



C2C  
Coast to Coast  
Climate Challenge

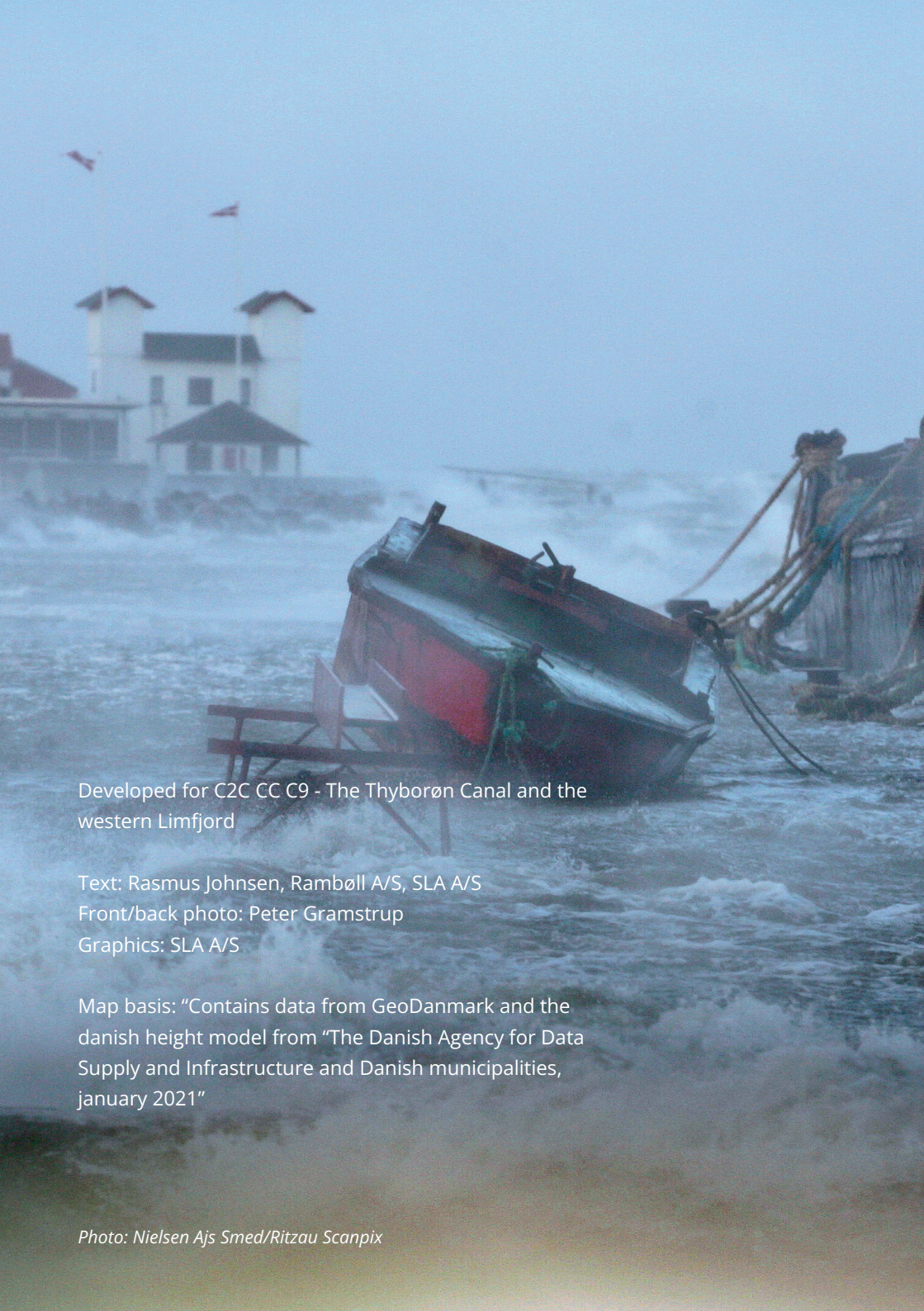
C9 - The Thyborøn Canal and the Western Limfjord

# WESTERN OPENING

NARROWING OF THE THYBORØN CANAL AS PROTECTION  
AGAINST STORM SURGES IN THE WESTERN LIMFJORD

December 2022





Developed for C2C CC C9 - The Thyborøn Canal and the western Limfjord

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*Photo: Nielsen Ajs Smed/Ritzau Scanpix*

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# FAQ - questions and answers

*As a consequence of climate change the sea level is rising and storm surges are happening more frequently. Additionally, there is a gradual natural expansion of the Thyborøn Canal. If Thyborøn Kanal is not narrowed, future storm surges will have unpredictable effects throughout the western Limfjord.*

**1. Will narrowing of the Thyborøn Canal solve the problems with storm surges?**

*Answer: Narrowing of the Thyborøn Canal will, for most of the 21st century, counteract the effect of climate change on future storm surge water levels in the western part of the Limfjord. This gives us and future generations time to learn more about what a climate adaptation solution consists of in the long run.*

**2. What happens if the Thyborøn Canal is not narrowed?**

*Answer: This will cause more frequent and more violent floods in the western part of the Limfjord, which will have negative consequences for people, buildings, infrastructure and a number of vulnerable natural areas, thus costing society dearly.*

**3. How much does it cost to narrow the Thyborøn Canal?**

*Answer: Approx. 700 million danish kroner. The damage costs from just one strong storm surge will be greater than the construction costs of 700 million danish kroner.*



#### **4. How will narrowing of the Thyborøn Canal impact the environment of the Limfjord?**

*Answer: The narrowing of the Thyborøn Canal will have a favorable effect on low-lying and occasionally flooded natural areas, which are vulnerable to the high water events that will occur if the canal is not narrowed. In addition, the extension will be planned with a view to achieving acceptable environmental impacts as a result of reduced water exchange in the Limfjord.*

#### **5. What happens with the navigation from the North Sea to the Limfjord if the Thyborøn Canal is narrowed?**

*Answer: A deep navigation channel into the Limfjord is still ensured, which makes it possible for the Port of Thyborøn and other ports to continue receiving ships. The fairway is marked with breakwater heads.*

#### **6. Does the narrowing of the Thyborøn Canal also provide opportunities for creating added value?**

*Answer: With the right design an attractive and iconic landmark on the West Coast can be created. The facility can also be part of the work to create growth in tourism around the entire western Limfjord. To realize this potential, it requires the will to invest in this objective.*

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- Read more at [www.c2ccc.dk](http://www.c2ccc.dk)

# Introduction

Climate change is underway. No matter what we do and how well we do it, the seas will rise and the weather will get wilder. We have only seen the tip of the iceberg. A large part of the future is therefore about limiting the effects of climate change, which can have unpredictable consequences for the planet's nature and population.

For Denmark, climate change will, among other things, mean that floods that occurred every 50 years such as "Bodil" and "Egon", will occur every year at worst. The rarer high water events, which today occurs once every 100 years, will also occur far more often in the future.

The general rise in sea water, more frequent and stronger storms, and the gradual expansion of the Thyborøn Canal will in the future cause significantly greater damage in the western part of the Limfjord. It will go beyond people, buildings, infrastructure and nature in the area.

Studies from The Danish Coastal Authority from 2012 show that a narrowing of the Thyborøn Canal is the most appropriate solution compared to other investigated alternatives.







A partnership consisting of 7 municipalities and water suppliers in the western Limfjord (Thisted, Morsø, Vesthimmerland, Skive, Holstebro, Struer and Lemvig) is working toward the shared objective of narrowing the Thyborøn Canal as protection against storm surges for the entire western Limfjord. The project is supported by the EU-Life program via the Coast to Coast Climate Challenge project.

The partnership has asked Rambøll to explain the effect of the narrowing, highlight derived consequences, assess the social economy and make a stakeholder analysis. Together with SLA and Rasmus Johnsen, Rambøll has also developed an outline project and prepared the basis for a future EIA report as well as looking at the added value and financing opportunities for the project.

The work shows that a narrowing of the Thyborøn Canal for most of the 21st century can protect people, buildings, infrastructure and a number of vulnerable natural areas against the impact of climate change from storm surges in the area.

With the project, we can therefore create stability, security and even new opportunities for citizens and visitors in the western Limfjord. At the same time, it gives us and future generations time to learn more about what long-term climate adaptation solutions involve.



NORTH SEA

Thisted municipality

THISTED

LØGSTØR

LIMFJORDEN

Vesthimmerlands municipality

NYKØBING MORS

Morsø municipality

THYBORØN CANAL

THYBORØN

LIMFJORDEN

LEMVIG

Lemvig municipality

Skive municipality

SKIVE

STRUER

Struer municipality

Holstebro municipality

Diagram shows the western Limfjord and the seven Limfjord municipalities.

The project has been named the “Western Opening” because it must serve as an effective protection against storm surges as well as secure the connection between the North Sea and the Limfjord.







# Objectives

The partnership has assigned six objectives to the project. The objectives with significance for the project's climate adaptation dimension relate to all 7 municipalities, while the objectives relating to the recreational dimension predominantly relate to Lemvig and Thisted municipalities.

## **The climate adaptation dimension**

The Western Opening must first of all:

- *Maintain the status quo in connection with storm surges in the western part of the Limfjord.*
- *Secure access to the Limfjord via Thyborøn Canal, including the navigation of Thyborøn Harbour.*
- *Preserve and protect significant natural values in connection with storm surges, and ensure that the water change in the Limfjord is kept at an acceptable level.*

## **The recreational dimension**

It is the ambition that the Western Opening will also:

- *Establish a landmark that can increase the area's market and attraction value.*
- *Connect West Jutland' Geopark with Thy National Park (and Cold Hawaii).*
- *Improve the conditions for outdoor activities in the area.*





Photo: Mads Krabbe Fotografi



# Solution

Investigations have shown that the most appropriate solution to limit the effects of future storm surges is to extend groyne 59 with approx. 940 meters (The South Pier) and groyne 72 with approx. 300 meters (The North Pier). This means that the remaining opening will be around 250 metres wide.

The piers are to be expanded in two stages with approx. 25 years apart. This is done to accommodate the water change in the Limfjord. The first stage consists of a fully developed south pier. The second stage consists of a fully developed north pier which is an extension of groyne 72.

The division of the construction work is associated with an additional expense for preparing the construction site, equipment, etc. However, it is offset by interest expense savings associated with the second stage of construction being postponed for 25 years.

It has been decided to increase the accessibility of the piers with a walking & cycling path, even though this is an expensive measure due to the piers needing to be made wider. The assessment is that the increased accessibility of the piers and the large breakwater heads will create unique recreational opportunities and enhance the value to the wider area.

NORTH SEA

AGGER  
TANGE

Groyne 72

Groyne 59

THYBORØN

THYBORØN KANAL

LIMFJORDEN

HARBOØRE  
TANGE

Diagram shows Thyborøn Canal and the proposed extensions from groyne 72 and groyne 59 marked in red colour.

# Socio-economic gain

## Economy

Investigations show that the cost of narrowing the Thyborøn Canal is recouped by saved damage costs in connection with just one strong storm event during the life of the project. The savings naturally increase with the number of storm surges.

Calculations show that a narrowing of the Thyborøn Canal, combined with expected climate change, can result in savings of up to approx. 900 million just for a single strong future storm event.

However, no one knows when the next incident will come. We only know that it will come. This means that the probability of achieving savings depends on when the project is completed: the earlier, the greater the probability.

The benefits of the project for the individual municipalities will vary, but common to all is that a reduction in the stormwater level will be achieved for the majority of the 21st century compared to the situation where nothing is done.

The price of the project's climate adaptation dimension is estimated at approx. DKK 700 million including the foot & cycle paths on the piers, which account for around DKK 30 million. If the facility is to be added further recreational dimensions, it will cost more, but these elements can subsequently be developed and established.





## Nature

Large parts of the western Limfjord are Natura 2000 areas<sup>1</sup>, which contain important resting and breeding areas for a number of migratory birds, animals, insects and plants, several of which are rare species.

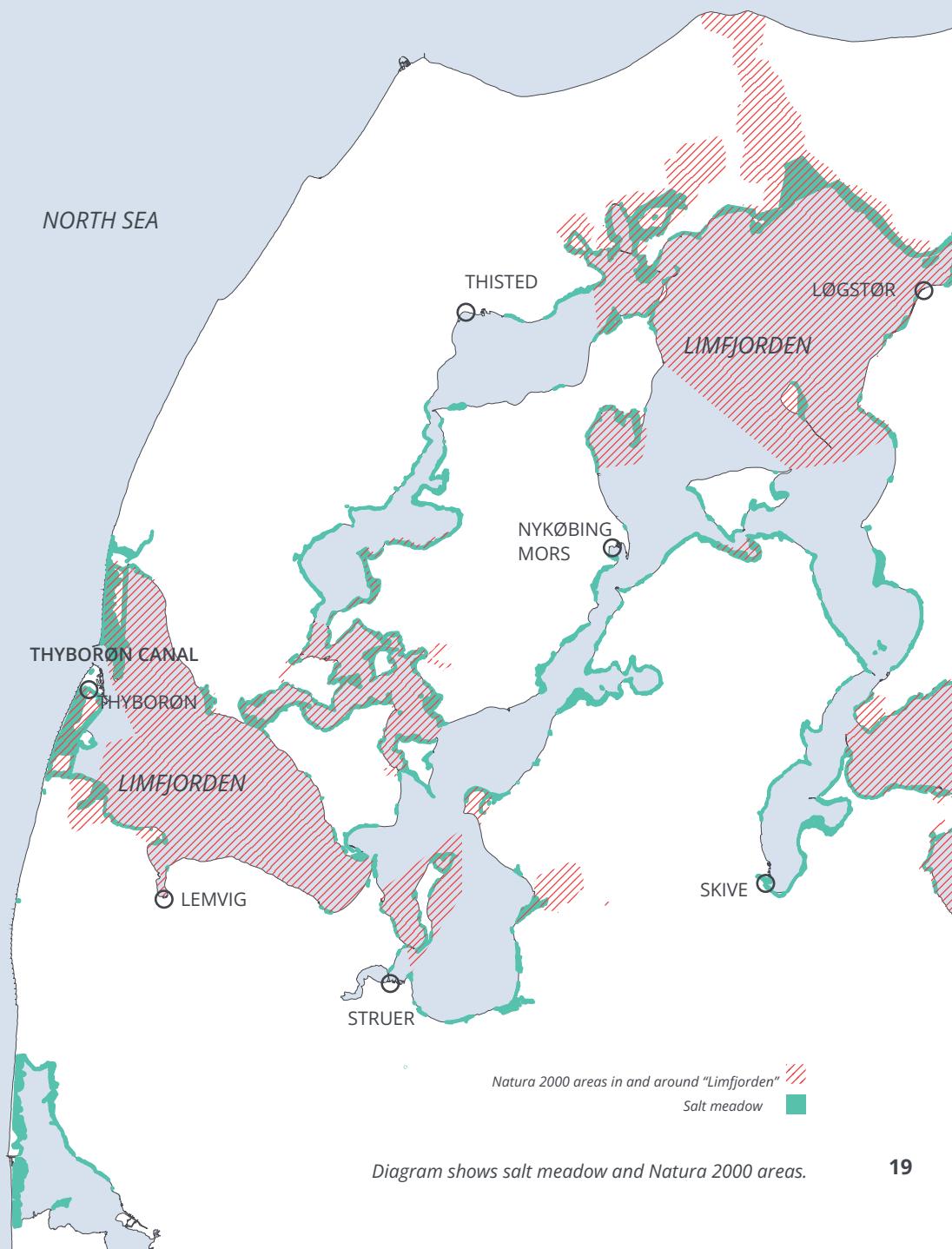
Along the banks of the fjord there are elongated salt meadows, which are § 3-protected nature<sup>2</sup>, of which there is not much left in Europe. In fact, 90% of Europe's protected salt meadows are found in Denmark. 30% of these are found on the banks of the Limfjord.

The low-lying and occasionally flooded natural areas are vulnerable to the prolonged floods and extreme events that will occur if the channel is not narrowed.

By dividing the construction work into stages, we ensure that the water exchange is always great enough that the environmental consequences are kept at an acceptable level.

*1. Natura 2000 areas are specially protected nature areas in the EU that must preserve and protect nature types and wild animal and plant species that are rare, endangered or characteristic of the EU countries (<https://mst.dk/natur-vand/natur/natura-2000/>)*

*2. § 3-protected nature types are covered by the Nature Protection Act. It includes the nature types salt meadows, lakes, grassland, bog, heath and meadow, and must protect against any changes in the natural state of the protected areas, a measure to slow down the decline of natural areas in Denmark.*



Natura 2000 areas in and around "Limfjorden"

Salt meadow

Diagram shows salt meadow and Natura 2000 areas.

## Recreation

The two piers provide many opportunities for new activities on water and on land around the Thyborøn Canal. The project creates a unique new setting for sailing, both in boats and on boards, for surfing, kayaking, angling, sunbathing, swimming, and not least, recreational experiences such as exercise, nature, art and culture.

The piers will be accessible via a five meter wide path from the shore to the outermost point. Several hundred meters out into the North Sea. You can walk, run, cycle and sit. Almost everyone can go “far out in the sea”.

With the right facilities on the piers, there will be good opportunities to enjoy the magnificent view, follow the traffic on the water, relax, find a shelter, eat lunch, have a private chat with a friend or catch a fish or two for dinner.

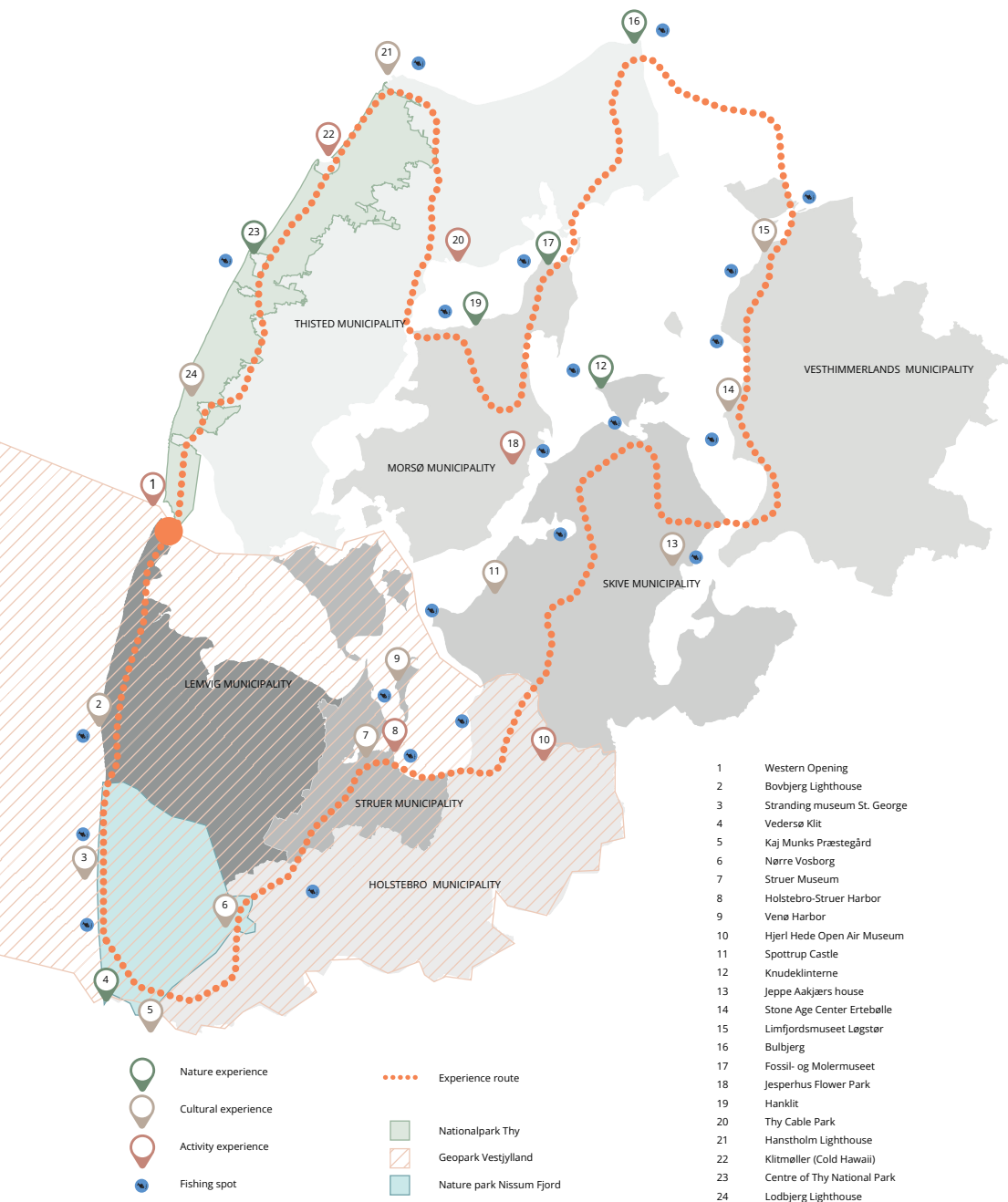
Farthest out to sea are the breakwater heads – each of which is the size of a handball court! It makes room for uniquely extraordinary experiences, e.g., music, dancing, parties, exhibitions and other events - even a handball match (but only with a few spectators).

The breakwater heads should be seen as the “Gateway to the Limfjord”, which connects Thy National Park, West Jutland’s Geopark (UNESCO) and the entire western part of the fjord, which is full of versatile attractions and experiences.

By prioritizing accessibility and experiences, the piers will become a must-see and attractive landmark with great appeal for everyone who demands unique experiences within culture, nature, city life, food and sport.

In short – the piers will lift the entire area around the western Limfjord by being an exemplary model of good shared climate adaptation for a larger area combined with recreational experiences.





Example of an experience route through the project's 7 municipalities

# Timeline

## 2012, September

The Danish Coastal Authority publishes the analysis Thyborøn Canal and Vestlige Limfjord. The analysis shows that a narrowing of the Thyborøn Canal by extending groyne 59 and possibly groyne 72 can protect against higher water levels in the Limfjord, and that it is by far the cheapest way to do it.

## 2022, October

The partnership comes out with outline proposals and a draft project prepared by Rambøll in collaboration with SLA and Rasmus Johnsen. It marks the end of phase 2 of the process, where the project was also given the name the "Western Opening".

## 2019, November

The partnership C9, which is one of 24 sub-projects in the large regional EU LIFE project, Coast to Coast Climate Challenge (C2C CC), publishes four reports and a non-technical summary prepared by Rambøll. It marks the end of phase 1 of a process which may lead to a narrowing of the Thyborøn Canal. The conclusion of phase 1 is that a realization will be an effective protection against future storm surges.

## 2022, October

The partnership has initiated a process of forming an organization that can continue working with the project after 31 December 2022, when the Coast to Coast Climate Challenge project ends and with it the support from the EU-Life programme. At the same time, external co-financing of the project must be worked on.

**2023**

Initiation of work with the EIA statement and financing.

**2024**

The EIA report is completed and the project's financing is in place.

**2026**

Commencement of construction work.

**2025**

Completion of tender project.

**2024**

Initiation of tender project.

**2028**

End of construction work.

# Retrospective and future

## Retrospective

Throughout history, nature, people and man-made values in the western part of the Limfjord area have been affected by storm surges. When they were severe, the consequences have been near catastrophic.

However, it is also the same storm surges that have made the area what it is today. That part of the story began on the night between February 3rd and 4th in 1825, when a storm surge broke through the Agger Tange creating the "Aggerkanalen" and thus what was for three decades a navigable connection between the Limfjord and the North Sea.

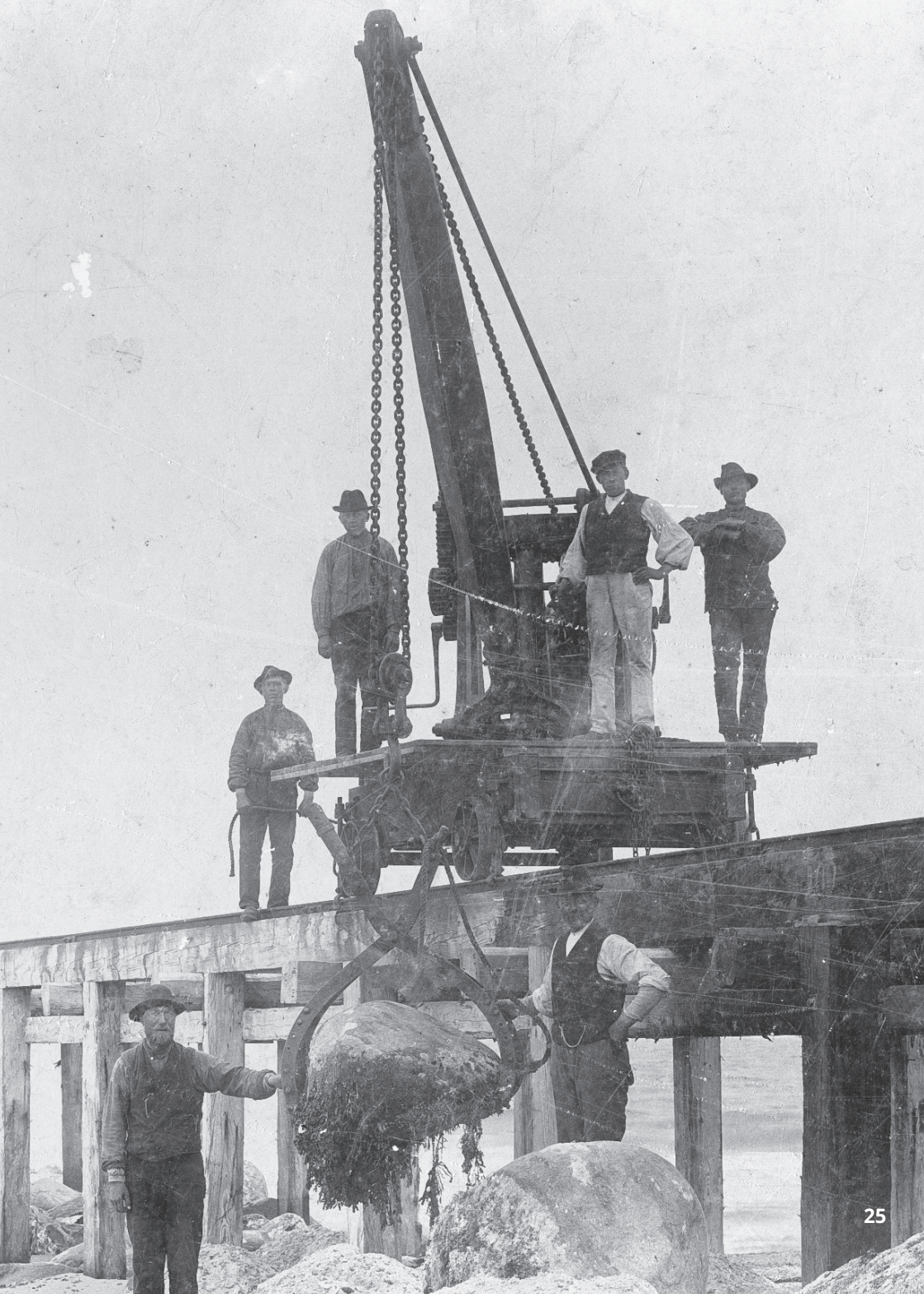
From the end of the 1850s, however, the canal became more and more sandy. It disappeared completely in connection with another storm surge in 1862. On the same occasion, the Thyborøn Canal was formed. As early as 1868, the new canal was sailed by 288 ships.

From 1875 until 1933, the state established groynes along the Agger and Harboør Tange. From 1915 to 1918, Thyborøn Harbor was built. Groyne 72 was extended from 1915 to 1922 to ensure sailing conditions.

The Danish Parliament decided in 1946 by the Thyborøn Act that a canal lock should be established to regulate the water level in the Limfjord. Its aim was, among other reasons, to cater to agriculture along the Limfjord.

With the law, they also wanted to secure the Limfjords straits (Harboøre Tange and Agger Tange), Thyborøn canal and harbor against storm surges and flooding. Work on the canal locks was stopped in 1954. The Thyborøn Act was repealed in 1970. Today, the Coastal Directorate is responsible for the maintenance of groynes and dykes, as well as sand feeding to counter retreat of the coastline.





### The future

Had it not been for the storm surges, we would not have had the Thyborøn Canal and thus an incentive to invest in preserving the canal and thus the great importance it has had and continues to have for this part of Denmark.

Because we did something, a corner of the world became what we know today. The future remains our responsibility.









THISTED KOMMUNE



HOLSTEBRO  
KOMMUNE



VESTHIMMERLANDS  
KOMMUNE  
*- lyst til at gøre en forskel*



SKIVEKOMMUNE



Lemvig Kommune



STRUER  
KOMMUNE

MORS



THISTED  
VAND  
DEN RENE LINJE



VESTFORSYNING

VESTHIMMERLANDS  
FORSYNING

SKIVE



VAND



LEMVIG VAND



STRUER  
ENERGI



MORSØ  
FORSYNING

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