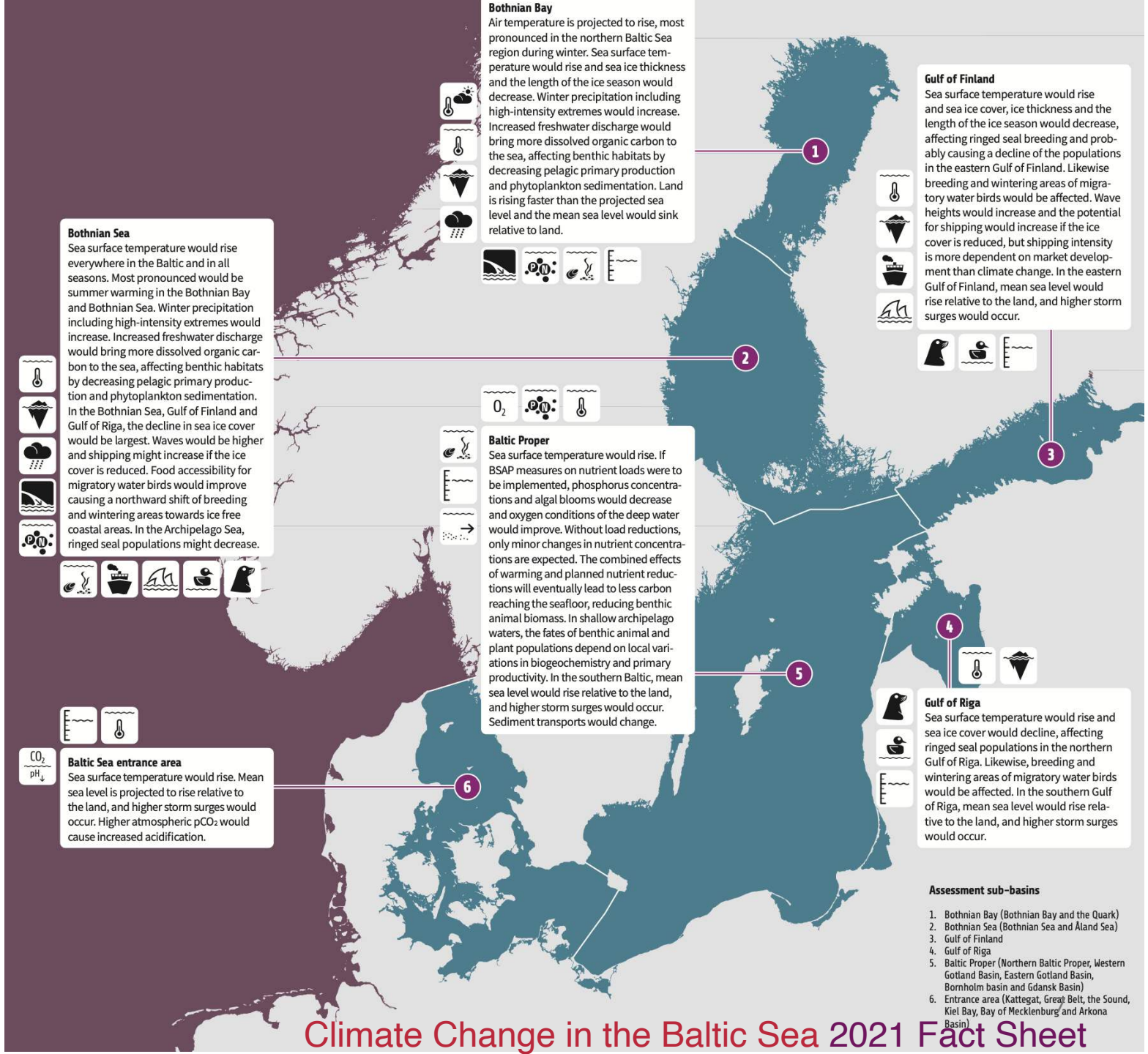
Climate Change

Physicochemical parameters

- Air temperature
- Water temperature
- Sea ice
- River run-off
- Sea level
- Solar radiation
- Salinity in the water
- Precipitation
- Winds
- Surges
- Sediment transportation

Ecosystem parameters

- Water birds
- Marine mammals
- Coastal fish
- Marine Protected Areas
- Microbial community
- Benthic habitats
- Nutrients concentration
- Non-indigenous species



Climate Change in the Baltic Sea 2021 Fact Sheet

Air temperature

Solar radiation

Winds

Surges

Precipitation

Water temperature

Sea ice

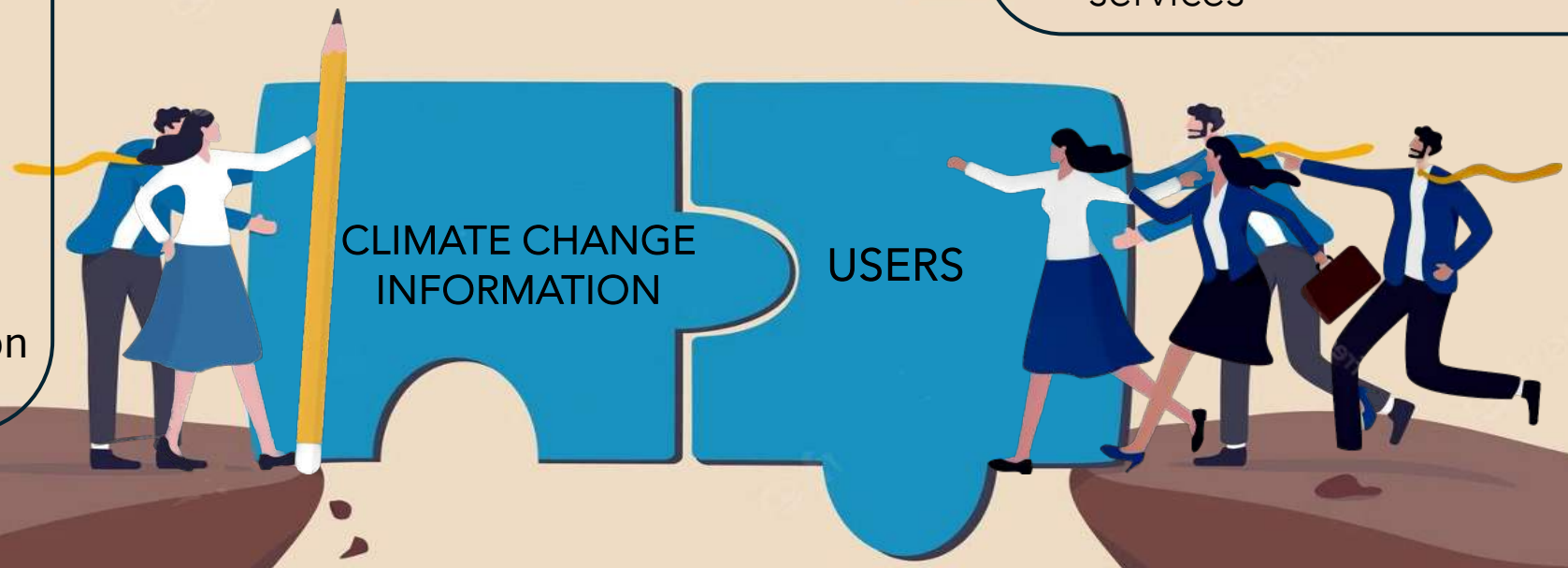
River run-off

Sea level rise

Salinity in the water

Sediment transportation

- Lack of ad-hoc, easy-to-access information
- Low level of awareness of climate change risks
- Lack of knowledge of existing services and their benefits
- Lack of applicability of the existing services



Climate change science

Boundary organisations

Climate information beneficiaries

The objectives of BEACH-SOS

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BEACH-SOS initiates the coming together of climate experts, local practitioners, and community-based interested parties to kick-start preliminary exchanges and the beginnings of transformative action.

- Thus, BEACH-SOS aims to build institutional capacity for coastal and beach tourism adaptation to climate change.

- The main challenge is to help overcome the climate risks to coastal municipalities and communities to sustain and promote the sustainability and resilience of beach tourism.

Helmholtz-Zentrum hereon

GERICS Climate Service Center Germany

Eine Einrichtung des Helmholtz-Zentrums Hereon

GERICS
Climate Service Center
Germany

An institution of Helmholtz-Zentrum **Hereon**

(1)Climate Change Signals and (2)Impact in Køge Bay, Denmark

Louis Celliers - David Cabana
Climate Service Center Germany

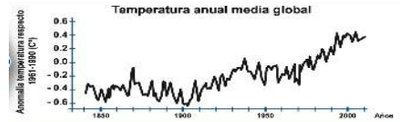
Stakeholder workshop held in Havhytten, Denmark, on May 2nd, 2024

Weather & climate scales

forecasts — predictions — projections

„Climate change“

„Climate variability“



„Weather“

Hours | Days | Months | Years | Decades | Centuries

Rain

Wet season/ dry season

„Pacific decadal oscillation“

Cyclones

„El Niño“ „ENSO“

Global warming, sea-level rise, ocean acidification

Based on: https://www.pacificclimatefutures.net/en/help/climate-projections/understanding-climate-variability-and-change/

Climate Projections and Risks

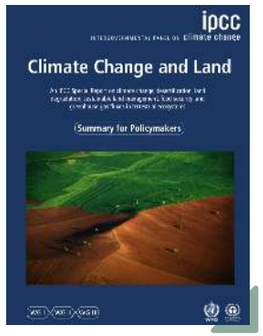
IPCC's Sixth Assessment Report (AR6)

WGI, WGII, WGIII

October 2018

SR1.5

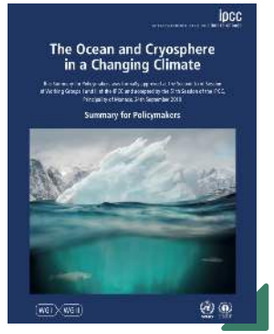
WGI, WGII, WGIII



August 2019

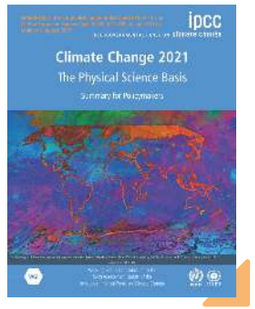
SRCCL

WGI & WGII



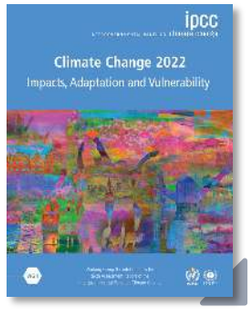
September 2019

SROCC



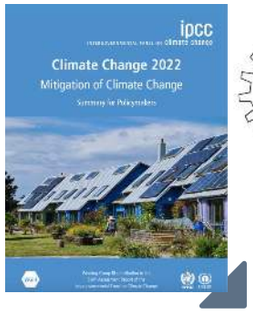
August 2021

WGI Report



February 2022

WGII Report



April 2022

WGIII Report

September 2022

- Synthesis Report

Table 7. Projected evolution of the tourism demand at country level compared to the present (2019), in percentage terms, for the different global warming scenarios.

	+1.5°C	+ 2°C	+3°C	+ 4°C
AT	0.13%	0.30%	0.88%	1.35%
BE	0.38%	0.82%	2.07%	2.93%
BG	-0.28%	-0.11%	-0.48%	-1.74%
CY	-1.86%	-2.69%	-5.32%	-8.28%
CZ	0.39%	0.74%	1.77%	2.49%
DE	0.94%	1.48%	3.03%	3.91%
DK	1.49%	2.48%	5.27%	6.83%
ES	-0.31%	-0.41%	-1.60%	-3.14%
FI	1.49%	2.36%	4.66%	6.23%
FR	0.01%	0.53%	1.41%	1.57%
HR	0.05%	0.53%	1.08%	0.58%
HU	-0.05%	0.09%	0.28%	0.22%
IE	1.34%	2.25%	6.15%	9.05%
IT	0.03%	0.06%	-0.54%	-1.69%
LT	2.13%	3.24%	5.99%	7.75%
LU	0.31%	0.67%	1.68%	2.31%
LV	1.05%	1.71%	3.40%	4.50%
NL	0.75%	1.35%	3.16%	4.33%
PL	0.72%	1.29%	2.81%	3.87%
PT	-0.50%	-0.54%	-1.49%	-3.31%
RO	-0.34%	-0.11%	0.03%	-0.40%
SE	1.27%	2.16%	4.58%	6.25%
SI	-0.01%	0.38%	1.26%	1.80%
SK	0.11%	0.39%	1.27%	1.94%
UK	1.16%	2.10%	5.22%	7.51%
EU	**0.35%**	**0.71%**	**1.45%**	**1.58%**

Source: JRC analysis. The values shown refer to the RCP8.5 emissions scenario.

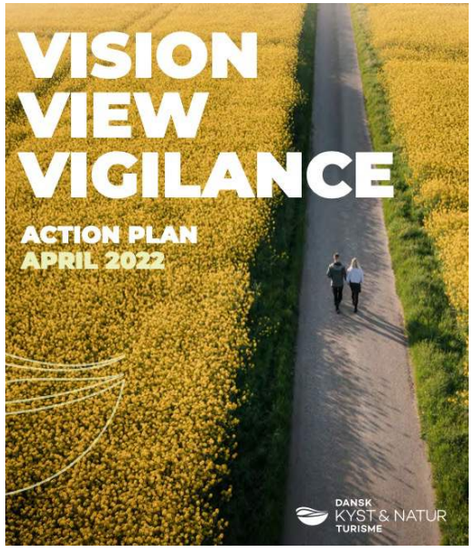
Matei, N.A., García-León, D., Dosio, A., Batista e Silva, F., Ribeiro Barranco, R., Císcar Martínez, J.C., Regional impact of climate change on European tourism demand, Publications Office of the European Union, Luxembourg, 2023, doi:10.2760/899611, JRC131508.

Mapping climate change - barriers and opportunities for action Task Force on Climate Change Adaptation May 2012, Danish Nature Agency

- Denmark will be an attractive holiday destination for a larger part of the year
- The Mediterranean will be too hot, and this will make Denmark more attractive
- The current coastal holiday areas will be less attractive because of higher sea levels
- Larger investment in climate protection because of heavy downpours

Likely that the potential for tourism will be significantly improved resulting from warmer summers in Denmark and heat waves in southern Europe.

Barriers and opportunities for future action: When adapting strategies for tourism, it should be considered how the potential for Danish tourism can be promoted as much as possible.



WHAT DOES COASTAL AND NATURE TOURISM MEAN TO DENMARK?

1 WORLD-CLASS TOURISM INFRASTRUCTURE

- ALL COASTAL AND NATURE TOURISM MUNICIPALITIES BUILD TOURISM INFRASTRUCTURE BASED ON A DEVELOPMENT PLAN
- COHERENT RECREATIONAL INFRASTRUCTURE CREATES EASY ACCESS TO UNIQUE NATURE EXPERIENCES
- CLIMATE ADJUSTMENT SHOULD SUPPORT THE TOURISM DEVELOPMENT OF HOLIDAY RESORTS

2 STATE-OF-THE-ART ACCOMMODATION CAPACITY

- INCREASED INVESTMENTS SHOULD BOOST SUSTAINABLE GROWTH
- HOLIDAY HOUSES FULFIL GUEST WISHES FOR A GREENER HOLIDAY
- EVERYONE SHOULD HAVE THE CHANCE TO WAKE UP TO BEAUTIFUL DANISH NATURE

3 POWERFUL INNOVATION AND ENTREPRENEURSHIP

- MORE DANISH ENTREPRENEURS STRENGTHEN TOURISM
- A PRODUCTIVE AND COMPETITIVE TOURISM INDUSTRY

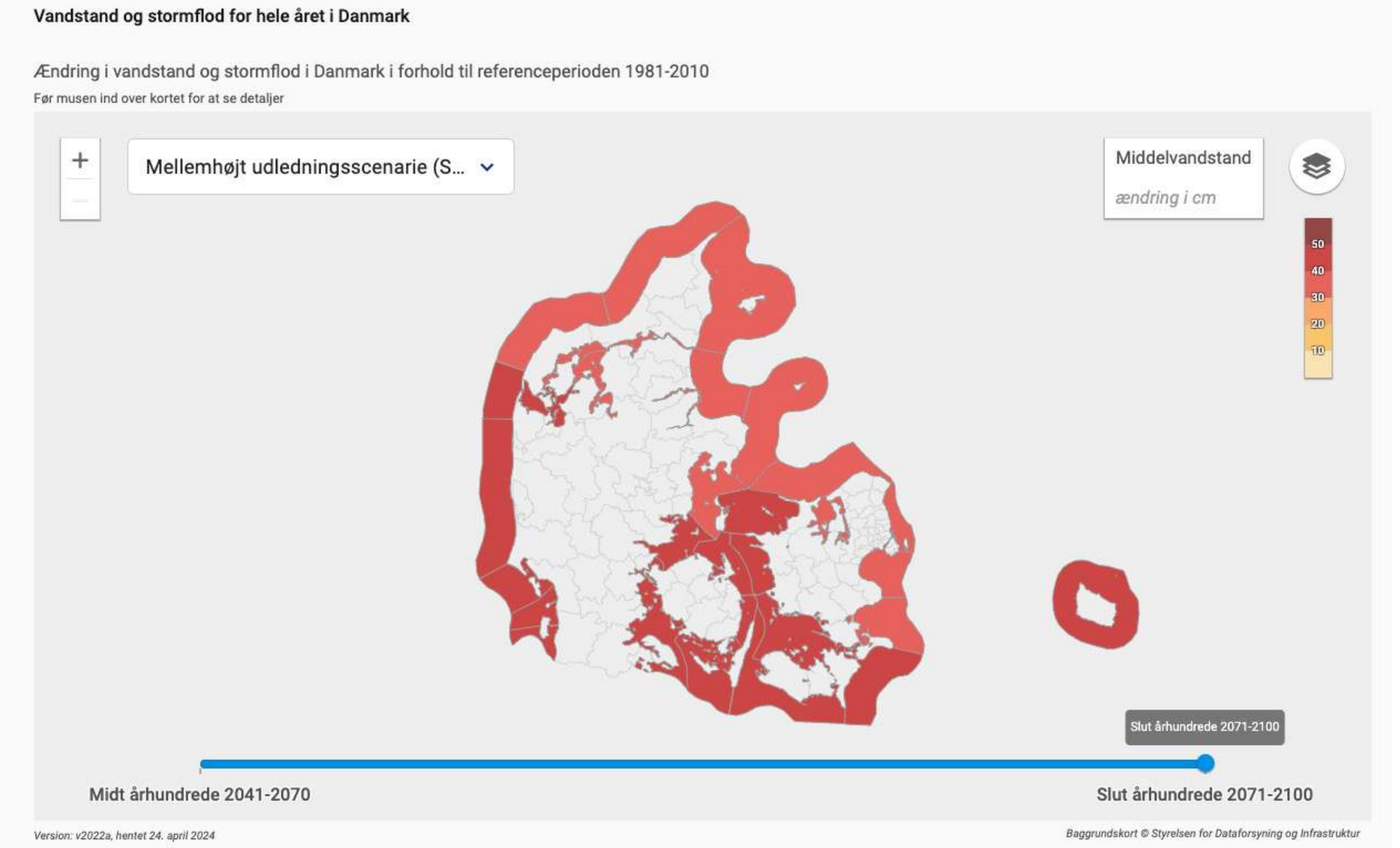
4 STRIKING NARRATIVES

- WAYFINDING SHOULD MANIFEST THE IDENTITY OF RESORTS AND COUNTERACT CROWDS
- CULTURE AND CULTURAL HERITAGE – A "SUPER ATTRACTION" IN COASTAL AND NATURE TOURISM

Interreg Baltic Sea Region
Co-funded by the European Union
BLUE ECONOMY BEACH-SOS
GERICS Climate Service Center Germany

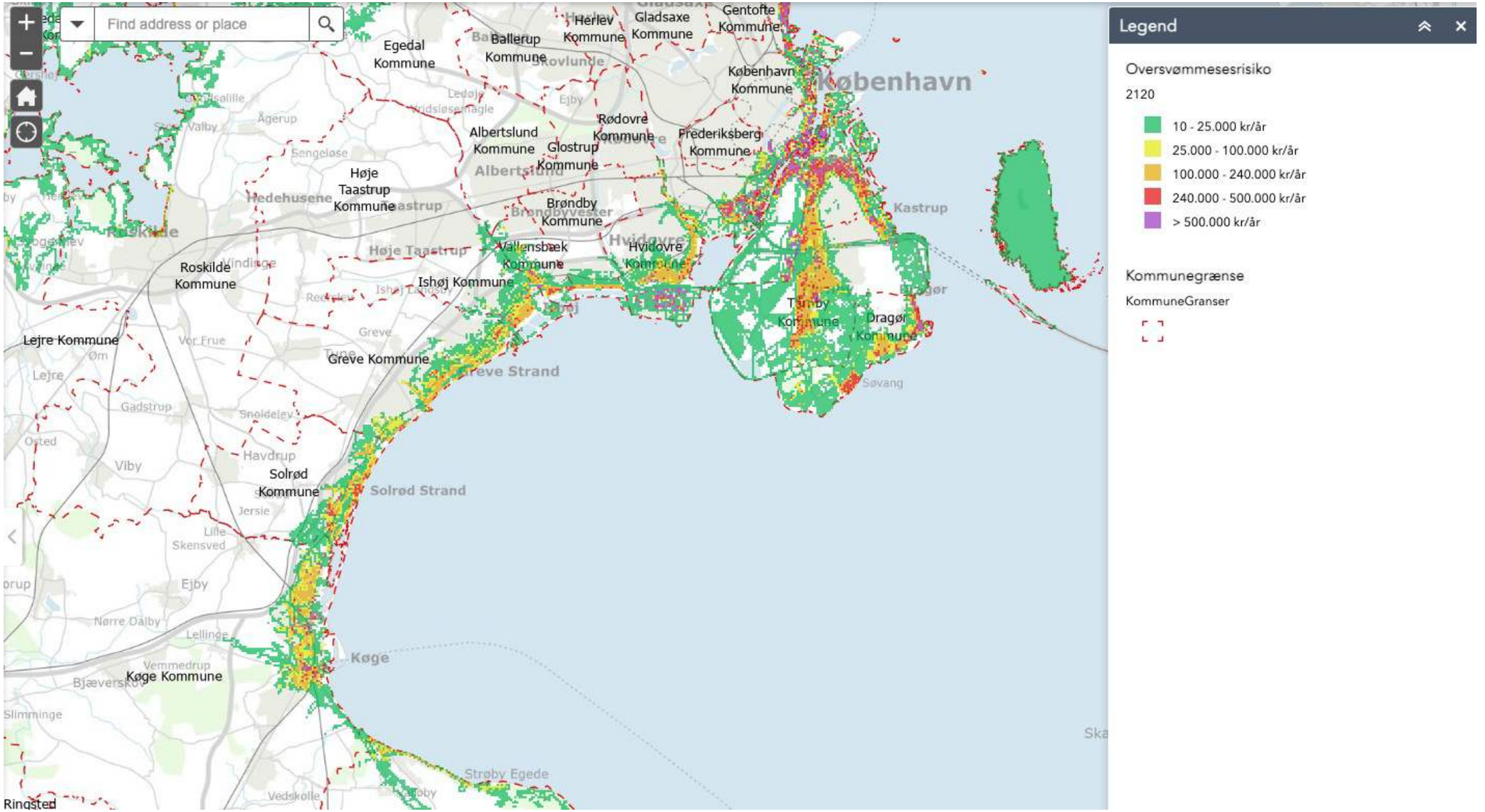
Sea-level rise 2120

https://en.klimatilpasning.dk/knowledge/climate/climate-atlas/



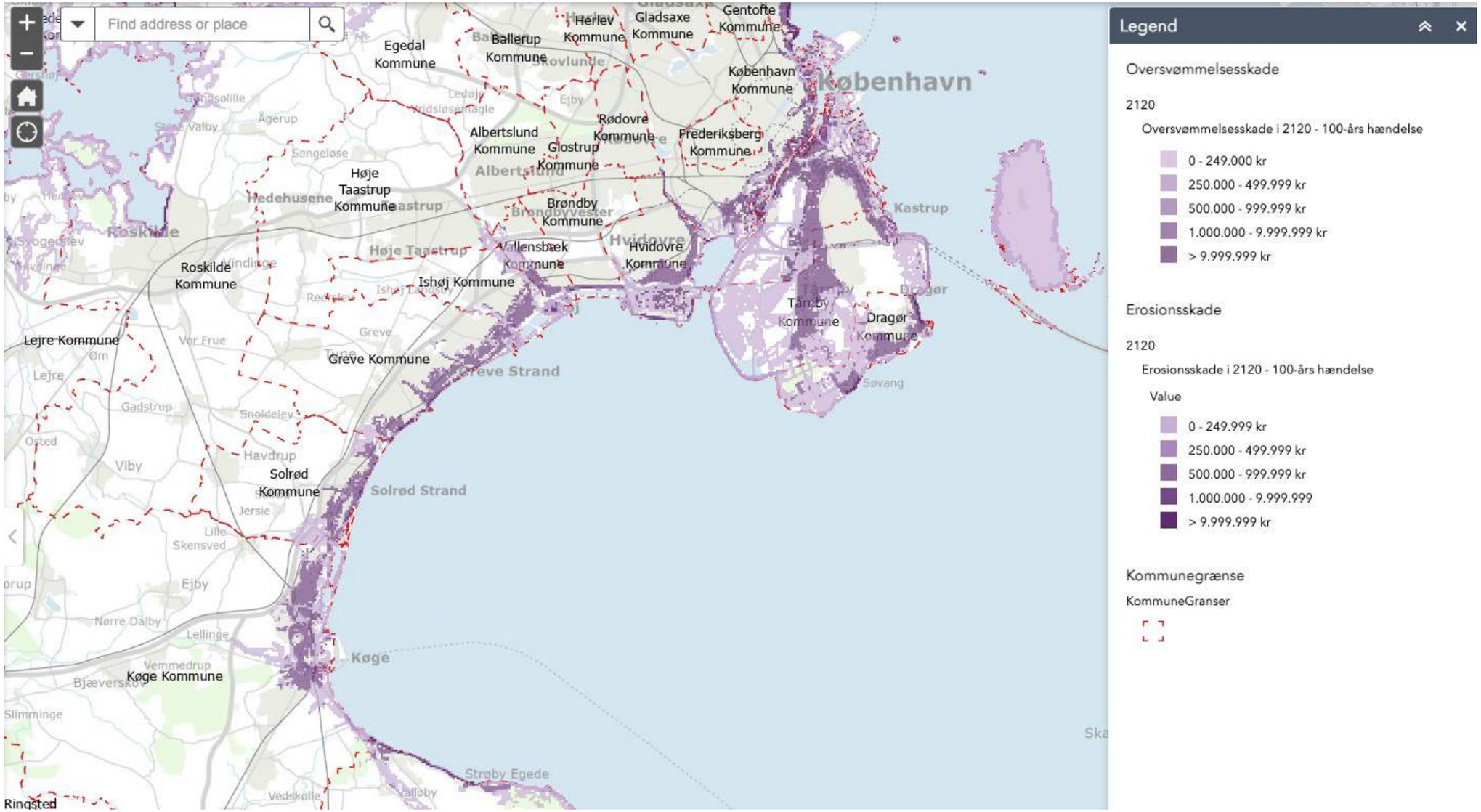
Risk of flooding 2120

https://en.klimatilpasning.dk/tools/kystplanlaegger/



Combined Flood and Erosion Damage 2120

https://en.klimatilpasning.dk/tools/kystplanlaegger/



Sea Surface Temperature (SST)

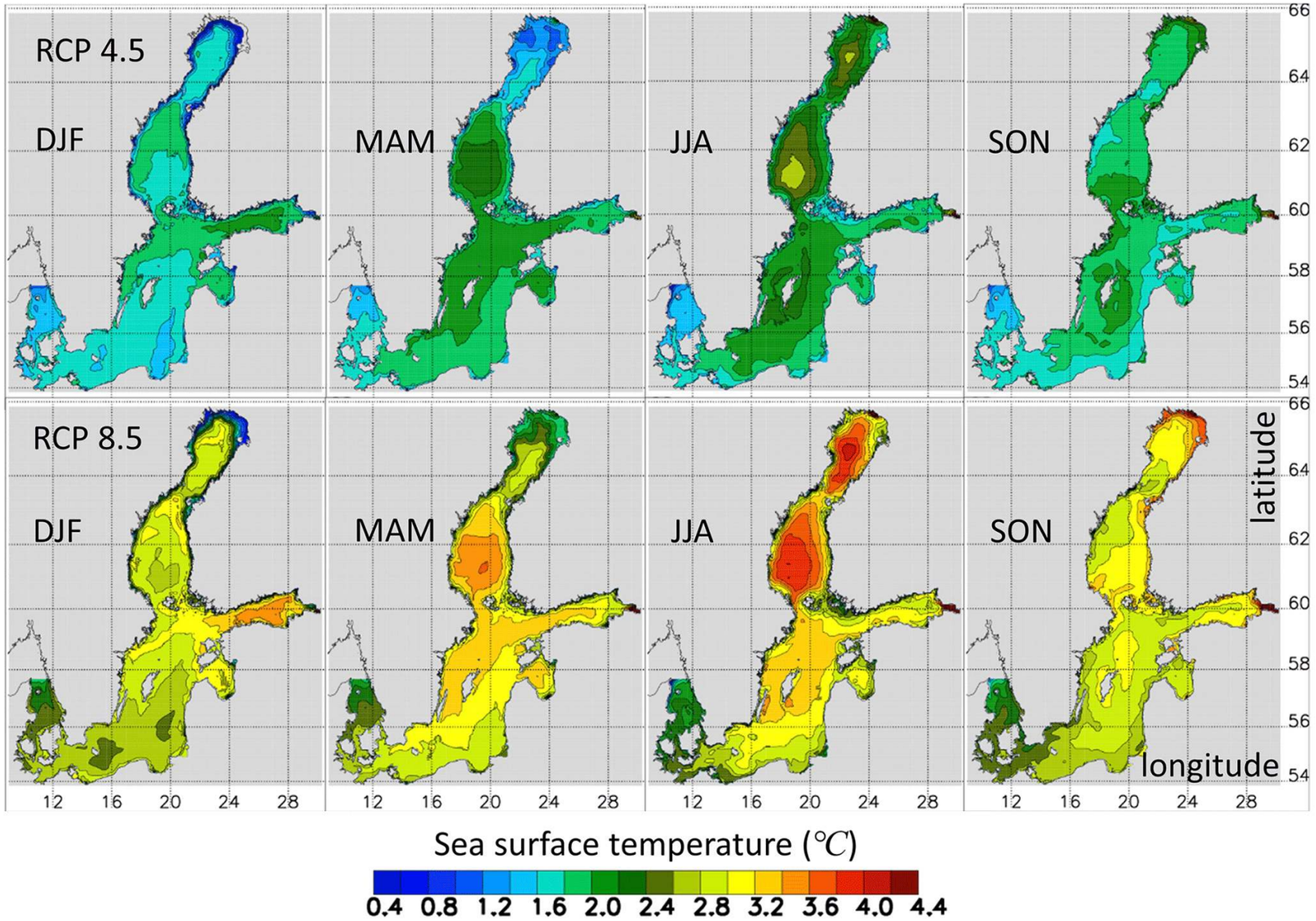
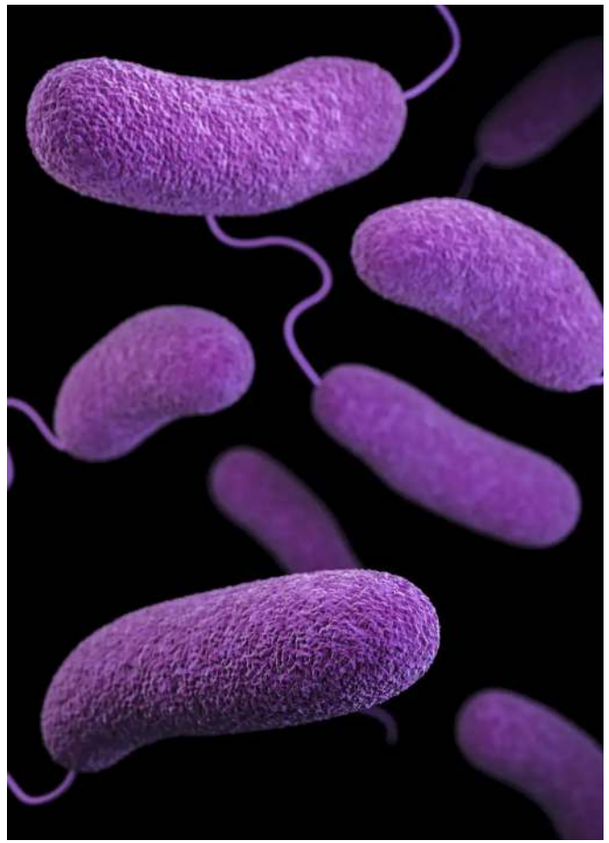


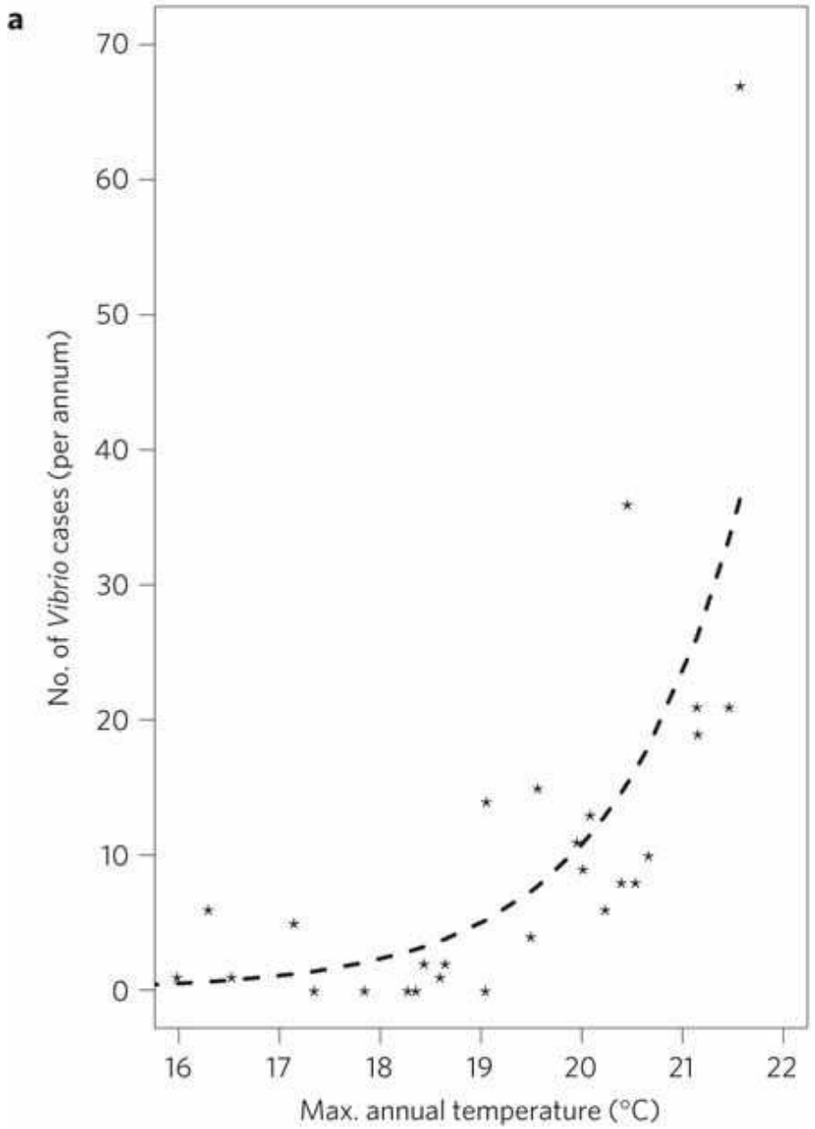
Figure 11. Changes in seasonal mean SST as simulated by the CLIMSEA ensemble. From left to right, mean SST changes (in ◦C) in winter (December, January and February; DJF), spring (March, April and May; MAM), summer (June, July and August; JJA) and autumn (September, October and November; SON) between 1976–2005 and 2069–2098 under RCP4.5 (upper panels) and RCP8.5 (lower panels). (Source: Meier et al., 2021; their Supplementary Fig. 1 distributed under the terms of the Creative Commons CC-BY 4.0 License, http: //creativecommons.org/licenses/by/4.0/, last access: 6 January 2022.)

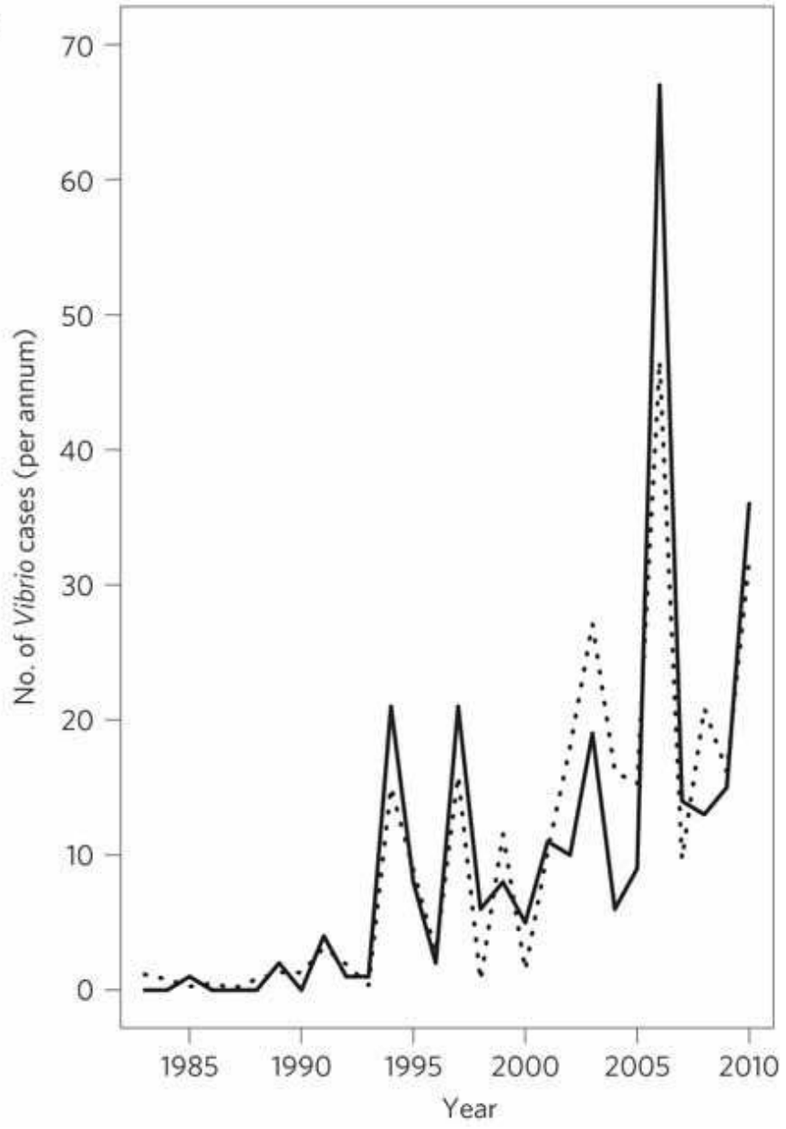
Meier, H.E.M., Dieterich, C., Gröger, M., Dutheil, C., Börgel, F., Safonova, K., Christensen, O.B., Kjellström, E., 2022. Oceanographic regional climate projections for the Baltic Sea until 2100. Earth System Dynamics 13, 159-199.

SST and *Vibrio* infections

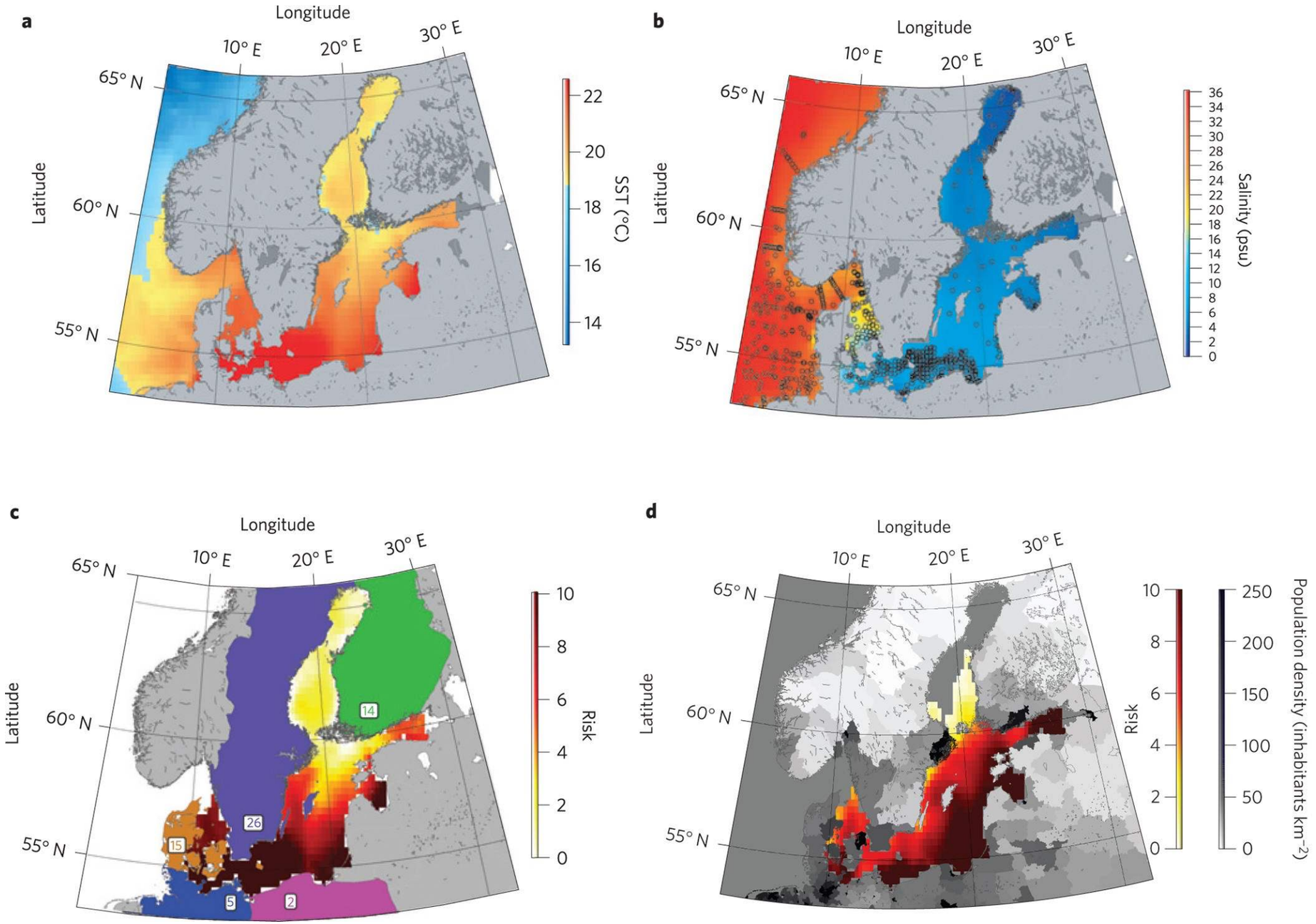


The relationship between Vibrio infections reported around the Baltic Sea area and maximum annual SST. Stars show observed data, dashed line shows GLM model predictions (based on the influence of SST alone). b, Time series of Baltic Sea Vibrio cases. Solid line shows observed cases and dotted line shows GLM model predictions based on the influence of maximum SST and time.





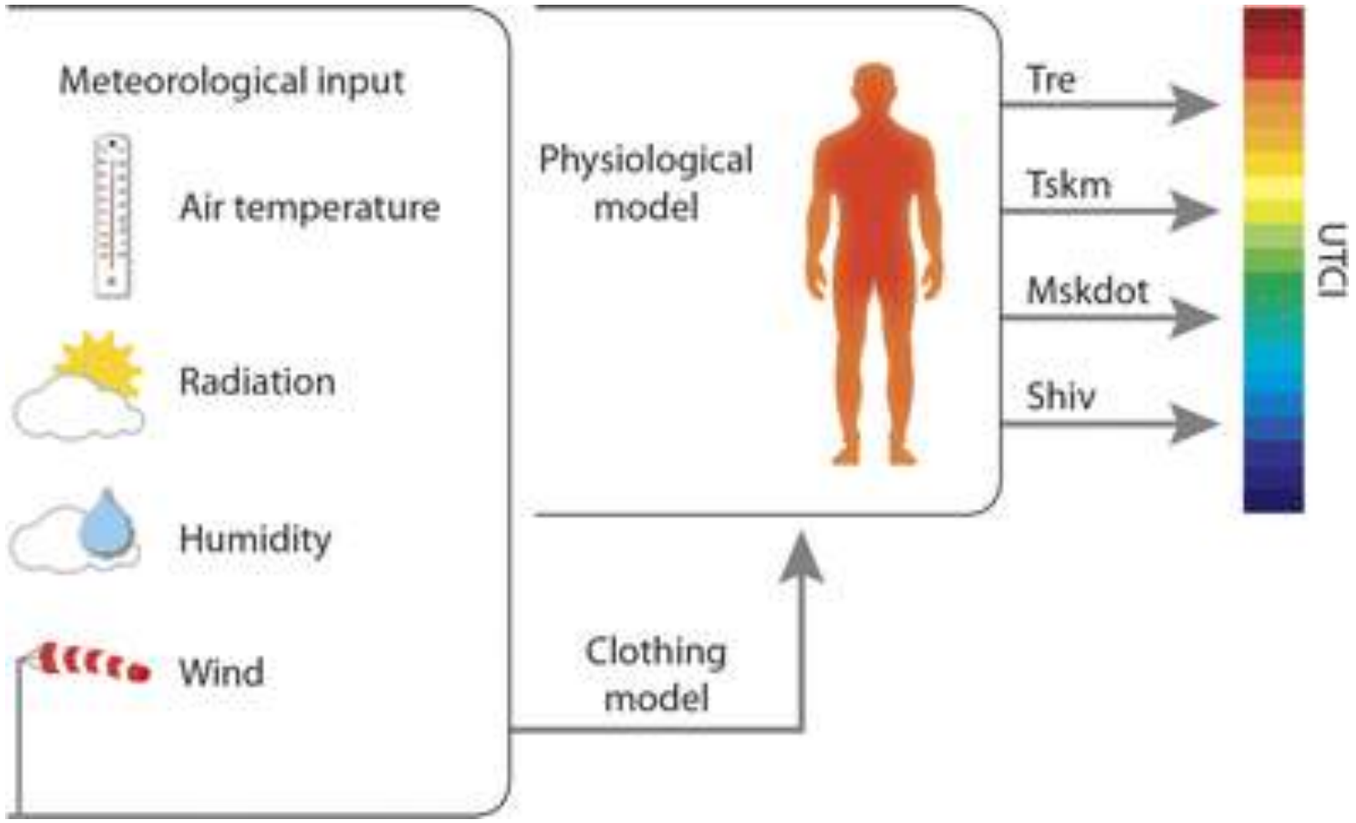
Baker-Austin, C., Trinanes, J., Taylor, N. et al. Emerging Vibrio risk at high latitudes in response to ocean warming. Nature Clim Change 3, 73–77 (2013). https://doi.org/10.1038/nclimate1628



a, Maximum SST in the Baltic area for the summer of 2006. **b**, Sea surface salinity obtained from *in situ* measurements for the same period calculated using a surface tension algorithm to grid the irregularly spaced measurements (circles). **c**, Risk model map during summer 2006 and number of cases in countries reporting infections. **d**, Projection of the risk of infection in 2050 using as baseline the maximum SST summer field for 2010 and applying the projections of temperature estimated by the ARIMA model, with the grey scale inland indicating the population density (Nomenclature of Territorial Units for Statistics 3). The SST field shown on the map has a spatial resolution of 0.25°. The ARIMA model was applied on area-averaged long-term ERSST data (originally at 2° × 2° spatial resolution) and HadISST (to confirm and compare results using independent data sets). The projection of temperatures from the ARIMA model were applied on higher resolution SST fields that better delineate regional differences and provide more detail on coastal regions.

Universal Thermal Climate Index (UTCI)

- One of the major components contributing to tourism satisfaction is a person's thermal comfort.
- Understanding how climate change will affect thermal comfort is key to the tourism and hospitality sectors as they seek to identify risks and opportunities in order to remain competitive.
- The Universal Thermal Climate Index (UTCI) is a common international standard for human outdoor temperature sensation.
- The UTCI is a measure of how human beings experience "thermal comfort", or what the weather "feels like", outdoors, such as on the beach.



Source: DOI 10.1007/s00484-014-0843-3

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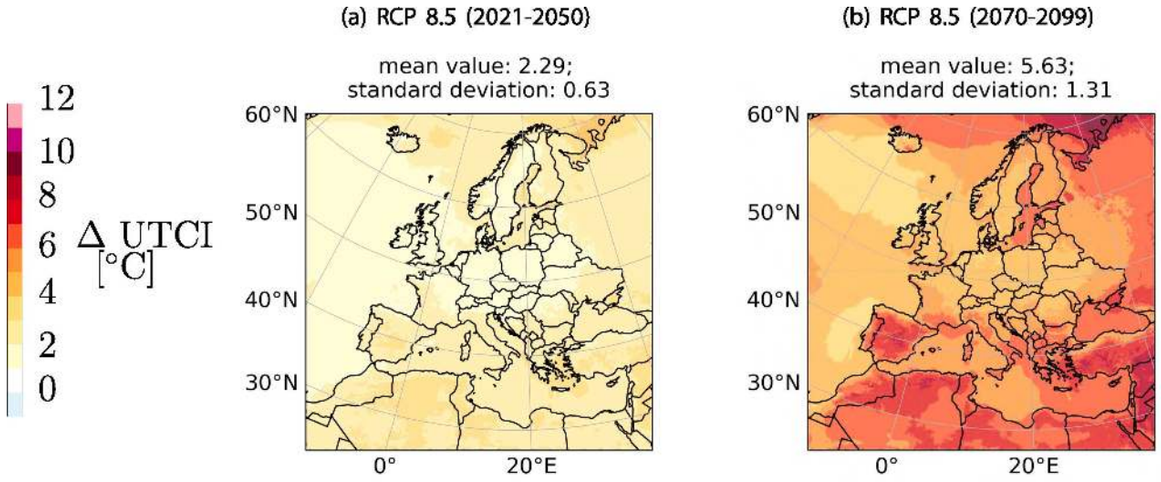
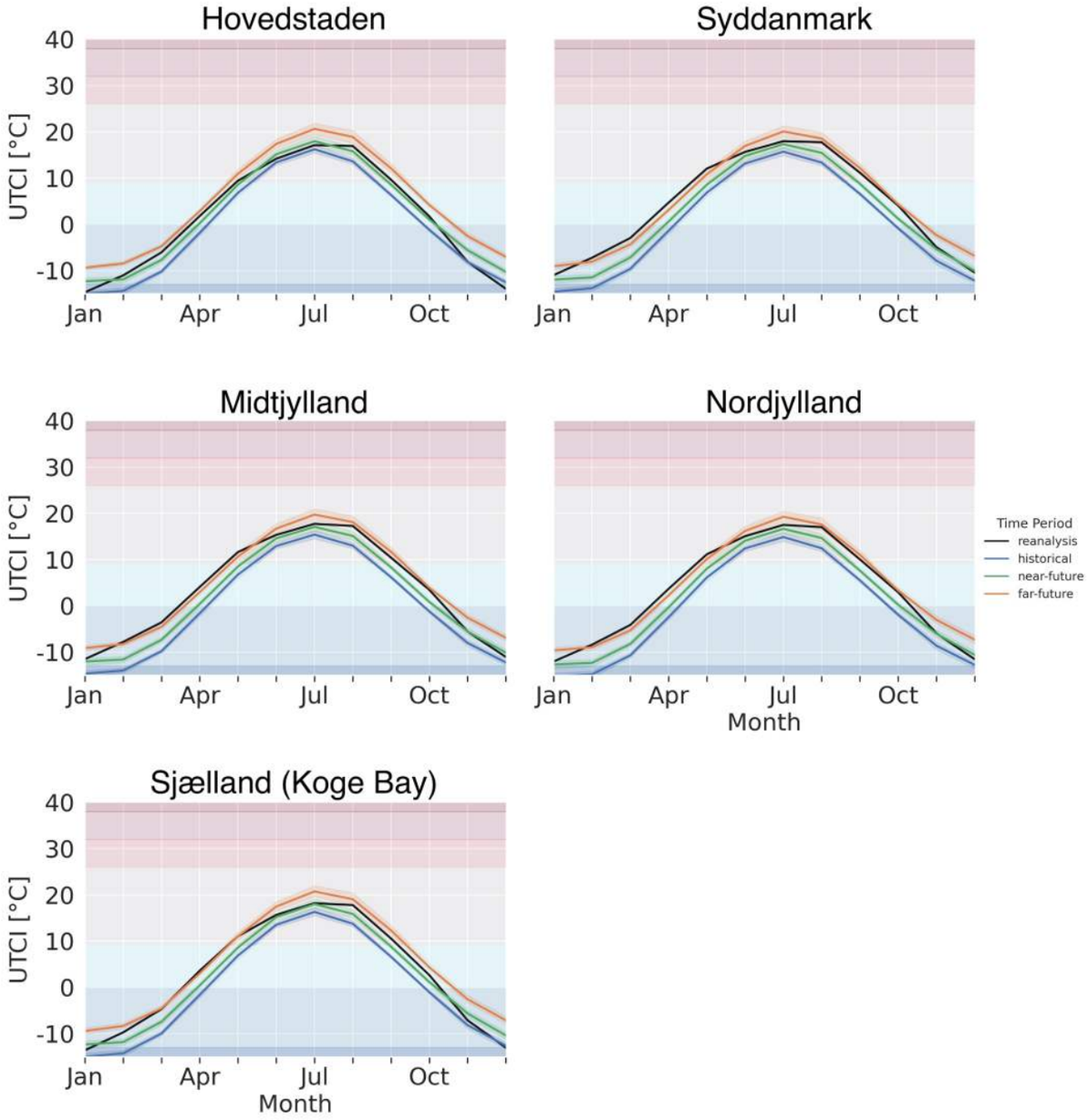
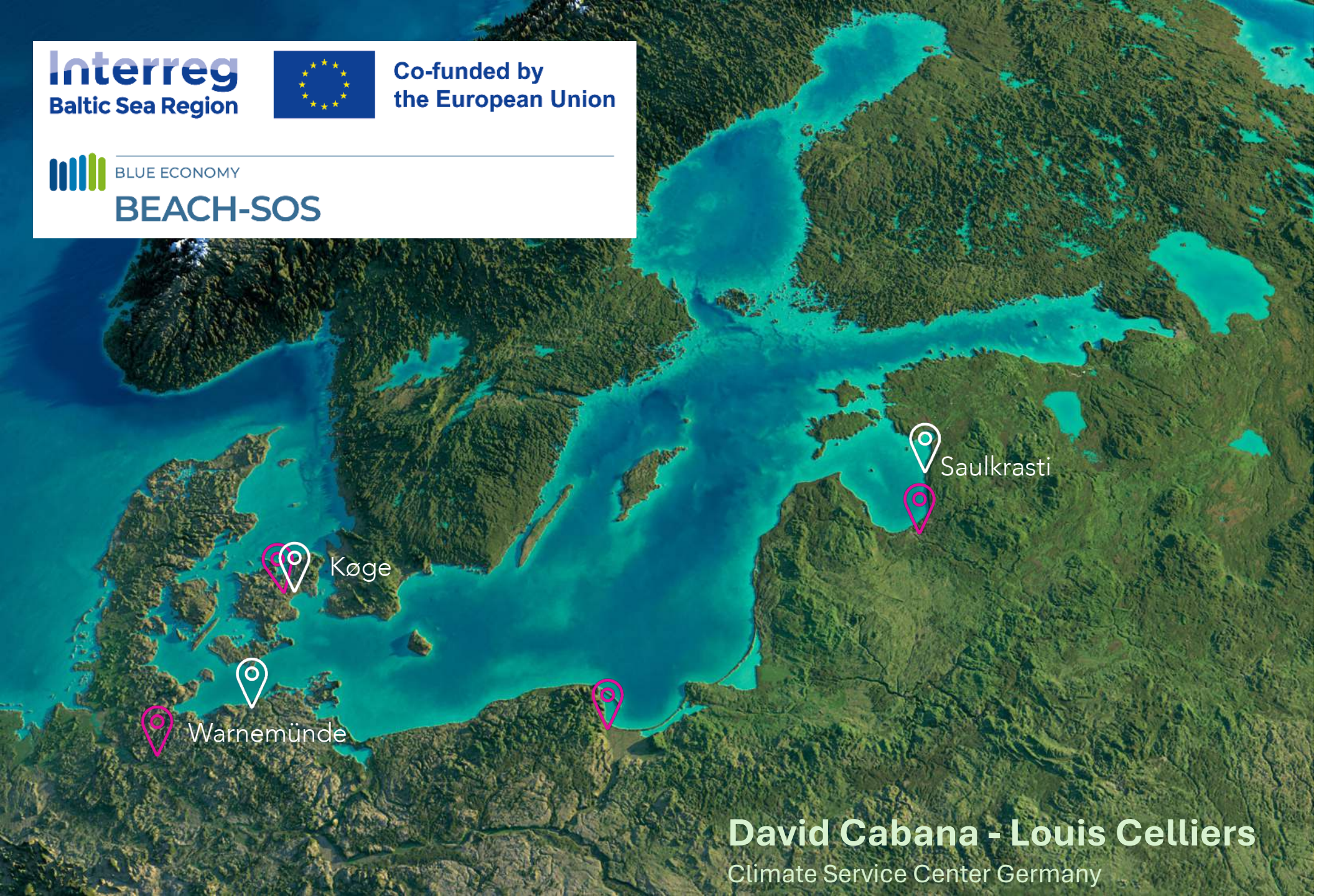




Christine Nam, Ludwig Lierhammer, Lars Buntemeyer, Prosper Evadzi, David Cabana, Louis Celliers. 2024. Changes in universal thermal climate index from regional climate model projections over European beaches. Climate Services, Volume 34, 100447, https://doi.org/10.1016/j.cliser.2024.100447.

Adaptation needs in Denmark

- Health considerations for beachgoers, i.e., over-heating
- Increasing water quality testing as well as a more diverse range of tests for an expanded list of pathogens
- Increased need for shading and covered pathways
- Increased freshwater supply, plastic waste generation, water treatment improvements
- Infrastructure and services (lifeguards, cleaning etc) for longer seasons/periods
- Increased visitor numbers
- Potential impact on beach wrack from changes in water temperature and ecosystems



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