AARHUS' CLIMATE ADAPTATION PLAN 2024-2030

Together for a resilient blue and green Aarhus

TECHNICAL SERVICES AND ENVIRONMENT
City of Aarhus

APPROVED
The Climate Alliance
BY C40 & CONCITO

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Photo, top: Flooding around Brabrand Lake, 2024
Photo, bottom: Bellevue Beach covered by seawater, December 2023

Together for a resilient blue and green Aarhus

Storm P:
"Everyone talks about the weather, but nobody does anything about it."

When we talk about the weather in the future, we will talk about yet another cloudburst that caused water on roads and in gardens. We will talk about saturated soil, rising groundwater levels, and rising sea levels. We will talk about summers with frequent heatwaves and long wet periods with heavy rainfall throughout the rest of the year. We will talk about how the landscape shapes the movement of water and how water flows through the city —because we will feel the impact of water and weather much more. Therefore, we must start to mitigate the 'new weather' brought on by climate change.

We must adapt our urban communities and landscapes in Aarhus Municipality to ensure we can continue living beautifully and harmoniously alongside the water. This can be achieved by greening streets and urban spaces to slow down water and by creating attractive city districts with room for recreation and play. By making space for water in nature, we can also create new experiences in nature and recreational routes.

The climate adaptation plan presented here outlines 12 initiatives. The first three, and most important, are the Climate Quarter at Nørreport, a nature project in Maden focusing on water retention, and the adaptation of the city to water in Egå, Vejlby Fed, and Risskov. These initiatives aim to prevent future floods from causing major and costly damages, like those experienced in Denmark in 2023, particularly during the rainy and stormy month of October. A stark reminder of the seriousness of the situation is the staggering DKK 1.1 billion in compensation costs from the storm surge that affected large parts of Denmark's inner waters in October 2023 — fortunately, it did not reach Aarhus Bay.

Aarhus' Climate Adaptation Plan is based on thorough studies of water, the socio-economic consequences of flooding, the municipality's planning strategy, and the principles outlined in the policy for architecture and urban quality.

It is a plan that embraces continuous and ongoing adaptation through specific projects, allowing us to incorporate new knowledge and adjust projects to meet emerging needs.
So, back to Storm P.'s quote.
The plan cannot change the new weather, but it does do something about it!

Happy reading!

Best regards,
Nicolaj Bang
Alderman, Technical Services and Environment
City of Aarhus

Photo: The sun sets over Aarhus, at the beach near Marselisborg

Introduction to the Climate Adaptation Plan

Photo: Example of a challenge. The ring road near Aarhus University on October 3, 2023. The road, bike path, and sidewalk are flooded by heavy rainfall, reaching all the way up to the arches at the lobby of the Aarhus University.

Photo: We are making good progress in adapting Aarhus to climate change and, in collaboration with Aarhus Vand (water utility), we have carried out several recreational adaptation projects. Here, Risvangen is shown, adapted to stormwater management in recreational areas.

The heavy rainfall that hit Aarhus in late summer 2023, combined with the intense cloudburst on October 3, has provided a stark picture of what Aarhus looks like when lakes, streams, and low-lying areas in the landscape fill with water. Many experienced flooding on paths and roads, while several properties in low-lying areas had water seeping into their floors.

Adapting the city to climate change requires significant investments, but the cost of inaction may be even higher. If a 100-year flood event were to hit Nørreport tomorrow, the damages in the area could exceed DKK 400 million. This is just one example of the climate change impacts we must address—now and in the future. Managing Nørreport's catchment at surface level would require handling a water volume of over 20,000 m^3 — the equivalent of approximately five times the surface area of University Lake.

The ambition of this new climate adaptation plan is to clarify our strategy for ensuring a resilient blue and green Aarhus, despite climate change. The plan includes our vision and strategic principles, as well as 12 initiatives that will help us achieve this vision.

Blue and Green Climate Adaptation
A key factor in successful climate adaptation is leveraging the natural characteristics of Aarhus' landscape. This means creating space in designated blue-green corridors to manage increased water volumes, and to ensure that urban development accommodates natural water pathways. In doing so, the city will be better able to absorb excess water and mitigate extreme temperatures.

This approach applies to all areas of Aarhus—from the city center in the valley to the suburbs in the hinterland, along the coast, and in the open countryside. We take a holistic approach to the entire water cycle, which does not adhere to neighborhoods or municipal boundaries.

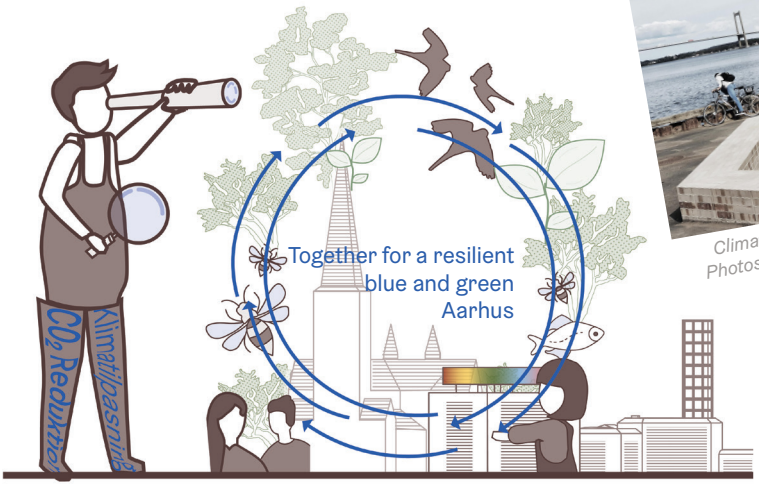
We are already making significant progress in municipal initiatives, particularly in collaboration with Aarhus Vand (water utility). The most important upcoming initiatives include:

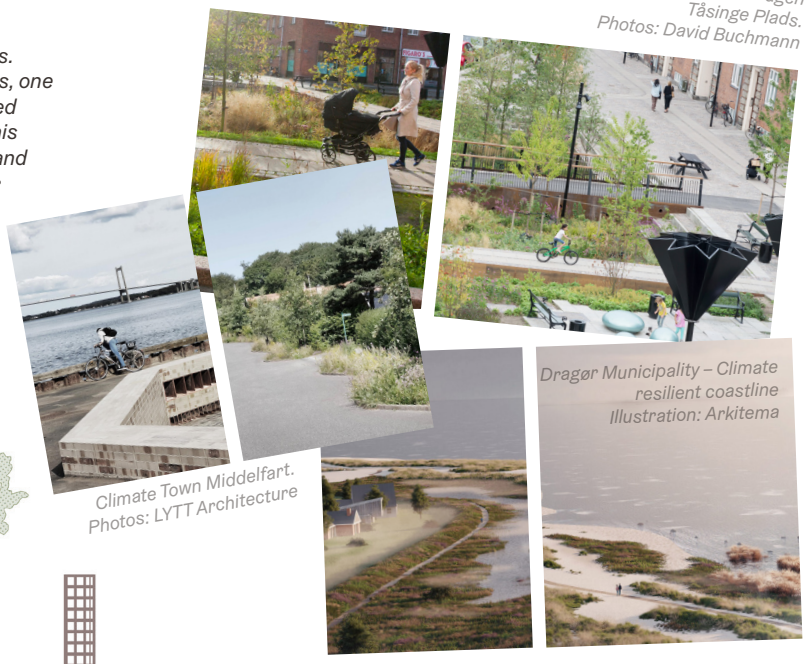
- **A Climate Quarter at Nørreport,** where we will test various innovative solutions over a longer time horizon to create space for and delay water in the dense urban environment. At the same time, we aim to enhance urban spaces, serving as inspiration for other climate adaptation projects in existing city areas.

- **A nature project for water retention in Maden** near Borum. The challenge here is managing water from a 330 km^2 catchment that passes through the low-lying areas around Brabrand Lake and continue into Aarhus River through the city center. If we do not ensure sufficient capacity in the system, the consequences will be felt from the suburbs to the city center. Therefore, we are working to create temporary water retention areas in Maden to handle the most extreme and severe flood events.

- **A project area in Egå, Vejlby Fed, and Risskov,** focusing on how a coastal urban area can be maintained despite challenges with water

Figure 1: Aarhus Municipality's Comprehensive Climate Efforts. Aarhus Municipality's overall climate efforts rest on two pillars, one of which is the climate adaptation plan. The other pillar, focused on prevention, is outlined in the Climate Plan 2025–2030. In this way, we work both to reduce human-induced climate change and to simultaneously adapt Aarhus to the changes that will occur regardless of preventive efforts.





Climate Quarter Østerbro, Copenhagen
Tåsinge Plads.
Photos: David Buchmann

Climate Town Middelfart.
Photos: LYTT Architecture

Dragør Municipality – Climate resilient coastline
Illustration: Arkitema

Reference photos above. We are inspired by innovative projects where climate adaptation enhances both nature and urban landscapes.

from multiple directions and numerous low-lying homes. These initiatives will align with a forthcoming coastal strategy, which will establish a solid foundation for integrating land and water. Additionally, coastal management will be strengthened to support broader climate adaptation efforts and planning for a more resilient city.

Collaborating on Climate Adaptation
With this Climate Adaptation Plan, we aim to foster diverse collaboration across the municipality and with relevant external partners, including Aarhus Vand (water utility), to explore synergies and multifunctional solutions. Together, we seek to identify, develop, and test effective solutions. We emphasize continuous engagement with citizens and stakeholders, ensuring that their input is incorporated and that solutions are collectively anchored.

Resilient Climate Adaptation
Climate adaptation is a complex field. While many solutions are known, much remains untested. Projects often have long time horizons and are implemented in phases, depending on flood risk timelines, synergies with other projects, partnerships, and funding opportunities. Additionally, new legislation and emerging knowledge may reveal new possibilities.

In Aarhus Municipality, we work with adaptive and dynamic processes in our climate adaptation efforts. This means that we plan strategically and long-term based on the knowledge available, while continuously assessing when and to what extent prioritized climate initiatives can be realized. A key aspect of this is ensuring that climate adaptation takes place whenever the necessary area can be secured.

In everyday terms, we refer to our approach as "climate adaptation with binoculars and a magnifying glass." With binoculars for the long-term perspective and a magnifying glass for immediate focus, we ensure a holistic approach where necessary short-term solutions (the magnifying glass) align with a long-term strategy (the binoculars). This prevents overinvestment in solutions that may not be needed for years—unless an immediate opportunity arises to implement them effectively now. In this way, we make timely and financially balanced decisions.

This is a dynamic Climate Adaptation Plan, grounded in a strategy that extends far into the future. The plan presents 12 initiatives that will be supplemented over time, depending on available funding. While the plan primarily addresses water-related challenges, it also considers heatwaves and droughts as part of the broader risk landscape, recognizing significant synergies in their adaptation.

Structure of the Plan
The first part of the plan describes how climate change is affecting Aarhus. The second part outlines Aarhus' vision and strategy for climate adaptation, including key objectives and actions. The third and final part presents upcoming climate adaptation initiatives in an action catalogue.

Sender

The Climate Adaptation Plan applies to the entire Aarhus Municipality. Throughout the strategy, the term "Aarhus" always refers to the entire municipality. When the word "we" is used in the policy, it refers to the Aarhus City Council and Aarhus Municipality.

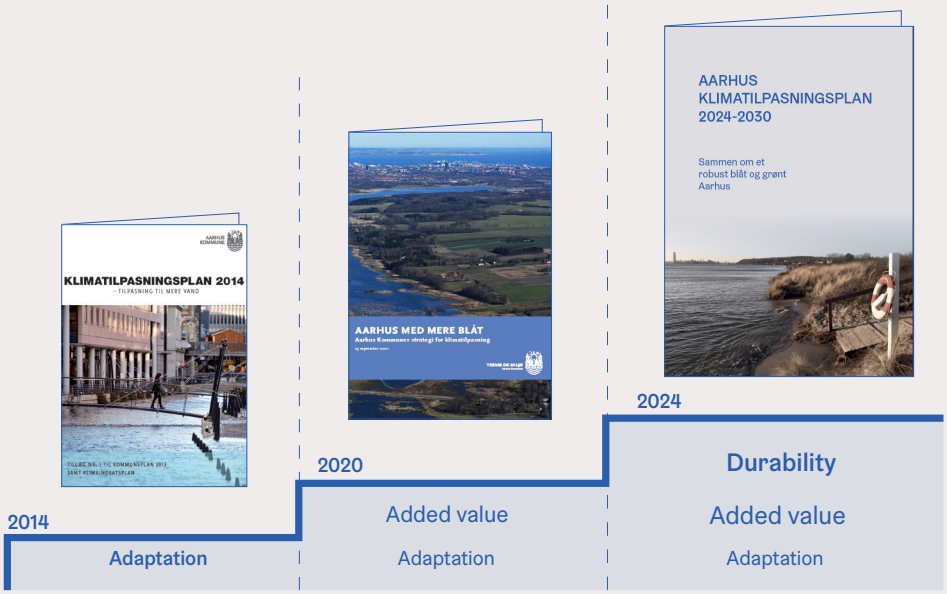


Figure 2: Building on Previous Plans
With its strategy and initiatives, the Climate Adaptation Plan builds on previous plans and replaces the 2020 strategy "Aarhus with More Blue." The plan also contributes to the implementation of the municipal plan.

Illustration: DK2020 Municipalities.
DK2020 municipalities work with standards and tools developed by C40. C40 is an international collaboration between some of the world's largest cities, aiming to reduce global CO_2 emissions and address climate change.

Certification

Aarhus Municipality has long taken a holistic approach to climate adaptation, most recently with the 2020 strategy "Aarhus with More Blue," which this plan replaces. Aarhus was among the first 20 municipalities in Denmark to receive DK2020 certification in 2019. The certification requires the municipality to demonstrate a path to net-zero emissions and climate adaptation measures. The Climate Adaptation Plan 2025–2030 has been developed to ensure the municipality remains eligible for certification.

Who Is Responsible for Climate Adaptation?
There is no single comprehensive law governing climate adaptation. Different sector-specific laws regulate various parts of the water cycle, and only a few legal areas directly address climate adaptation. The responsibility for adapting the existing city to climate change in line with politically adopted visions, plans, and strategies lies jointly with the municipality and the utility companies. At the same time, solutions must also be socio-economically viable.
As a general rule, property owners are responsible for protecting their own property from flood damage—this applies to both private and public landowners.

Emergency Preparedness
The Climate Adaptation Plan is supported by Aarhus Municipality's emergency response plan for extreme weather. The purpose of the emergency plan is to ensure a rapid and effective response to protect people and animals from immediate danger and to maintain critical societal functions in the event of flooding. The plan has been developed in close collaboration with the East Jutland Fire Department.
While the Climate Adaptation Plan focuses on preventing flood damage, the emergency response plan aims to "stop the disaster" when flooding occurs.

Glossary
100-year event: A statistical term referring to an event—such as a specific water level or amount of rainfall—that has a probability of occurring once every 100 years. This is known as a recurrence interval. Similarly, one can refer to 5-year, 10-year, or 20-year events. In a changing climate, the likelihood of such events occurring increases, meaning that the same event will have a shorter recurrence interval in the future.

Alternative Water Sources: A water resource or surplus water that does not meet drinking water quality standards and is used as a substitute - instead of using drinking water.

Blue-green: "Blue" primarily refers to areas that permanently or temporarily have visible water, while "green" mainly refers to green spaces and vegetation. Blue-green areas are spaces where water management is integrated within green areas.

Sewer Separation: Sewer separation replaces a combined system—where wastewater and stormwater are handled together—with a separate drainage system. The separation strategy is outlined in the urban wastewater management plan.

Nature-Based Solutions: Climate adaptation measures that rely on landscapes and natural processes.

Catchment: An area where precipitation drains into a specific stream, lake, or sea.

Part 1

Climate Change in Aarhus

The following provides an overview of how changing weather conditions will affect Aarhus, and the challenges we must address to make the city more resilient. Understanding the natural landscape is key to grasping these challenges, which is why this section begins with a description of it.

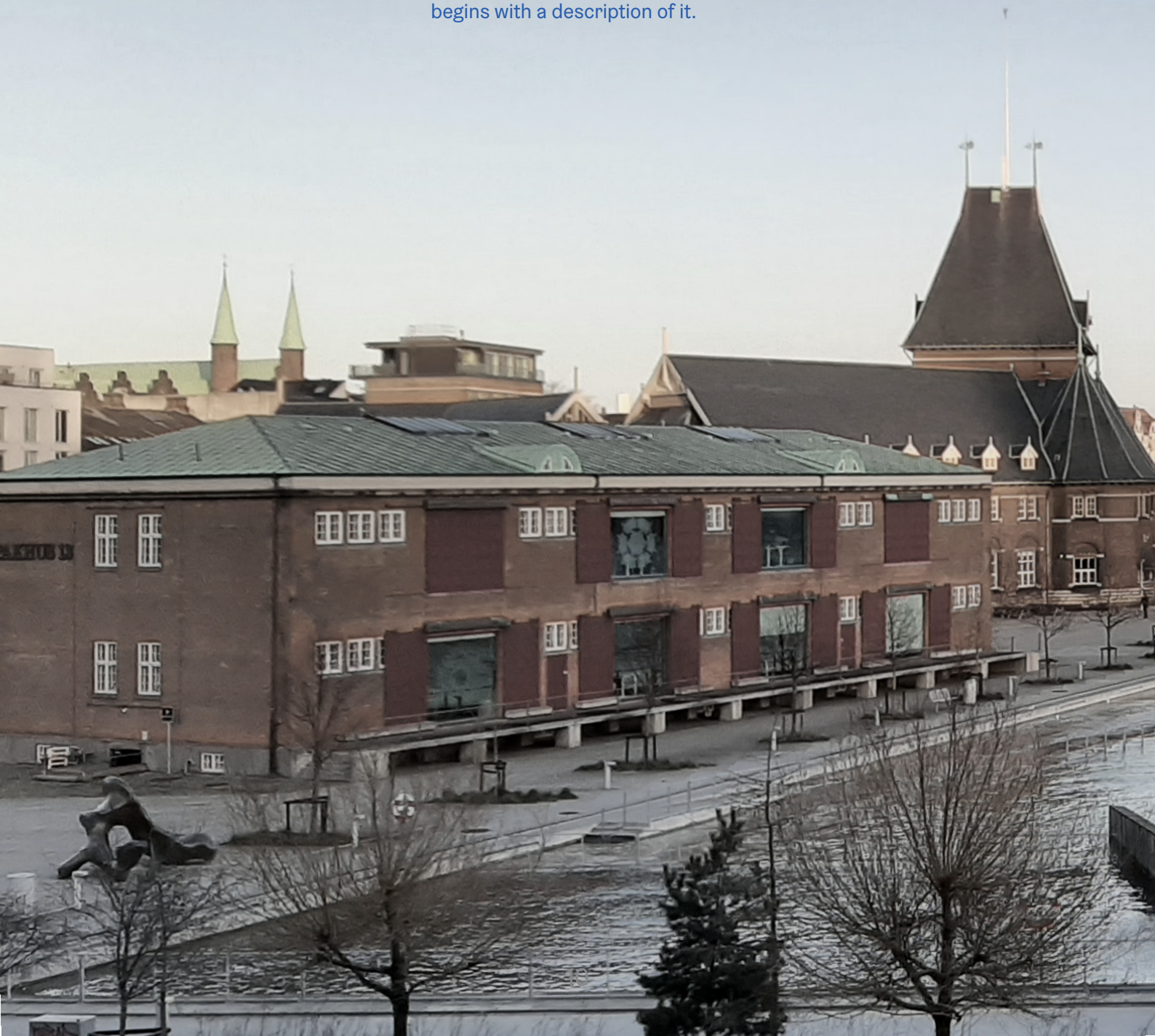


Photo: High water levels in Aarhus Bay, December 2023. Seawater covered the lower levels of the harbor square.

The City by the Water – The City with the Water

Figure 3: Aarhus 100 years ago. The map shows the historical, water-bearing valleys, the location of the town and the villages in the landscape.

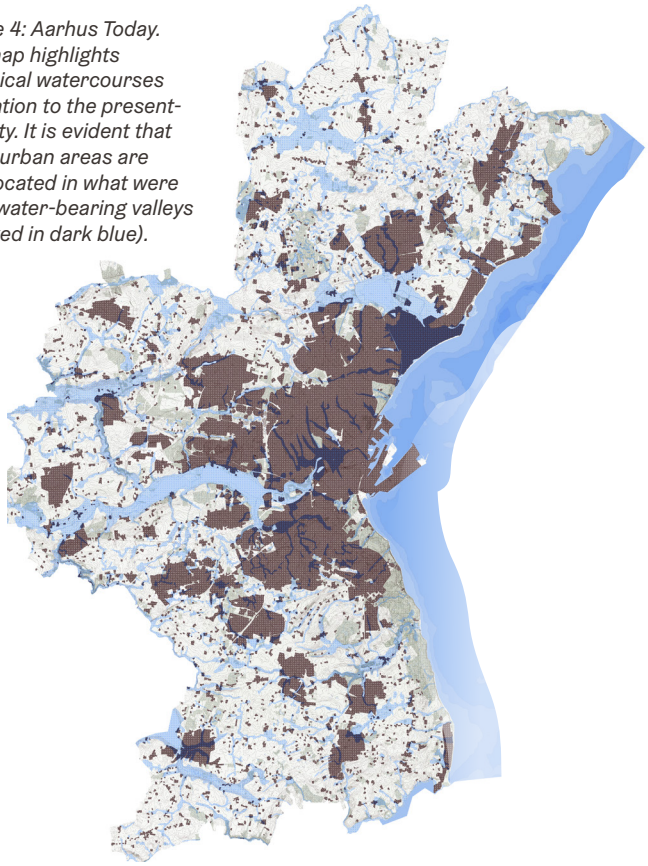


Figure 4: Aarhus Today. The map highlights historical watercourses in relation to the present-day city. It is evident that many urban areas are now located in what were once water-bearing valleys (marked in dark blue).

For thousands of years, the Ice Age and water have shaped the landscape around Aarhus. The moraine landscape is intersected by wide, deep valleys — among them, the Aarhus River, which runs through the city center before flowing into the harbor, and the Egå River, where the valley was once a fjord. Aarhus was originally founded on a slightly elevated ridge within the river valley, offering advantages such as trade opportunities and easy access to transportation.

Over the centuries, the city has expanded across the landscape, developing both on hills and in lower valley areas where technology and engineering have enabled drainage, land reclamation, and flood protection. The city's expansion accelerated during the industrialization, when wet and low-lying areas were drained for urban development and agriculture, for example the area around Thorvaldsensgade and Godsbanen, where mill ponds and wet meadows once existed. Similarly, the former salt marshes at Vejlby Fed were drained and initially developed as a summerhouse area, later becoming the residential district of Risskov, which today extends west of Nordre Strandvej.

The maps on the next page illustrate the central city and Vejlby Fed at 100-year intervals. They show:

- The areas as they were 100 years ago — low-lying, wetland areas that remained undeveloped.
- The areas today, where urban expansion has taken place through land reclamation and drainage.
- The risk maps, indicating where rising sea levels, storm surges, river flooding, and cloudbursts now concentrate — precisely in those areas that remained undeveloped before the industrialization.

This highlights the increasing pressure on parts of the city that lie "in the path of water"—in historical watercourses, depressions, valleys, coastal areas, and even the sea itself. If we want to maintain urban development in these areas over the next 100 years, it will require careful planning, investments, and new approaches to city design.

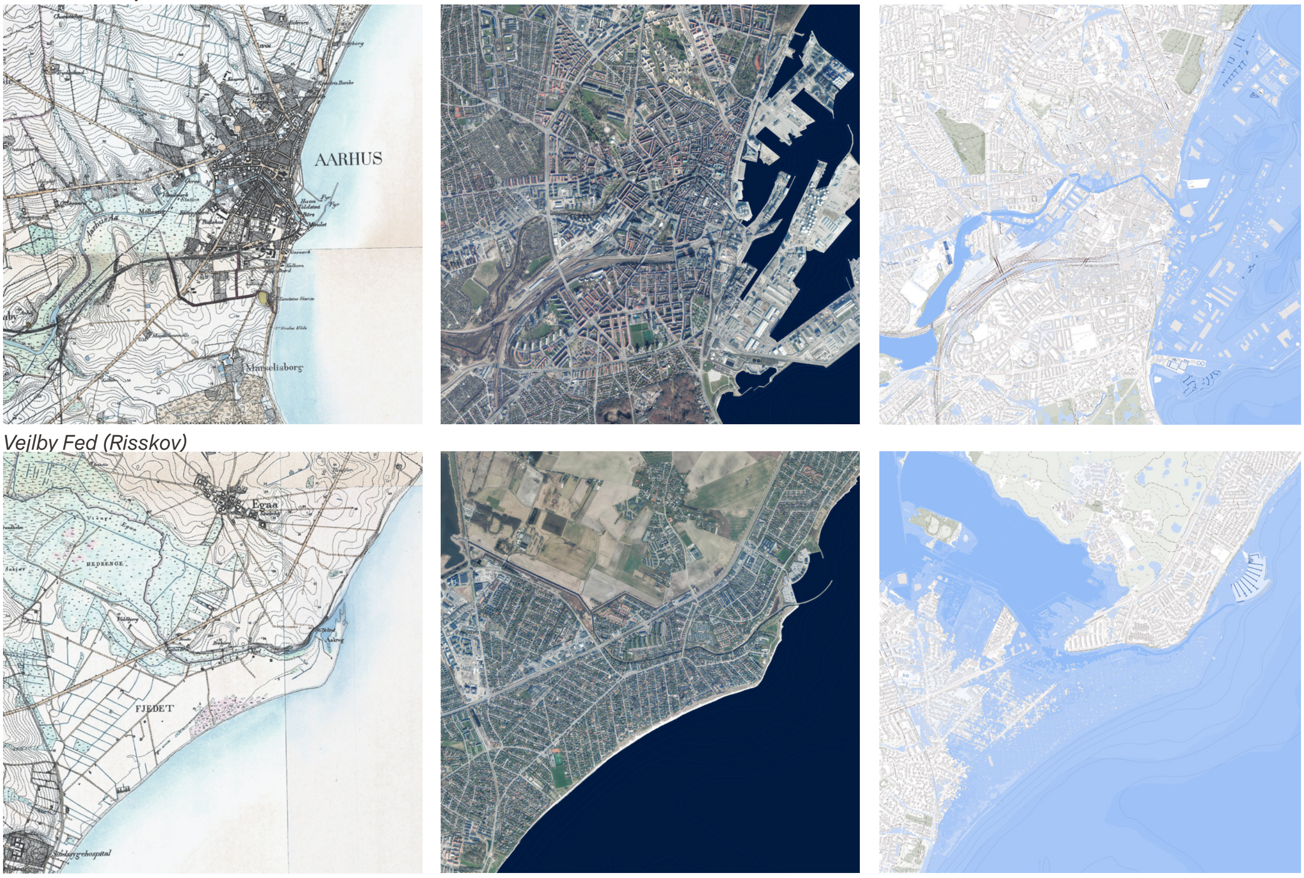
Figure 5: Three identical map excerpts, taken at 100-year intervals, illustrating how the city has gradually spread across the valleys of the landscape

By the water ...With the water?

100 years ago ← → *100 years into the future*

The central city

Vejlby Fed (Risskov)



Historical map: Topographical map, 1870-1899. The city's buildings are predominantly located on the hills.

Aerial photo: Aarhus city center, aerial photo 2020. The city has spread into the valleys, and a harbor has been built out into the bay.

Risk mapping: The blue zones indicate the extent of waterways and seawater during a storm surge under RCP8.5 in the year 2100.

Peter Holm,
View of Aarhus seen from the south, from Frederiksbjerg, approx. 1850.

Søren L. Lange,
An illustrated view of Aarhus from the year 1823. One can clearly discern the city located in the valley in front of the bay, with the moraine hills as a striking frame.

Flood Risk Assessments in the Landscape - Increasing extreme weather, water and heat

Water from all sides
In Aarhus Municipality, we experience water coming from all sides.

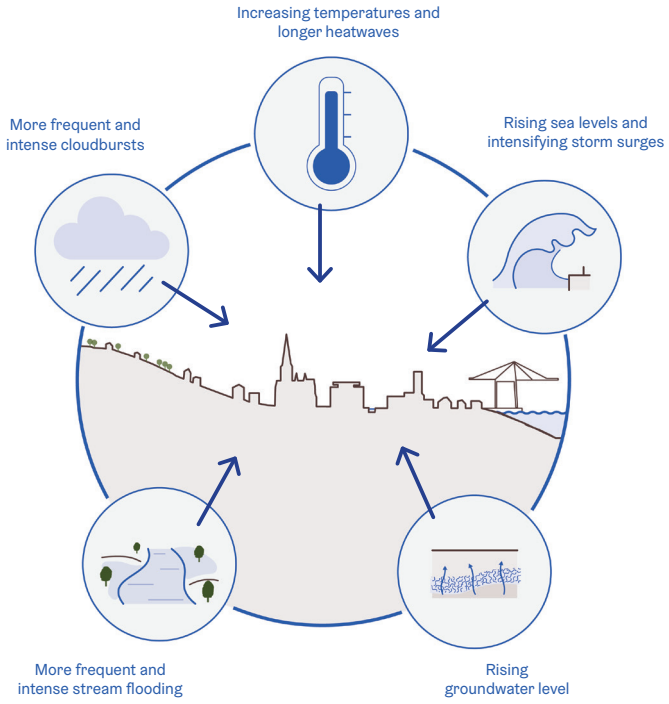
- From above: Prolonged rainfall and cloudbursts flow into streams, lakes, or over the city's surface.
- From the sea: Rising sea levels and stronger, more frequent storm surges impact our coastline, residential areas on the waterfront, natural habitats, and harbour areas.
- From below: Groundwater levels are rising, and in some periods, they are dangerously close to the surface.

In addition, we face greater temperature fluctuations, leading to more frequent and prolonged periods of drought and heat. Adapting to more frequent heatwaves is an essential part of climate adaptation, ensuring synergy between measures that address both water and heat-related challenges.

Water at all times
Apart from water coming from all sides, climate change also causes shifts in weather seasons, leading to situations where multiple events occur simultaneously. If a cloudburst follows a period of prolonged rainfall, it becomes difficult to absorb the precipitation, as the soil is saturated and waterways, lakes, and sewers are already filled with water. When water comes from all sides at the same time, Aarhus must still be a liveable city. That is why we address these challenges in a holistic way: Increasing focus on measures that account for combined events is crucial as we adapt to the new weather conditions.

These combined events put the entire water system under strain, while our traditional methods of managing such incidents are increasingly being challenged. In some areas of Aarhus, individual events remain the greatest threat - for example, extreme cloudbursts over densely built urban areas or powerful storm surges along coastal developments. However, in most places, the real challenge emerges when pressure is placed on the entire water cycle.

Figure 6: Water from all sides



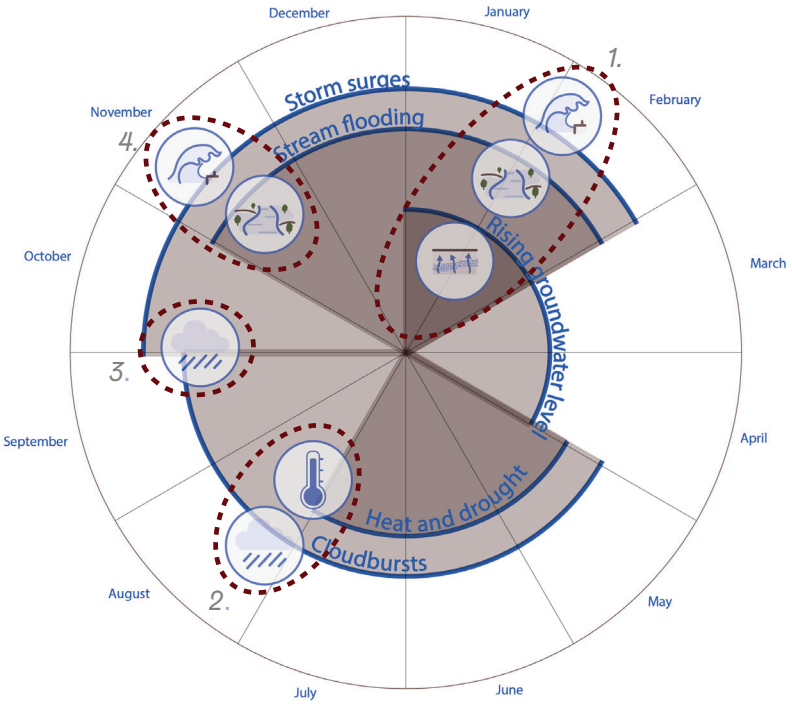


Figure 7: Water at all times
Besides water coming from all sides, climate change also causes shifts in "weather seasons." This means that prolonged winter rainfall can occur earlier, as we saw in November 2023. The diagram presents four examples:
1. Throughout the winter, we have seen repeated flooding of Brabrand Lake due to an overfilled waterway system and prolonged rainfall, most recently in February 2024.
2. Summer cloudbursts on dry soil – Lystrup, August 2012.
3. Autumn cloudbursts – October 2023. Normally, we see cloudbursts in the summer.
4. In November 2023, lakes were overfilled, and waterways overflowed. Fortunately, the storm warning was downgraded.

Data source

The mapping of future climate conditions is based on the UN's emission scenarios, known as RCP scenarios (Representative Concentration Pathways). Aarhus Municipality uses the so-called RCP8.5 scenario for screening and planning purposes at the municipal plan level for the years 2100 and 2120.

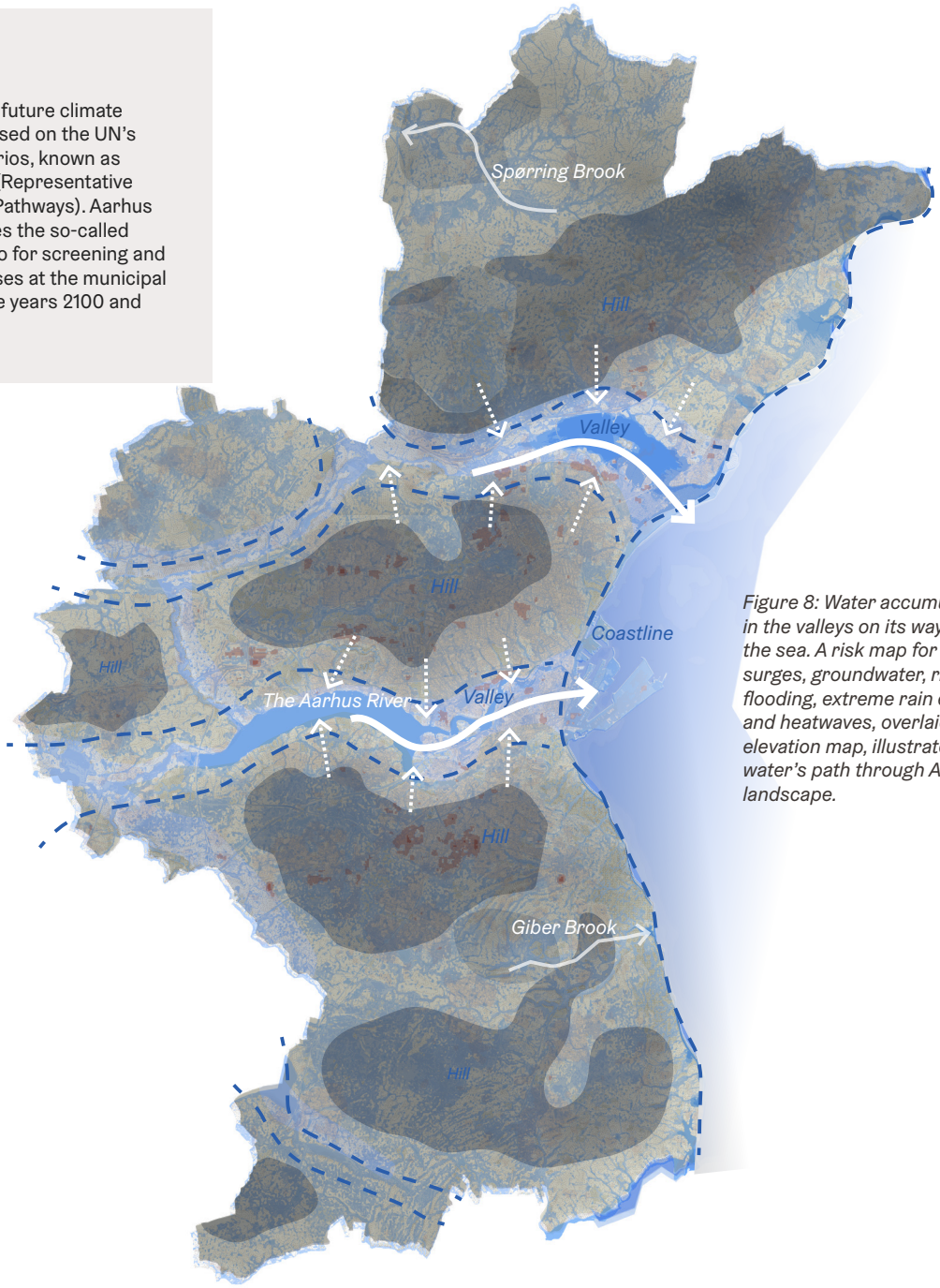


Figure 8: Water accumulates in the valleys on its way to the sea. A risk map for storm surges, groundwater, river flooding, extreme rain events, and heatwaves, overlaid with an elevation map, illustrates the water's path through Aarhus' landscape.

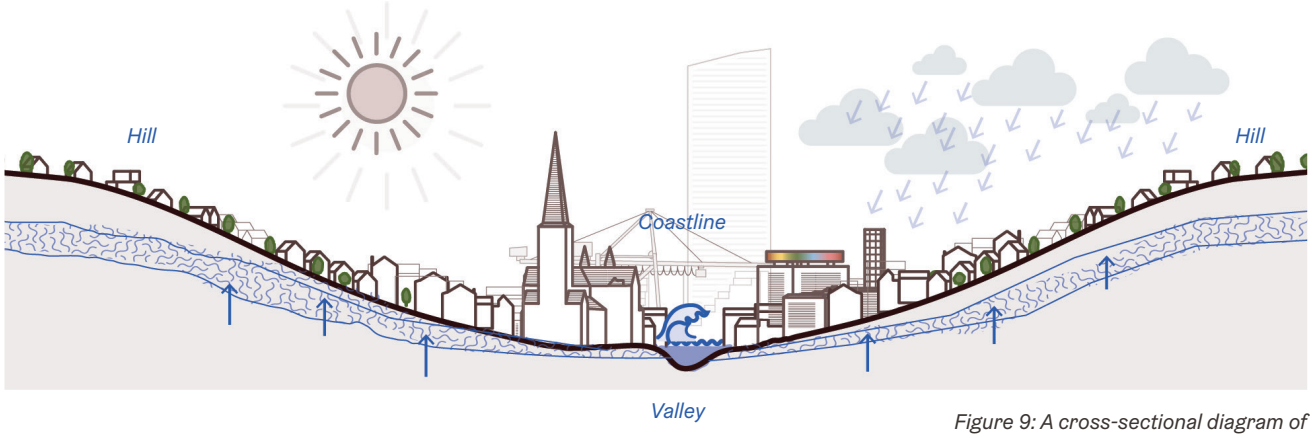


Figure 9: A cross-sectional diagram of Aarhus' urban landscape, showing how water comes from all sides.

Climate Change in Aarhus

Rising sea levels and intensifying storm surges

Climate change is causing sea levels to rise while storm surges become more frequent and intense.

Currently, there is about one storm surge every 20 years. From 2070, it is expected that there will be approximately 45 storm surges over a 20-year period.

Even today, the lowest-lying part of Vejlby Fed would be flooded if Aarhus experienced a 100-year storm surge. The storm in October 2023 was one such event, causing significant damage further south in Denmark's inner waters.

By 2120, a 2-year storm surge is projected to reach 2.5 meters above today's normal water level, while a 100-year storm surge will rise 2.8 meters higher.

Where is Aarhus most at risk?

Vejlby Fed and Egå are low-lying areas already facing significant threats today. In the upcoming initiatives/actions in Egå and Risskov, potential solutions will be explored (as outlined on page 48 of the action catalogue)."

In the long term, as future events surpass the high-water lock at DOKK1 and the coastal road protecting the city center, action will be necessary.

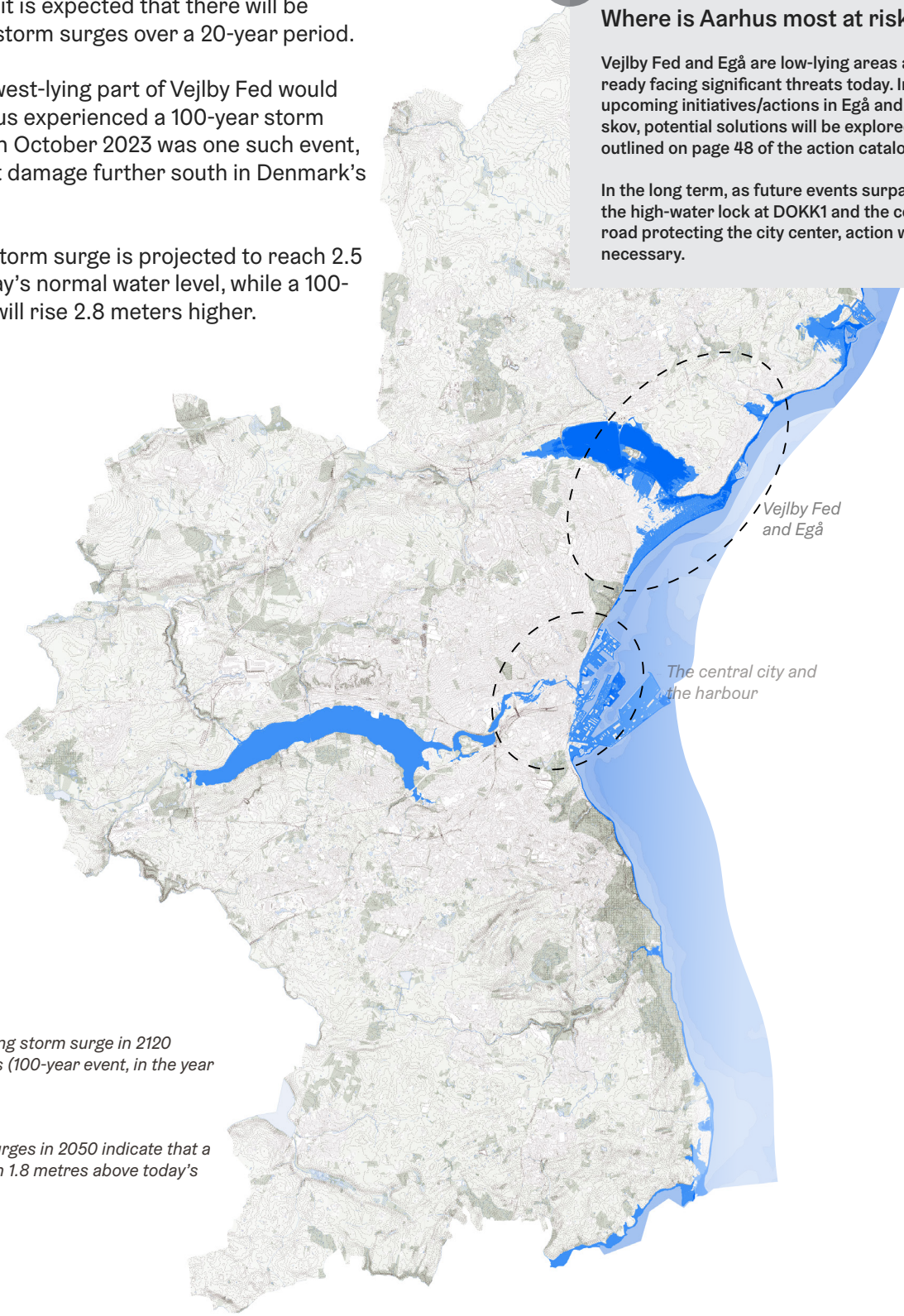


Figure 10: Sea level during storm surge in 2120 according to projections (100-year event, in the year 2120, RCP 8.5).

Projections for storm surges in 2050 indicate that a 100-year event will reach 1.8 metres above today's normal water level.

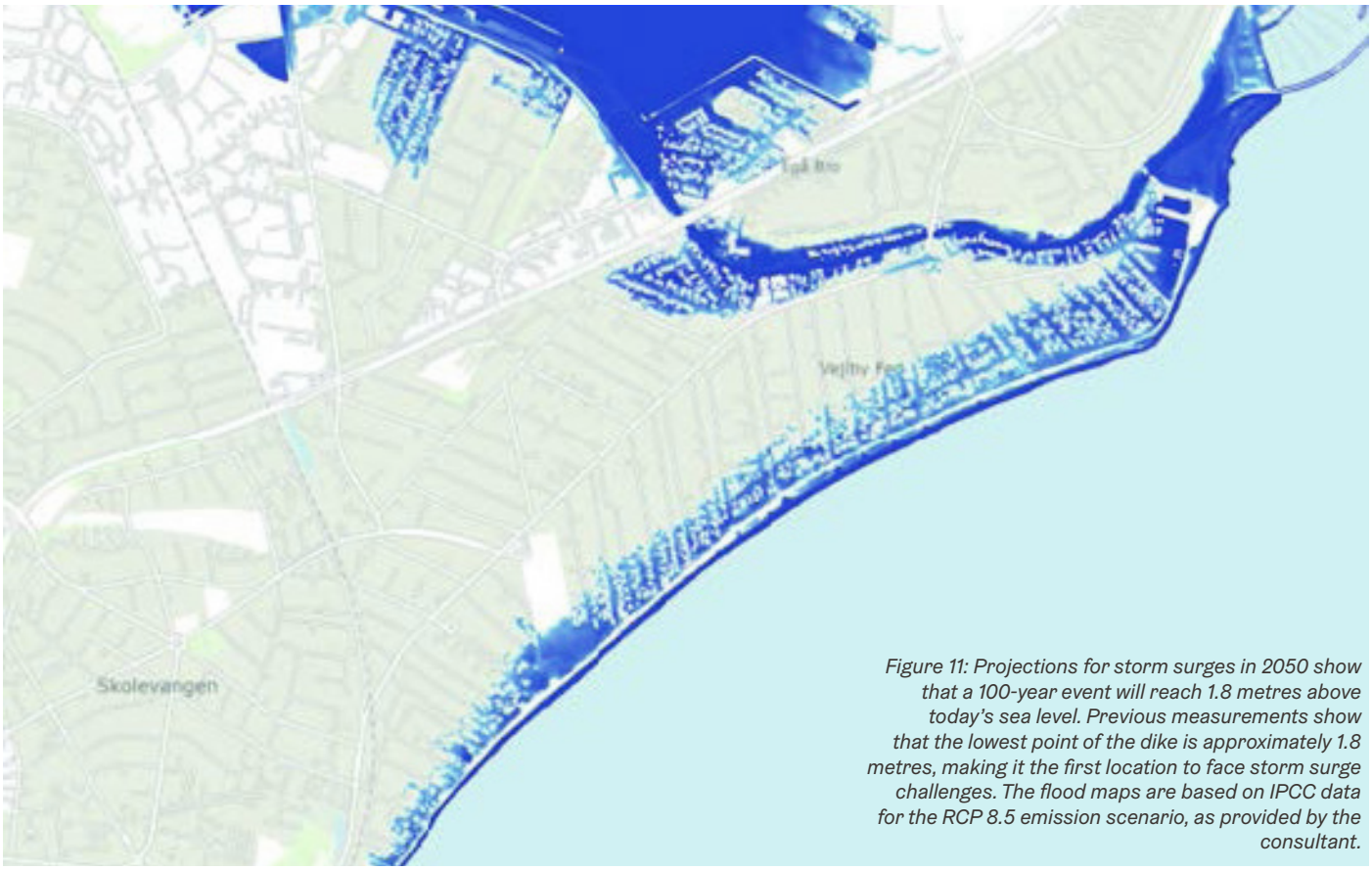


Figure 11: Projections for storm surges in 2050 show that a 100-year event will reach 1.8 metres above today's sea level. Previous measurements show that the lowest point of the dike is approximately 1.8 metres, making it the first location to face storm surge challenges. The flood maps are based on IPCC data for the RCP 8.5 emission scenario, as provided by the consultant.

Figure 12: Projections show that the permanent sea level will rise by approximately 20 cm by 2050 and around 120 cm by 2120. During a 100-year storm surge event, this would result in increased sea levels of approximately 180 cm in 2050 and around 280 cm in 2120.

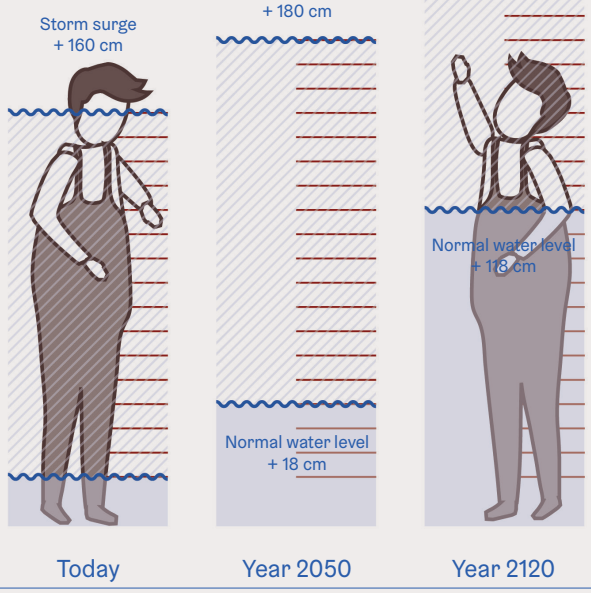


Photo: Coastal flooding has eroded the dike and staircase south of Aarhus. December 2023.

Photo: High water levels in Aarhus Bay in December 2023. Flooding of the lower plateaus around DOKK1 and water levels very close to the harbour pier's surface. The high-water lock was closed due to a high water level.

Climate Change in Aarhus

More frequent and intense river flooding

We will experience increased water flow into rivers - especially in winter when the ground is already saturated. Flooding occurs when lakes, rivers, and sewage systems reach capacity due to prolonged rainfall. At Brabrand Lake, we have seen two so-called "50-year flood events" within just six years. Such events will become more frequent in the future.

Where is Aarhus most at risk?

The river system is generally under pressure, especially the Egå and Århus Rivers, which is why it is crucial to create more space for water on land and in rivers and lakes, including in the surrounding areas.

A good example of potential solutions is the initiative for water retention in Maden - see the action catalogue on page 48. Over time, even more similar efforts will be needed to create space for "water retention".

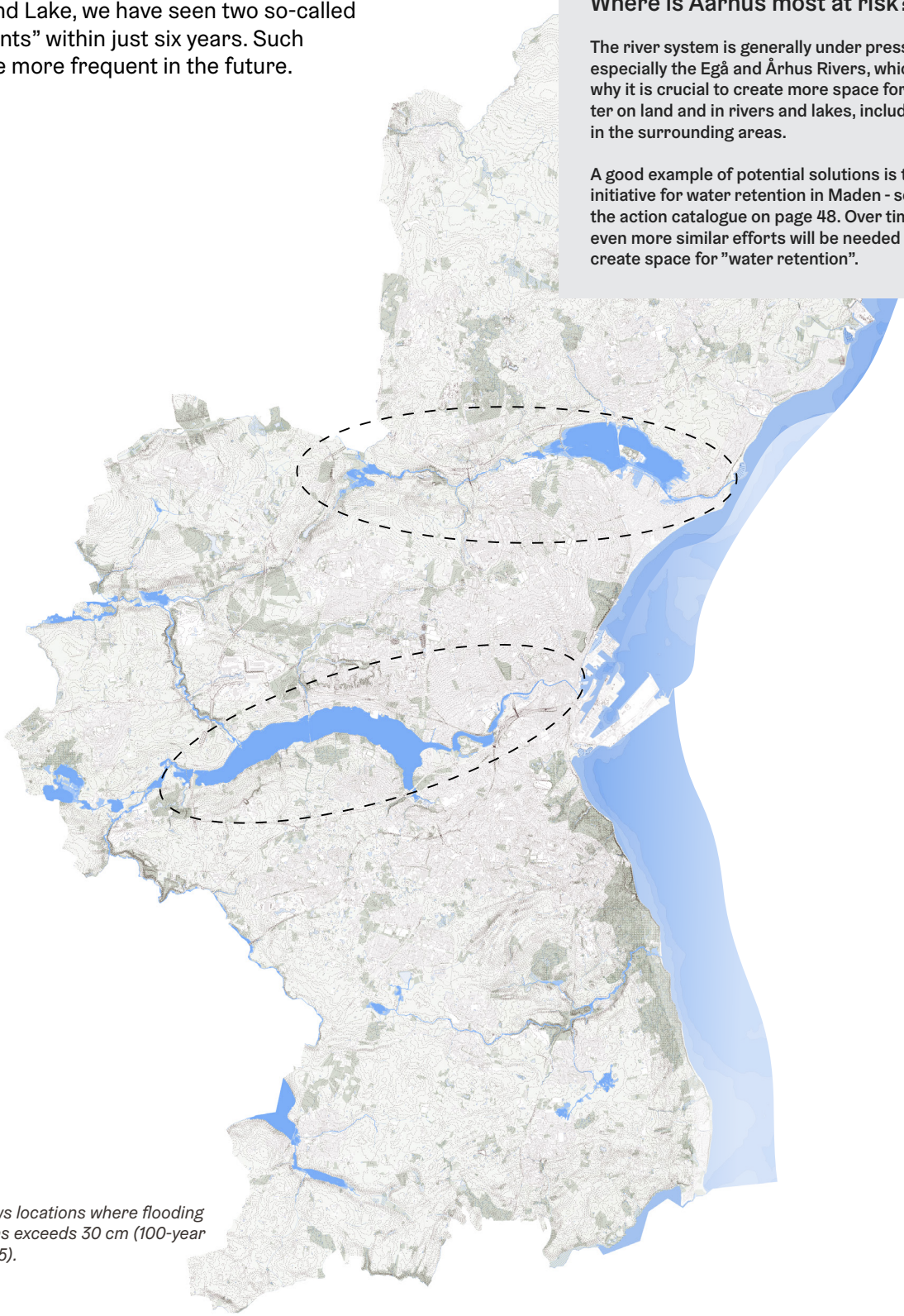


Figure 13: The map shows locations where flooding from larger river systems exceeds 30 cm (100-year event, year 2120, RCP 8.5).

Photo: October 29. Aarhus Municipality and the emergency services were ready to pump water away from the river system in Egå with additional pumps at the high-water lock in Egå.

Photo: November 2023. High water levels in Brabrand Lake. The water level was approaching the same critical level as in 2020, when a storm surge was also forecasted.

Photo: December 2023. Seawater floods an access road in Egå.

Photo: November 2023. High water levels in Brabrand Lake. The water level was approaching the same critical level as in 2020, when a storm surge was also forecasted.

Photo: October 2023. The meadow "Hede Enge" east of Lystrup Road. A lot of water had accumulated on the meadow as rain over an extended period had saturated the catchment of Egå. This posed a significant risk of flooding during heavy rainfall events.

Climate Change in Aarhus

More frequent and intense cloudbursts

We are generally experiencing more rainfall in the winter and more frequent and intense cloudbursts in the summer.

During cloudbursts, there is a risk of many local floods. The city centre is particularly flood-prone, due to the terrain and the high degree of impermeability. When it rains for an extended period, even minor events can cause flooding.

From models, we know that the frequency of cloudbursts is expected to double by the end of the century - meaning that the extreme flood events we have already experienced will become much more common in the future.

Harlev and Sabro experienced a cloudburst on October 3, 2023, equivalent to a 70-year event.

Where is Aarhus most at risk?

Cloudbursts affect all areas, but especially the low-lying parts of the city centre, as well as heavily paved built-up areas where the sewage systems are not separated, are particularly flood-prone.

Our current efforts with sewer separation in collaboration with Aarhus Vand (water utility), along with climate adaptation in the area around Vesterbro Torv, are creating more space for water in the city.

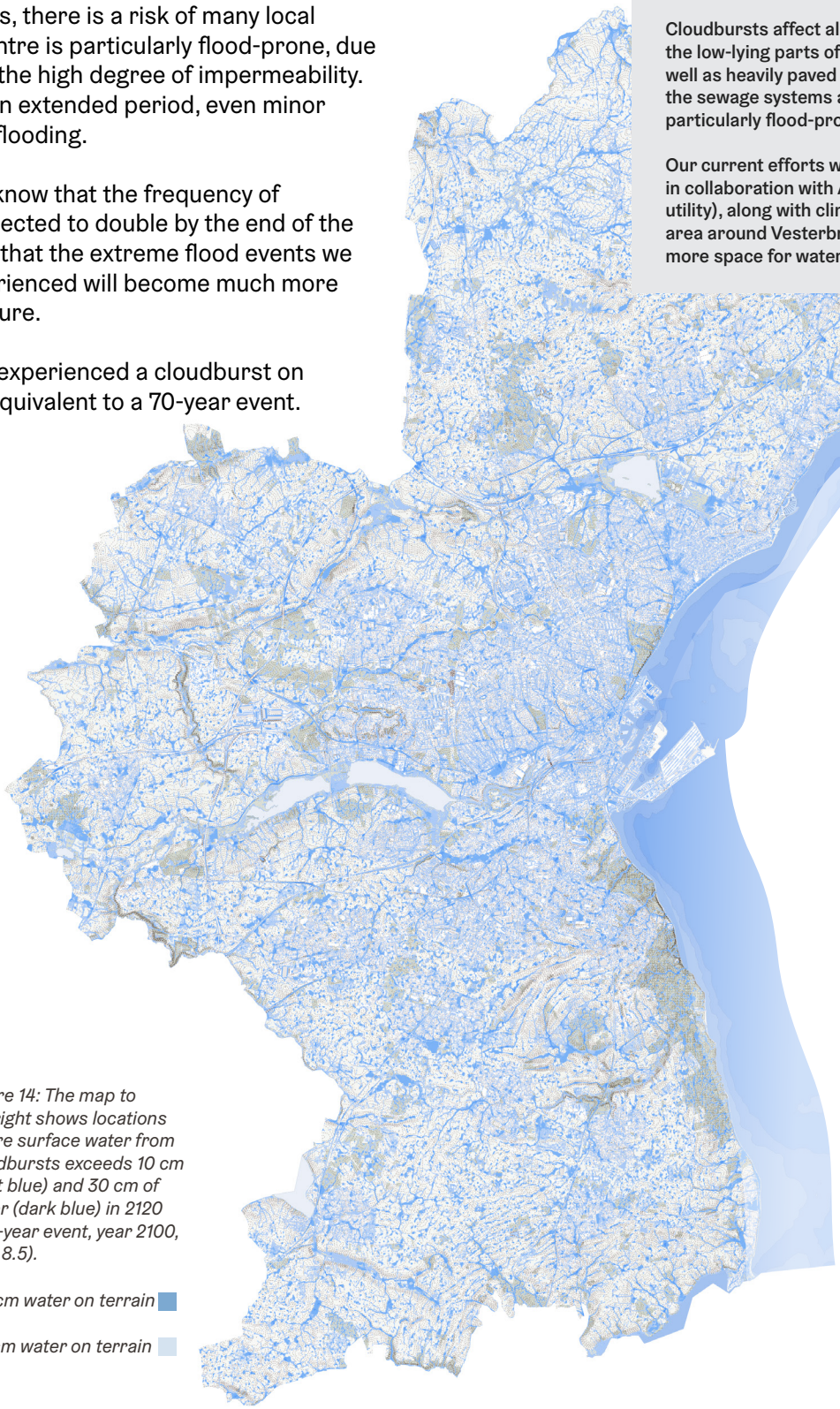


Figure 14: The map to the right shows locations where surface water from cloudbursts exceeds 10 cm (light blue) and 30 cm of water (dark blue) in 2120 (100-year event, year 2100, RCP 8.5).

In 2023, Aarhus experienced two types of rain, both cloudbursts and prolonged heavy rain, as late as in October, which severely challenged the city's sewer systems.

Photo: Nordre Ringgade, October 3, 2023

Photo: Stormwater pond at Klokkervej Åbyhøj, after October 3, 2023

Photo: Vesterbrogade, October 3, 2023

Photo: Jyllands Allé, October 3, 2023

Photo: Viby Torv, October 3, 2023

Photo: Paradisgade, October 3, 2023

Climate Change in Aarhus

Rising groundwater levels and more water-saturated soils

In many parts of Aarhus, the groundwater level is currently just 1 meter or less below the surface. Since 1988, the groundwater level has risen by approximately one meter, causing challenges for many property owners during wet periods, as they are forced to pump water out or endure flooding.

In the future, more areas in Aarhus will experience persistently high groundwater levels. During prolonged rainfall, when groundwater is already high, lakes, rivers, and sewage systems can overflow, making it difficult to manage stormwater runoff. Low-lying and coastal areas are especially vulnerable, where continuous pumping or surface flooding may become an unavoidable reality.

As groundwater levels continue to rise, the associated costs are expected to increase. More areas will be affected for longer periods, leading to greater inconvenience and higher expenses throughout the year.

Where is Aarhus most at risk?

Groundwater levels are high in many areas of the municipality, leading to wet gardens, rising water in pipes and basements, and challenges for construction and infrastructure projects.

In collaboration with Aarhus Vand (utility company), we are working to expand knowledge about groundwater and its connection to other water sources. This insight will contribute to national climate action efforts.

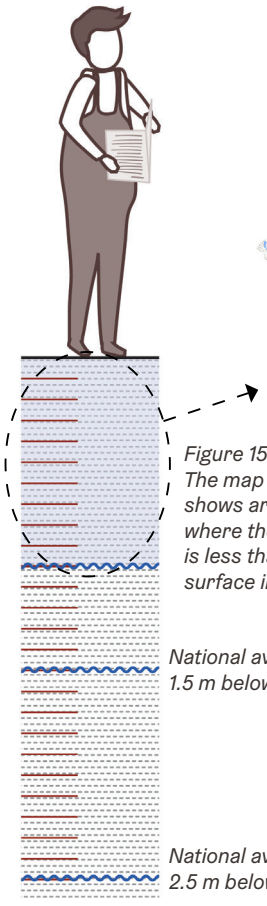


Figure 15: Groundwater level. The map to the right shows areas in Aarhus where the groundwater is less than 1 m below the surface in the year 2100.

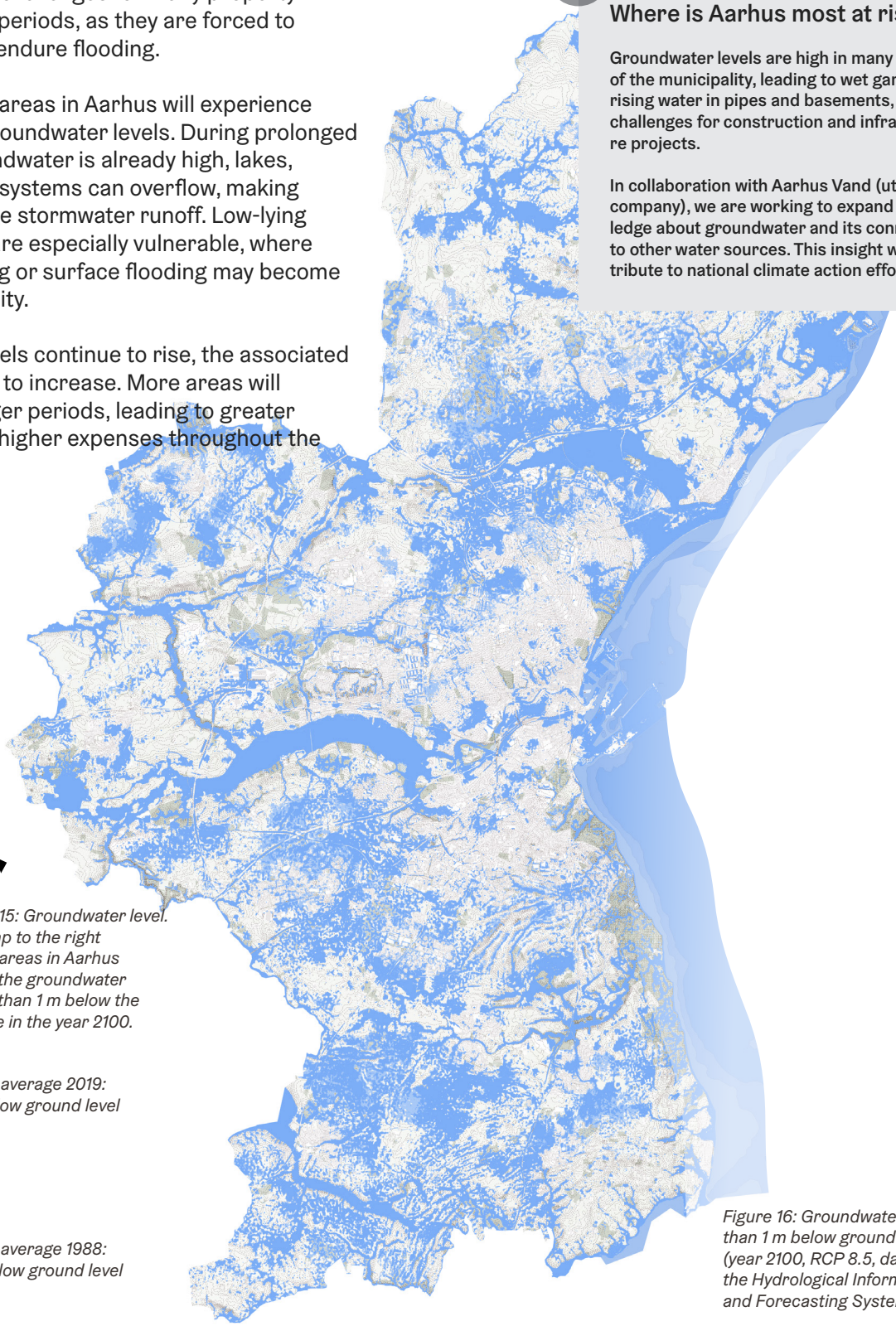


Figure 16: Groundwater is less than 1 m below ground level (year 2100, RCP 8.5, data from the Hydrological Information and Forecasting System)

Climate change in Aarhus

Heat

Many still remember the summer of 2018, which saw Denmark's longest recorded drought, lasting from May to August (DMI, 2022). Hospitals reported a record number of admissions due to dehydration and heatstroke, and over just two weeks, the extreme heat is estimated to have contributed to 250 excess deaths in Denmark (SSI, 2018).

By 2100, Denmark's annual average temperature is expected to rise by approximately 3.4°C. In Aarhus, the number of days with temperatures exceeding 25°C is projected to increase from an average of 8 today to 31 by the end of the century.

In 2100, Aarhus is expected to experience an average of 31 days with temperatures above 25°C - today, we have an average of just 8 days with these temperatures.

Cities are particularly vulnerable to rising temperatures due to the urban heat island effect. Heat will not be evenly distributed across Aarhus, with localized heat islands forming in certain areas. These heat islands can pose serious risks, especially for vulnerable groups, if access to shade and water is limited.

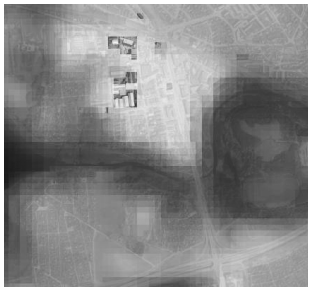
Where is Aarhus most at risk?

In paved areas with vulnerable populations, such as patients at Skejby Hospital, high temperatures can pose serious risks. Greening the city with solutions that both retain water and cool urban spaces — such as trees, green roofs, and lakes — helps mitigate heat island effects.

Urban forests and green infrastructure play a crucial role in cooling cities. The maps highlight two examples in Aarhus: Risskov and Brabrand Stien.

We are actively implementing nature-based solutions, including planting more shade-providing trees throughout the city. A specific example is the initiative at Vesterbro Torv — see the action catalogue on page 52 for details.

Top left: Heat map based on the average temperature during the summer of 2018 in Risskov, Aarhus. Risskov recorded a temperature of 22°C, while the surrounding city reached 29°C — a difference of 7°C.



Bottom left: Heat map based on the average temperature during the summer of 2018 along Brabrand Stien in Aarhus. The temperature at Brabrand Stien, near the Aarhus River, was 25°C, while the industrial area north of the river reached 34°C—a difference of 9°C.

Data source: Land 8.

Figure 17: The map highlights temperature variations across Aarhus during June, July, and August 2018 (with 20% cloud cover).
The map illustrates how heat is unevenly distributed, with temperature differences exceeding 15°C between the hottest areas near Søren Frichs Vej, Aarhus University Hospital at Skejby and the cooler areas around Brabrand Lake and Risskov.

Data source: Land 8.

Part 2

Aarhus' Climate Adaptation Strategy

Vision and Strategy

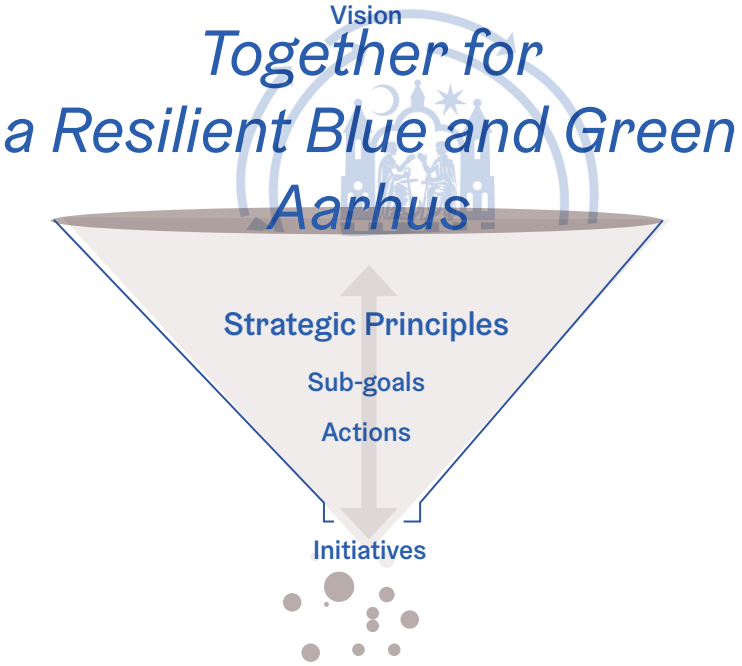


Figure 18: Illustration of the Strategy's Components.
The vision is realized through Four Strategic Principles, which are further detailed in sub-goals and actions. These are essential to achieve a resilient, blue and green Aarhus. Therefore, we highlight the potential contribution of each initiative toward fulfilling the sub-goals.

Figure 19: Strategic Principles

Together for a Resilient Blue and Green Aarhus
Aarhus has the great advantage of being beautifully situated in the landscape, with close contact to the water. In Aarhus, nature is an integral part of the city, and water is life-giving in all its forms.

The vision is to develop a city that is resilient to the future climate, with more water and higher temperatures. The Aarhus of the future will have blue-green corridors as an integrated part of the city's mosaic. We want to see water and nature weaving into the city center as natural breathing spaces, creating recreational environments in the suburbs, villages, and along the coastline. In the Aarhus of the future, life - just as today - will be lived with the water, in the city by the water.

This requires everyone to make space for blue and green elements in Aarhus, both within the city and in the surrounding open country. When we develop and transform, we must do so based on the fundamental landscape and climate conditions. Water in the city is also about urban quality and must include aesthetic and architectural considerations in the design of urban spaces and landscapes.

This forms the basis for a liveable city. Therefore, our vision is to stand together for a resilient, blue and green Aarhus.

Aarhus' Climate Adaptation focuses on Four Strategic Principles:

- We create time and space for water
- We create a liveable city for everyone
- We adapt to climate change with a focus on socioeconomic costs and synergy
- We strengthen innovation and collaboration

The Four Strategic Principles are further elaborated in the following pages through sub-goals and actions.

The City Council aims to ensure that societal values and mobility are not negatively affected by increasing water volumes. Complete protection against flooding from extreme cloudbursts and severe storm surges is impossible to achieve, and flooding will continue to occur in the future.

However, through smart and well-coordinated physical planning, flood damage can be minimized, while also creating additional value.
The strategy for adapting Aarhus Municipality to extreme cloudbursts is to view water as a resource that enhances nature and urban spaces when we create time and space for it.

Excerpt from the Aarhus Municipal Plan

Photo: Bellevue Beach covered by seawater after the storm in December 2023.

Strategic Principles

We create time and space for water

We create space for water through strategic planning, allocation of areas for water-sensitive urban design (WSUD) and multifunctional use of green spaces.

Climate adaptation in Aarhus is based on the entire water cycle. This is done by considering the landscape's natural structure and the natural flow paths of water, both on and below the surface. For example, this includes restoring old streams, ditches, and other water features.

By doing so, climate adaptation supports the blue-green connections identified in our Municipal Plan. We call this creating time and space for water.

To achieve this, we work towards two key objectives:
- Taking the entire water cycle as our starting point.
- Creating space for water in the landscape and on the surface.

Photo: In Gellerup Forest, rainwater basins have been incorporated to create space for water.

Actions That Improve the Entire Water Cycle:

We Develop Water-Sensitive Urban Design (WSUD) Plans

Planning with water-sensitive urban design (WSUD) ensures climate-resilient urban development by creating time and space for water while reducing the risk of future flooding from stormwater, shallow groundwater, streams and lakes.

These plans form the basis for developing master plans, local plans, and larger projects. Therefore, water-sensitive urban design (WSUD) plans are an essential tool in prioritizing blue-green connections in urban planning.

We Regard Water as a Resource

In climate adaptation, water is regarded as a resource, where visible blue elements enhance the city's recreational areas and in the open country, in connection with green spaces.

Furthermore, we aim to utilize both rainwater and shallow groundwater as alternative water sources (instead of drinking water) in the future, thus reducing the strain on and consumption of our groundwater resources.

We Incorporate Knowledge of Shallow Groundwater by Climate Adaptation

There is currently no legislation regarding shallow groundwater. In October 2023, the government proposed that municipalities take on the regulatory responsibility for managing shallow groundwater, while wastewater utilities would be allowed to implement collective solutions in areas where societal benefits can be achieved. This is a solution that both municipalities and wastewater utilities have long requested. Aarhus Municipality and Aarhus Vand (water utility) are proactively gathering experiences and insights into these challenges while awaiting new legislation.

Photo: For the urban development area in Lisbjerg, a Water-sensitive urban design (WSUD) plan has been prepared, which means that space for water on the terrain and in the landscape has been incorporated into the development plan.

Photo: Climate adaptation in Riisvangen

Actions that create space for water in the terrain and landscape:

Climate adaptation is implemented when Aarhus Vand (water utility) separates rainwater and wastewater in existing urban areas

With the wastewater plan, a long-term strategy for sewer separation has been established, extending until 2085. This separation ensures that rainwater is separated from wastewater. Climate adaptation is implemented where it is economically viable. The focus is largely on creating solutions that allow water to remain on the surface wherever possible.

Climate adaptation is prioritized where it can be implemented in synergy with other projects

Integrating climate adaptation with the city's development and transformation is common sense. Urban transformations offer the best opportunities for synergy, where creating space for water and its flow becomes tangible measures as we shape the city's spaces.

Climate adaptation is implemented in the catchment to reduce flooding in urban areas

Water can be "parked" in open landscapes, ideally in synergy with lowland restoration projects and other initiatives to restore natural wet river valleys. This helps reestablish nature's ability to retain water, including the new water and nature parks in Aarhus. At the same time, this contributes to CO_2 reduction, nitrogen reduction, increased biodiversity, more natural areas, phosphorus retention, thereby achieving environmental goals for watercourses, and reducing the risk of summer drought in streams.

Strategic Principles

We create a liveable city for everyone

Climate adaptation and urban development are closely connected. Climate adaptation can enhance the quality of recreational areas, both in the city and in the open country -contributing to the experience of "a liveable Aarhus."

We create neighborhoods that are unique, with green and blue urban spaces, more green and blue connections, a richer and more diverse plant and animal life, meeting places for social interaction, and facilities for play and movement throughout the year — whether it's gray and rainy or during extreme heatwaves.

In this way, we create spaces for nature experiences that connect to mental, physical, and social well-being. We call this "A liveable city for everyone".

i

As part of the recent blue-green theme plan "A Greener Aarhus with More Blue," we have introduced a new greening tool, a "Green Norm," which sets requirements for the quantity and quality of greenery in residential and commercial local plans.

The "Green Norm" tool is also driven by the ambition to mitigate the urban heat island effect and create space for water. See the guidelines in the 2017 Municipal Plan "Shared Spaces."

To ensure that climate adaptation makes Aarhus a liveable city for everyone, we work towards two key objectives:

- Supporting the blue-green connections
- Enhancing the quality of urban spaces through climate adaptation, contributing to citizens' health.

Actions that support the blue-green connections:

Climate adaptation strengthens the blue-green connections, both in the city and in the open country.

As far as possible, climate adaptation projects are placed within the blue-green corridors designated in the municipal plan, with the aim of developing them into continuous areas that benefit people, flora, and fauna. The projects are designed with a strong focus on their landscape architectural quality in both placement and design.

Climate adaptation in the city should enhance urban nature

When we make space for water, we also want to introduce more greenery, increasing the number of green areas and trees. It's about improving the quality of urban spaces and creating connections with a focus on nature-based solutions. This contributes to the green goals of A Greener Aarhus.

Climate adaptation in the open country should strengthen nature

When we restore natural wet river valleys and reestablish nature's ability to retain water, we also contribute to climate adaptation. Nature-based solutions will enhance both the quality of nature and biodiversity. This supports the green goals of A Greener Aarhus and is in line with Aarhus' ambition to establish 1,200 hectares of blue-green parks.

Photo: The roadside infiltration beds in Åbyhøj contribute to a distinctive streetscape, enhancing urban nature while improving traffic safety.

Photo: Rainwater management in the new district of NYE is an example of climate adaptation that creates distinctive environments, fosters community, and strengthens nature.

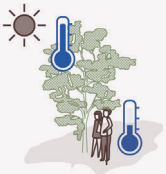
Actions that enhance the quality of urban spaces and contribute to citizens' health:

We contribute to distinctive and aesthetic urban environments

In climate adaptation projects, relevant guiding principles from Aarhus Municipality's Policy for Urban Quality and Architecture are selected based on the site's potential. This ensures that we create inviting and attractive urban spaces where people enjoy spending time.

Climate adaptation improves citizens' health and fosters community opportunities

Climate adaptation projects support Aarhus Municipality's health policy, which aims to make Aarhus a city that offers spaces and experiences that promote well-being and physical, social, and mental health. We achieve this by creating incentives for physical activity and relaxation in recreational areas, as well as ensuring well-connected and accessible spaces.



As the city develops, we focus on creating urban spaces that can reduce heat, for example by providing shade

We must mitigate the effects of longer and warmer heat periods. Blue-green urban spaces are a valuable resource that can positively contribute to Aarhus' growth while aligning with the goals of ´the Green Norm.

The municipal plan requires that the Green Norm be used as a greening standard for new residential and commercial local plans, as well as new urban parks. We place special emphasis on areas of the city where high temperatures and heat waves have the greatest impact.

Strategic Principles

We take an adaptive approach to climate change - with a focus on socioeconomic benefits and synergy

Climate adaptation is expensive, which is why it must be done wisely.

As a basis for prioritizing efforts, a socioeconomic analysis is conducted to assess damages from storm surges, cloudbursts, and river flooding.

This analysis ensures that climate adaptation is only implemented when it makes sense from a socioeconomic perspective. To keep costs down and enhance quality, we also seek synergies with other projects.

For example, climate adaptation can be integrated into areas where excavation and reconstruction are already planned or in connection with lowland restoration projects.

In this way, climate adaptation also contributes positively to the development of Aarhus. We call this adapting to climate change - with a focus on socioeconomic benefits and synergy.

To ensure the right societal prioritization of climate adaptation in Aarhus, we focus on the following key objectives:

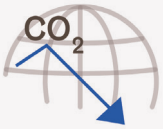
- Integrating climate adaptation with infrastructure projects and urban development in Aarhus
- Ensuring that our planning is dynamic and adaptive.

Actions that support synergy with construction projects and urban development:

Climate adaptation in synergy with infrastructure, urban development, and nature projects

When major infrastructure or urban development projects are planned in the municipality, we prioritize integrating climate adaptation to create holistic solutions that allow time and space for water management.

The municipality also has many flood-prone critical road sections, where synergy with other construction projects is a key factor in prioritization. Coordinating project execution minimizes inconvenience for citizens and ensures a more sustainable use of resources.



Climate adaptation measures have minimal CO_2 impact

We prioritize climate adaptation in areas at risk of significant socio-economic damage. High-risk areas are identified, and adaptation opportunities are assessed in alignment with Aarhus' development. At the same time, we explore ways to create added value, such as new experiences and improved urban spaces.

Photo: The light rail in Aarhus was established alongside the coastal road (Kystvejen) which functions as a high-water barrier from DOKK1 to Skolegyde, protecting the city center from rising sea levels.

Actions that support dynamic and adaptive planning:

We prioritize climate adaptation in areas at risk of significant socio-economic damage

We identify high-risk areas and assess climate adaptation opportunities in alignment with Aarhus' development. At the same time, we explore ways to create added value, such as new experiences and improved urban spaces.

We adapt to climate challenges in a timely manner without overinvesting

We implement climate adaptation at the most appropriate socio-economic levels rather than adhering to fixed standards, as this helps avoid the risk of overinvesting in adaptation infrastructure.

We plan climate adaptation of the municipality adaptively

Based on flood risk assessments, climate adaptation is planned and prioritized over time. Adaptation efforts are implemented gradually, responding to climate changes, area development plans, or new knowledge and insights.

Strategic Principles

We strengthen innovation and collaboration

By an adaptive approach to climate adaptation, we must learn along the way, learn from each other, and test new solutions and ways of thinking. As a society, we depend on all actors -both private and municipal - taking part in the city's development and climate adaptation.

Therefore, we seek strategic, innovative, and interdisciplinary collaborations, for example, with research and educational institutions and businesses, including the agricultural sector. We also welcome participation in international partnerships.

We continuously involve citizens, associations, utility companies, and other relevant stakeholders in areas where climate adaptation is implemented, assessing how their inputs can be incorporated into solutions.

In our climate adaptation efforts, we focus on securing contributions to financing our goals, including grants and funding from both national and international sources. We call this innovation and collaboration.

To enhance innovation and collaboration in Aarhus' climate adaptation, our goals are to ensure that:

- Everyone takes responsibility for contributing to climate adaptation
- We work innovatively with climate adaptation, preferably in partnerships.

Actions that ensure everyone takes responsibility for contributing to climate adaptation:

We clarify citizens' responsibilities and actions in climate adaptation

Climate adaptation requires a collective effort. Through targeted activities in our adaptation projects, we support increased awareness and knowledge among citizens and local organizations about their responsibilities and how they can contribute to shared solutions. .

We clarify how and when citizens and other stakeholders are involved in projects

Through community dialogue with citizens, selected groups, businesses, and associations, we strive to create a shared understanding of climate challenges. This understanding can be broad - such as rising sea levels and shallow groundwater - or specific, like the climate adaptation of a park. Depending on the nature and phase of an adaptation project, different stakeholders will have varying interests and opportunities for influence. Communication takes many forms, and in climate adaptation efforts, we continuously explore new formats. Effective communication ensures both ownership and engagement in the projects.

Photo: Site inspection of the Realdania-supported collaboration project about water in Egå with Aarhus School of Architecture, Aarhus Vand, and the Department of Technology and Environment, Aarhus Municipality, working together.

Photo: Citizen involvement in climate adaptation efforts in Åbyhøj.

Actions that support our innovative approach to climate adaptation, preferably in partnerships:

We continuously evaluate and take a development-oriented approach to climate adaptation

The knowledge gained from evaluating processes and projects is actively used to refine our climate adaptation methods. Relevant insights are included in the annual report to the city council, where ongoing initiatives are documented. Additionally, we share and seek knowledge through collaborations with partners.

We seek new and additional collaborations

In our climate adaptation efforts, we actively seek partnerships with research institutions, businesses, foundations, and other stakeholders who share an interest in developing innovative solutions and gaining new insights into complex challenges.

Through these collaborations and broad engagement, we ensure knowledge-building based on real-world challenges and locally relevant solutions. This could include partnerships on specific case areas with research institutions, EU projects involving several municipalities and regions, etc.

Our Approach to Climate Adaptation

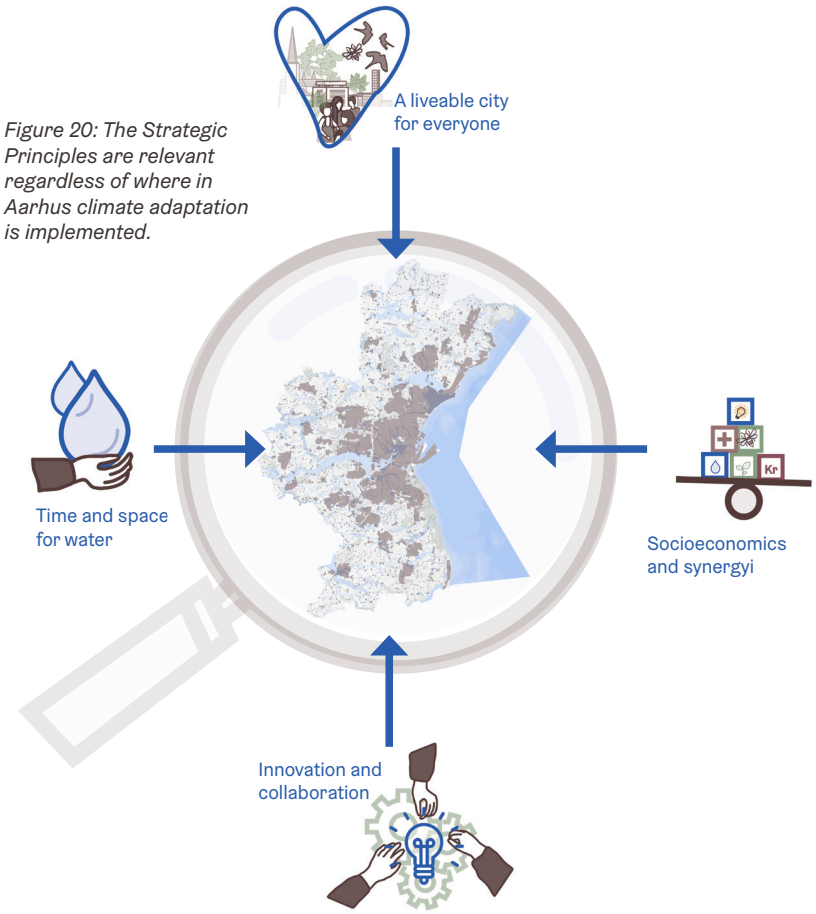


Figure 20: The Strategic Principles are relevant regardless of where in Aarhus climate adaptation is implemented.

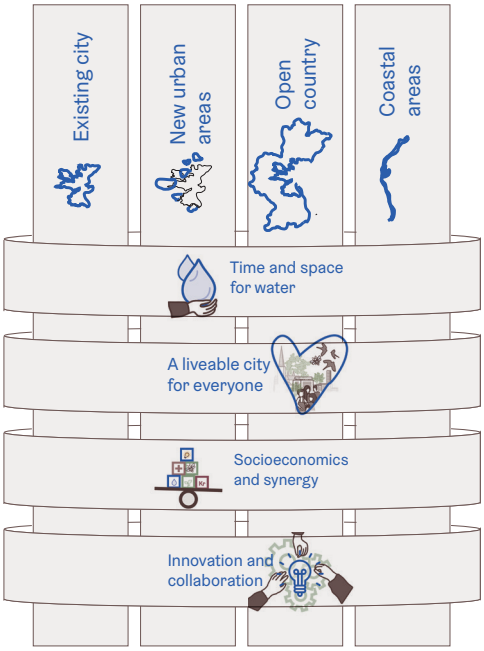


Figure 21: The Four Strategic Principles, combined with physical initiatives, form a methodological checklist for climate adaptation in Aarhus.

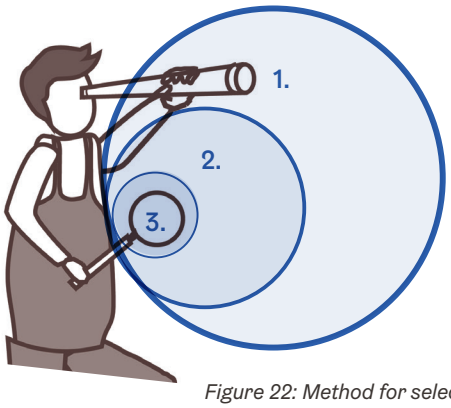
The Four Strategic Principles Apply to All of Aarhus
We apply all Four Strategic Principles across Aarhus, but their significance and emphasis vary depending on the geographical and physical context. Different urban and landscape typologies - new urban areas, the existing city, coastline, and open country - present different conditions and possibilities.

Together, the Four Strategic Principles, combined with physical initiatives, serve as a methodological checklist for Aarhus' climate adaptation, as shown in Figures 21 and 22.

Different Adaptation Approaches by Area:

- **New urban areas:** We assess what is needed to accommodate a 100-year flood event, integrating water management into the landscape through rainwater ponds, blue-green corridors, and similar solutions.
- **Existing city:** We create space for water in green areas while maintaining green spaces for recreation. Depavement projects transform previously paved areas into green spaces.
- **Coastal areas:** Rising sea levels and changes in coastal landscapes require long-term planning. In vulnerable locations, temporary protective measures may be necessary, while in the long term, land use may need to be reconsidered. Climate adaptation should work in synergy with other projects.
- **Open country:** We explore ways to retain water during cloudbursts to reduce pressure on lakes, streams, and drainage systems downstream. Restoring natural wetland valleys and retiring low-lying farmland can create synergies between climate adaptation and nature conservation.

Method for Prioritizing Initiatives



1. Screening
Assessing the risk of significant damage costs and identifying opportunities for socio-economic investments.
Evaluating synergy with major infrastructure, urban development, or nature projects?

2. Analysis
Conducting preliminary studies on the relationships between water sources and socio-economic factors in climate adaptation

3. Implementation
Planning and construction in synergy with other projects to maximize synergy.

Figure 22: Method for selection and prioritization – Three levels of assessment

Method for Selecting and Prioritizing Physical Climate Adaptation Initiatives in Aarhus
To ensure the most effective allocation of resources, Aarhus has developed a systematic method for selecting and prioritizing climate adaptation initiatives. The approach focuses on maximizing societal benefits while maintaining fairness and equity - prioritizing areas based on need rather than social status or capital. Climate adaptation is implemented where the need is greatest, and the method is applied at various municipal levels.
Three-Tiered Selection and Prioritization Approach:

1) Screening at municipal level
Identification of catchments that require special attention based on a high-level risk assessment. Evaluation of flood damage costs and potential economic consequences. Screening for synergies with other infrastructure, urban development, and nature restoration projects.

2) Preliminary studies in selected catchments
In designated catchments or districts where risk assessment and screening have indicated a need for climate adaptation, preliminary studies are initiated. Based on knowledge of relevant flood sources and their interrelationships, the socio-economic benefits of reducing flood risk, synergies with other projects, and potential contributions to the quality of the area, a prioritization plan for projects is developed. This plan is based on a continuous climate adaptation approach, ensuring improvements over time in alignment with climate developments.

3) Planning and construction at the local level
Based on preliminary studies, the specific project goals for climate adaptation efforts are defined. Socio-economic considerations, synergies, and added value remain key elements, further developed from the initial assessment. A prioritization plan is established, project planning of upcoming construction work is prepared, and funding is secured.

The method is implemented with an adaptive approach
To address changes over time, we work adaptively with both flexible strategies and measures that enhance Aarhus' resilience to climate change. This approach allows initiatives to be expanded with increased adaptation over time or through changes in land use in response to growing challenges, emerging solutions, and new opportunities of collaboration.
Based on climate change projections for vulnerable areas, we take a long-term perspective by establishing a prioritization of actions - determining what needs to be addressed first and what can be tackled later as conditions evolve.

- In the most vulnerable areas, we will take a long-term approach to:
- Where will we continue to keep the water out?
- Where can we adapt land use and introduce new functions?
- Where will we invite the water in and design the city to accommodate increased flood risk and rising groundwater levels (waterlogging)?

Part 3

Catalogue of Climate Adaptation Initiatives

The final section of this dynamic climate adaptation plan presents 12 initiatives, which will be supplemented over time - and whose implementation depends on available funding.

For each initiative, we outline the challenge, main idea, potential stakeholders, timeline, and financial aspects. We specify how and to what extent the initiative supports our Four Strategic Principles, including how sub-goals and actions are addressed.

Finally, we describe how we will continuously monitor the plan's goals and initiatives. This is also a prerequisite for the ongoing adjustment of initiatives and objectives, as well as for maintaining certification as an ambitious climate municipality.

Overview of Initiatives

The following pages present the climate adaptation initiatives for the upcoming planning period. These initiatives will be adjusted and developed into concrete projects depending on available funding and political priorities. Similarly, entirely new initiatives may emerge as part of the revision of the climate adaptation plan.

The 12 initiatives are:

- Climate Quarter Nørreport
- Climate Adaptation at Nørre Stenbro and Østbanetorvet
- Adapting the City to Water: Egå, Vejlby Fed, Risskov
- Water Retention in Maden near Borum
- Coastal Strategy – The Living Coast
- Vesterbro Torv
- Climate Adaptation of Critical Roads
- Added Value, Sewer Separation, and Climate Adaptation in Hasle, Åbyhøj, and Åby
- Added Value, Sewer Separation, and Climate Adaptation in Viby
- Climate Adaptation of the Marselis District
- Water-sensitive Urban Design Plans (WSUD)
- Strong Collaboration with Utility Services

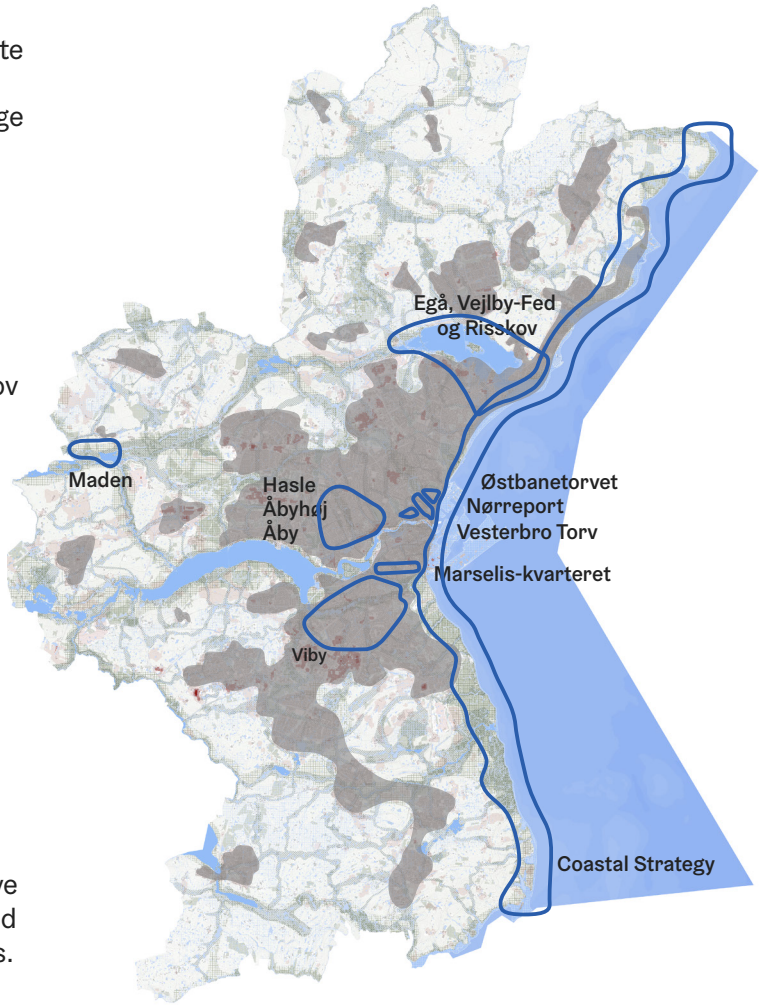


Figure 23: Overview of physical initiatives

When working on these initiatives, we take an adaptive approach. This means that initiatives are adjusted and supplemented as they develop into concrete projects.

Funding is a key factor for success, but also a potential barrier to ensuring the necessary action and progress in climate adaptation. The specific implementation of the climate adaptation plan's initiatives will largely depend on the city council's annual prioritization of climate adaptation projects. However, climate adaptation is also a shared responsibility with many potential sources of funding. It is essential to secure financing through external means, including from private landowners and partners, and to continuously seek synergies with other projects and developments.

This process allocates municipal funds from the blue-green infrastructure program alongside any external funding that has been secured. However, to achieve our goals, we must also explore additional or alternative funding mechanisms.

For each initiative, we outline the challenge, main idea, potential stakeholders, timeline, and financial aspects. We also specify how and to what extent the initiative supports our Four Strategic Principles, including how sub-goals and actions are addressed.

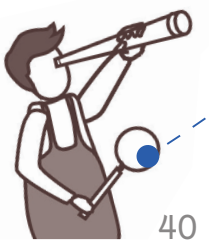


Figure 24: Expected timeline prioritization of initiatives

Long term

Aarhus City Centre (potential initiative)

Brabrand (potential initiative)

Preventive action plan for areas at high risk of 'heat island effect'

Resilient harbour areas

In a few years

Climate adaptation of the Marselis District

Climate Quarter Nørreport

Coastal strategy – The Living Coast

Adapting the city to water: Egå, Vejlby Fed, Risskov

Water retention in Maden near Borum

Adaptation in surrounding towns based on water-sensitive urban design plans

Now

Vesterbro Torv

Added value, sewer separation, and climate adaptation in Hasle, Åbyhøj, and Åby

Climate adaptation at Nørre Stenbro and Østbanetorvet – Initial measures at Nørreport

Preliminary study - Adapting the city to water: Egå, Vejlby Fed, Risskov

Feasibility study and detailed planning of project 'Water retention in Maden near Borum'

Added value, sewer separation in Viby

It is essential to maintain an ongoing and systematic follow-up on the initiatives described and established sub-goals to ensure the dynamic development of climate adaptation in Aarhus.

Each year, we assess the status of the initiatives: which are in progress, which have been completed, which need adjustments, and what are the next concrete sub-goals. This approach ensures a continuous flow in climate adaptation efforts - both in relation to the evolving risk landscape and securing necessary funding.

Our evaluation method is detailed at the end of this document, following the review of the 12 initiatives

Photo: Where's the beach? Flooding of the beach at Vejlby Fed (Bellevue) in December 2023.

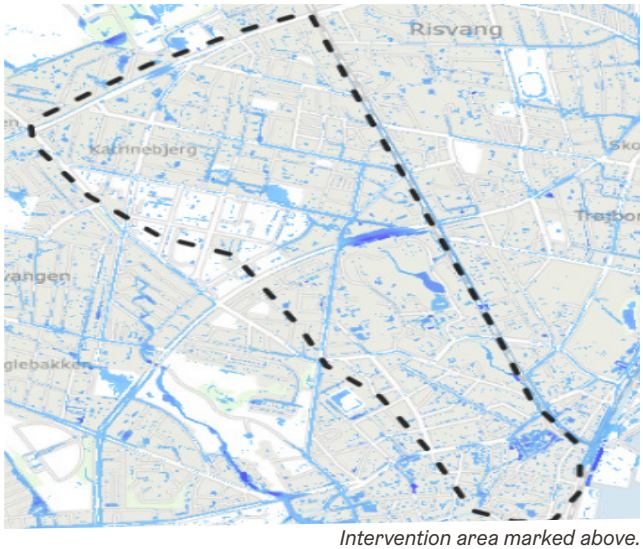
Climate Quarter Nørreport

Challenge
There is a significant risk of severe damage from cloudbursts to properties and infrastructure in the residential areas surrounding the Latinerkvarteret, Nørreport, and Nordre Ringgade. A 100-year rainfall event today is expected to cause damages exceeding DKK 400 million. The challenges in this area arise due to its topography, where water flows downhill from higher-lying areas like Christiansbjerg and Katrinebjerg without opportunities for retention along the way. In such an event, the catchment would experience flooding from a total water volume of over 20,000 m^3 - equivalent to five times the surface area of the lake at the University Park. To mitigate this risk, it is crucial to create designated flood pathways on roads and pathways and establish planned flood zones where water can safely accumulate. Additionally, the area is highly paved and densely built, which can lead to further challenges during heatwaves by exacerbating urban heat island effects.

Main idea
The goal is to establish a Climate Quarter for the entire 2 km^2 catchment of Nørreport, which includes Katrinebjerg, Aarhus University, Øgadekvarteret, and Latinerkvarteret. The primary objective in the first phase is to delay and retain water in larger green spaces in a careful and efficient manner during cloudburst events. Over the long term, the Climate Quarter aims to test and implement various innovative solutions for managing water in a dense urban environment. The focus is on creating space for water and slowing down its flow while enhancing urban spaces. These efforts will serve as inspiration for future climate adaptation projects in existing urban areas. As part of the initiative, the project will also explore depavement strategies, transforming paved surfaces into green areas to improve water absorption and reduce heat stress in the city.

Potential Stakeholders
Aarhus University, Midtbyens Fællesråd (the local citizens' council), Aarhus Vand (Aarhus' water utility company), Other relevant stakeholders utilizing the area's green spaces.

Timeline & Financing
Current status: Preliminary study
Financial estimates: The amounts in the diagram below are preliminary estimates and will depend on the selected solutions and the availability of funding sources.



Intervention area marked above.
Risk mapping, 100-year event in the year 2020.

Illustration of Nørreport.

Short term 2024 - 2026	Medium term 2027 - 2030	Long term 2030 - 2050
DKK 2 million	< DKK 10 million	> DKK 50 million
Preliminary study *The preliminary study will develop a strategy for interventions and phased implementation. It will identify: Smaller initiatives that can be carried out in the short term with relatively high impact. Larger interventions that require more funding, a longer time frame, and broader stakeholder involvement.*	*Phase 1:* *Delaying water on existing green areas.*	*Subsequent phases, e.g.:* *Separation of rainwater and wastewater* *Uncovering of pipe-covered watercourses.*

Climate Quarter Nørreport

Time and Space for Water

Impact potential in relation to strategic sub-goals

Creating space for water on the surface	Medium
Improving the entire water cycle	Low

There is significant potential to delay stormwater runoff within the project area by utilizing green spaces, re-establishing natural flow paths, and transforming paved surfaces to reduce strain on drainage systems.
Key actions include:
Designing flow paths that follow the natural landscape and direct water toward the main drainage routes and low-lying areas where it can be retained. Enhancing water retention in existing green areas, streets, and private properties within the catchment.

Initiative-specific sub-goals:

- *In 2025, an evaluation will determine whether a higher service level for the water catchment can be achieved beyond the current standard and/or if the timeline for sewer separation should be accelerated.*
- *In 2025, a prioritization plan will be developed, identifying designated retention areas for delay of stormwater, and key flow paths to guide excess water safely through the area.*

A liveable city for everyone

Impact potential in relation to strategic sub-goals

Blue-green connections	Medium
Urban quality for a healthy lifestyle	Medium

Climate adaptation solutions can enhance urban spaces by introducing more water into parks and green areas, strengthening blue-green connections, and creating new gathering places. These initiatives contribute to:
Improved microclimate through increased greenery and water features, helping to mitigate urban heat effects. More urban nature in areas that are currently heavily paved, enhancing biodiversity and environmental quality. Integration with local identity, ensuring that solutions respect and enhance the area's cultural heritage, aesthetics, and unique character.

By incorporating climate adaptation into urban planning, the Nørreport Quarter will not only become more resilient but also more vibrant, livable, and attractive for residents and visitors.

Initiative-specific sub-goals:

- *In 2025, areas will be designated for water retention. Over time, these areas will help strengthen blue-green connections. Spaces that have not previously been green can contribute to increased urban nature and help reduce heat impact.*
- *In the next phase, as projects become more concrete, the number of square meters can be specified.*
- *In 2026, recommendations will be developed on how cloudburst solutions can support cultural environments and the characteristic features of the area.*

Socioeconomics and Synergy

Impact potential in relation to strategic sub-goals

Synergy with other infrastructure and development	Low
Dynamic and adaptive planning	High

Climate adaptation of larger urban areas like Nørreport entails significant expenses. It is crucial to tailor efforts so that expected damage costs are balanced with the investments made. By incorporating socio-economic assessments and adaptive planning, initiatives are prioritized where they have the greatest local and temporal impact and yield positive cost-benefit analyses. Synergies are sought with projects for critical road sections, including Nordre Ringgade, Nørrebrogade, and Nørregade, as well as potential urban development projects.

Initiative-specific sub-goals:

- *In 2025, damage cost calculations and cost-benefit analyses will be conducted for flood-prone areas.*
- *In 2026, potential synergy projects and joint financing opportunities will be screened.*

Innovation and Collaboration

Impact potential in relation to strategic sub-goals

Private ownership and citizen responsibility awareness	Medium
Innovative Collaborations	High

The project will involve Aarhus University, Aarhus Vand (water utility), businesses, and residents, in an effort to engage stakeholders in adapting their own areas, as well as collaborating on the use of spaces where climate adaptation is possible.

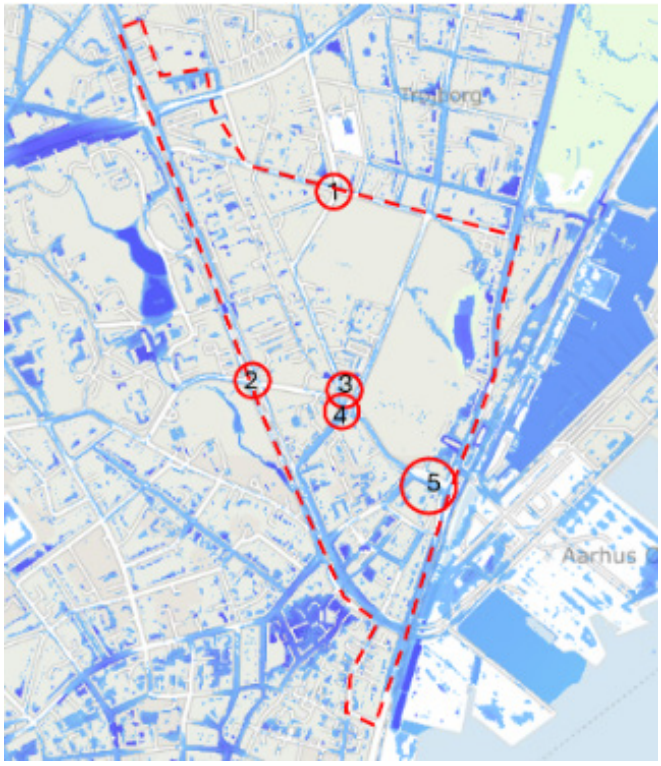
In this area, we aim to implement innovative approaches to climate adaptation through collaboration and shared learning. Innovation and new thinking are ensured by working adaptively, where continuous learning, a high level of ambition, and the involvement of knowledge institutions and citizens drive renewal and help achieve the city's goals in synergy with climate adaptation.

Initiative-specific sub-goals:

- *In 2025, relevant stakeholders will be involved in finding common solutions and collaboration in the area where water can be delayed.*
- *In 2026, citizens and stakeholders will be presented with and involved in potential measures in the catchment, which will be discussed collectively.*

Climate adaptation at Nørre Stenbro and Østbanetorvet – initial measures at Nørreport

Challenge
The area around Nørreport is situated low in the terrain, which is why large amounts of water collect here during cloudburst events. Due to the topography of the catchment, with higher ground in areas such as Christiansbjerg, Risvangen and Trøjborg, large amounts of stormwater can quickly flow down Randersvej and Nørrebrogade, ending up at the low section at Nørreport. In these situations, the water can cause significant flooding and damage to properties and infrastructure. Furthermore, there are few green spaces in the area that could delay the water, so there is a need to delay the flow of water on road areas.



Risk Mapping, 100-year event in 2020

Main idea
The initiative around Nørre Stenbro and Østbanetorvet is the first part of a larger climate district around Nørreport, the Nørrebrogade neighborhood, and Østbanetorvet. The goal is to direct water from the catchment into the Bay of Aarhus, reducing the risk of major flooding at Nørreport. In 2023, five climate adaptation projects were identified as part of feasibility study, aimed at reducing damage from heavy rainfall while also enhancing the quality of the five urban and street spaces. The five projects are listed below and shown on the overview map.

1. Urban space at Larsen-Ledets Gade
2. Sidewalk at the intersection of Nørrebrogade and Nørre Boulevard
3. Urban space at Peter Sabroes Gade and Kirkegårdsvej
4. One-way street and road corner at Kirkegårdsgade and Nørre Boulevard
5. Urban space at Østbanetorvet

Potential stakeholders
Two local citizens' councils, Aarhus Vand A/S (water utility).

Time and budget
Current status: Project
The amounts listed below are preliminary estimates and will depend on the available solution options and exploration of possible funding opportunities.

Short term 2024 - 2026	Medium term 2027 - 2030	Long term 2030 - 2050
DKK 4.5 million	> DKK 10 million	
Construction funds have been allocated to carry out projects 1.-4. in 2025.	*Planning and implementation of project no. 5. This depends on synergy with other projects in collaboration.*	

Climate adaptation at Nørre Stenbro and Østbanetorvet – initial measures at Nørreport

Time and space for water

Impact potential in relation to strategic sub-goals

Space for water on the terrain	High
Improving the entire water cycle	Low

The water is directed away from the flood-prone areas around Nørreport towards Østbanetorvet. Rainwater from heavy rainfall events is directed into Østbanetorvet, where it flows past two retention ponds on its way. In the long term, additional retention basins will be established. The rainwater in the basins is used as a resource that can contribute to a more recreational environment, while simultaneously addressing climate adaptation. In the project, we have developed detailed plans for how the water should be managed in the event of large rainfall events at the catchment level. Climate adaptation measures contribute to a significant reduction in the risk of flooding in the urban area.

Initiative-specific sub-goals:

- *A management plan has been developed for the entire catchment.*
- *Extreme rainfall is directed on the terrain to the retention ponds.*
- *A total retention volume of at least 300 m^3 will be established.*
- *The area can handle up to a 30-40-year rainfall event.*

A liveable city for everyone

Impact potential in relation to strategic sub-goals

Blue-green connections	Medium
Urban quality and frameworks for healthy living	High

In the project, climate adaptation and measures should contribute to more urban nature and strengthen the green character of the area with trees and planting, reflecting its previous appearance. The designated efforts will create time and space for water, while the greenery and creation of gathering spaces in the urban areas will enhance the distinctive environments already present in the area. Additionally, the changes in the urban spaces will contribute to strengthening opportunities for relaxation, improving the microclimate, and providing a positive experience for people moving through the area.

Initiative-specific sub-goals:

- *The urban spaces are designed to delay stormwater while also creating areas that improve opportunities for shade and recreational experiences.*
- *Connections are made between the existing green spaces.*
- *In the projects, asphalt is removed in favor of more greenery, thus increasing the area of urban nature.*
- *Beautifying the urban spaces helps strengthen the experience for pedestrians and cyclists who move through the area.*

Socioeconomics and synergy

Impact potential in relation to strategic sub-goals

Synergy with other developments and projects	Medium
Dynamic and adaptive planning	High

The area and catchment have been identified through screening at the municipal level, where the area was found to be highly vulnerable to heavy rainfall events. Socio-economic calculations have been made, showing a positive cost-benefit for climate adaptation in a defined catchment around Østbanetorvet. The enhanced service level for heavy rainfall events is a 30-40-year rainfall event.
The area has been planned adaptively, so that the first four projects can be implemented now, while it is possible to expand climate adaptation at Østbanetorvet when there is synergy with the creation of a new public space at the square.

Initiative-specific sub-goals:

- *Socio-economic calculations have shown a higher societal service level for heavy rainfall events with a return period of 30-40 years. Aarhus Vand A/S (water utility) is contributing approx. DKK 2-5 million to the project based on these calculations.*
- *In two construction projects, expected to be carried out in 2025, synergy is achieved: the mobility project for one-way traffic on Kirkegårdsvej and a citizen-driven project for the urban space at Larsen-Ledets Gade.*
- *The climate adaptation of Østbanetorvet can be initiated once there is a synergy between a potential traffic calming of Østbanetorvet and the realization of strategic public spaces, as the square is designated for.*

Innovation and Collaboration

Impact potential in relation to strategic sub-goals

Private Ownership and Citizen Responsibility Awareness	Medium
Innovative Collaborations	High

In the project's feasibility study, socio-economic calculations have been carried out, leading to an elevated service level for heavy rainfall events. These calculations have been conducted in only a few other places at the national level and have resulted in a model for service level calculations. In the four construction projects, Aarhus Municipality and Aarhus Vand (water utility) will continue to collaborate on innovative solutions for the enhanced service level.

Initiative-specific sub-goals:

- *The project has applied the latest socio-economic methods for a synergy project between Aarhus Municipality and Aarhus Vand (water utility).*

Adaptation of the city to water: Egå, Vejlby Fed, Risskov

Challenge
The area is challenged by water from all sides. Sea levels are rising, storm surges are becoming more frequent and intense, groundwater levels are rising, and rivers, lakes, and stormwater management systems are under pressure from large volumes of water during prolonged rainfall events in the winter and heavy rainfall in a short period during the summer. The challenges of water from all directions are particularly complex due to the low-lying terrain, where the hydrological connection between land areas and the sea is significant in the deposits of the former fjord inlet. Large parts of the area have residential properties in the low-lying areas. The responsibility for flooding largely lies with the individual property owners.

Main idea
Climate change is affecting how we can live and reside by the water. The area around Egå, Vejlby Fed, and Risskov requires solutions that are based on the landscape and the paths of the water. It is complex in terms of water management, and the responsibility for handling these challenges largely lies with the individual property owners.
A preliminary study will result in a mapping of flood risks from water sources, both current and future, as well as a catalog of potential climate adaptation measures tailored to the area. The catalog will help inform decision-making for holistic choices in climate adaptation solutions. What can be implemented depends largely on legislation, financing, and local collaboration.
The results will be linked to external cooperation, where opportunities to enhance urban and landscape qualities in the area will be strengthened as climate adaptation is implemented. Local stakeholders will be involved.

Potential stakeholders
The Aarhus School of Architecture, Aarhus Vand (water utility), 6 different local community councils within and on the periphery of the project area, Digelaget Vejlby Fed, Vejlby-Egaa Enges Land Reclamation Association, homeowners' associations, including an active volunteer 'climate group,' as well as other stakeholders such as Risskov Library, schools and educational institutions, and various associations using areas where climate adaptation solutions are being explored. The State.

Time and budget
Current status: Preliminary study
The amounts listed below are preliminary estimates and will depend on the available solution options and the exploration of funding opportunities.

Overview map of the intervention area


Risskov.
December 2023


Skæring.
December 2023


Egå
December 2023

Short term	Medium term	Long term
2024 - 2026	2027 - 2030	2030 - 2050
Approx. DKK 2 million	Approx. DKK 5 million	> DKK 50 million
The preliminary study is expected to run from 2024 to 2026, including external collaboration supported by Realdania with the Aarhus School of Architecture and Aarhus Vand (water utility). *The preliminary study will result in a catalog of potential climate adaptation projects at the screening level for relevant stakeholders. Climate adaptation measures can then be selected for further investigation regarding technical, legal, and financial possibilities. Whether and how the projects are feasible is not included in the current phases of the preliminary study, so additional funding will need to be found if specific climate adaptation projects are to be prioritized.*	*As much of the area is low-lying and all water sources are in play, it is expected that the opportunity catalog will primarily include complex climate adaptation solutions, which require larger investments, more time, and greater involvement before realization is possible. In the medium term, important project work will be necessary to prepare for concrete projects. This includes investigations into the feasibility of specific climate adaptation measures from the opportunity catalog, including clarification of financial possibilities for these measures, such as economic distributions according to property owners' responsibilities, benefits, and advantages of the solutions.*	*Concrete projects, such as the construction of pumps/gates, water storage, storm surge protection, etc.* *The amount covers possible measures, where expenses are primarily financed by the owners who benefit from these. Aarhus Municipality will contribute to the areas owned by the municipality.*

Adaptation of the city to water: Egå, Vejlby Fed, Risskov

Time and space for water

Impact potential in relation to strategic sub-goals

Space for water on the terrain	Medium
Improving the entire water cycle	High

The feasibility study takes its starting point in the overall water cycle by including all water sources in the mapping of flood-prone areas, both now and in the future. A catalog of possibilities will be developed, illustrating potential climate adaptation measures in the project area that can mitigate the risk of flooding, for example, by creating time and space for the water.

Initiative-specific sub-goals:

- *A comprehensive mapping of flood risk and a catalog of possibilities for all water sources.*

A liveable city for everyone

Impact potential in relation to strategic sub-goals

Blue-green connections	High
Urban quality and frameworks for healthy living	High

Water is a key element in defining the identity of the area, and potential climate adaptation measures can be further explored in terms of how they can add value to the area by closely linking site-specific knowledge and the landscape with knowledge of water. This will be done through the collaborative project LAVA, "The Landscape and Water as Drivers for Adaptive Planning," supported by Realdania (foundation). Over the period 2024-2027, it will support the catalog of possibilities and sequencing plan by investigating and testing methods on how cities can be better equipped to withstand the consequences of rising groundwater and sea levels, increased rainfall, and more frequent storm surges. This will be based on three principles: understanding and working with water and the landscape, understanding and working with the site and its potential, and prioritizing actions both in the short and long term through adaptive planning.

Initiative-specific sub-goals:

- *Climate adaptation in the area is based on the landscape and the challenges posed by the total water sources, linked to solutions grounded in the site's potential. These solutions will contribute added value to the area's recreational spaces and urban areas.*

Socioeconomics and synergy

Impact potential in relation to strategic sub-goals

Synergy with other developments and projects	Medium
Dynamic and adaptive planning	High

The project area has been identified and prioritized through socio-economic screening at the municipal level, where high damage costs are prominent for several water sources, including storm surges, rivers, and groundwater. It is crucial for climate adaptation that individual measures are integrated and implemented in synergy with one another. Planning must be adaptive so that the projects proceed in the correct sequence and do not hinder or worsen the impact of other water sources on the city. In the project, the catalog of possibilities is linked to the site-specific and landscape characteristics of the area, and synergies with other projects are explored.
In a subarea of the project, the "Urban Nature Hede Enge" project (EU project Biodiverse Cities 2023-2026) is being implemented, which aims to create more nature and urban nature experiences on 70 hectares of municipal land. The results of the preliminary study will contribute knowledge to ensure that initiatives in the EU project and climate adaptation measures are coordinated.

Initiative-specific sub-goals:

- *In 2024, a catalog of possibilities for climate adaptation solutions will be developed based on a mapping of flood-prone areas, both now and in the future.*
- *Contributing knowledge about water sources to the "Urban Nature Hede Enge" project (until 2026).*

Innovation and Collaboration

Impact potential in relation to strategic sub-goals

Private Ownership and Citizen Responsibility Awareness	High
Innovative Collaborations	High

Together with Aarhus Vand (water utility), we are collaborating with the Aarhus School of Architecture in the LAVA project. The project supports the investigation and testing of concrete, site-specific solution proposals and scenarios that can be applied in adaptive planning.

Initiative-specific sub-goals:

- *In external collaboration with the Aarhus School of Architecture and Aarhus Vand (water utility), a city and landscape laboratory were established in 2024. Here, together with stakeholders in the area, we will test various proposals with the aim of integrating them into adaptive urban planning, based on the landscape, the area's site-specific conditions, existing projects and plans, and the challenges posed by all water sources.*

Water retention in Maden near Borum

Challenge
The city center of Aarhus and the surrounding areas near Brabrand Lake are at risk of severe flooding due to prolonged winter rainfall, especially when combined with storm surges. The challenges can arise when water from a catchment of about 330 km² needs to pass through the low-lying areas around Brabrand Lake and the city center. These challenges can occur either due to prolonged winter rainfall or in combination with high water levels in the Aarhus Bay. In situations where it is necessary to close the sluice due to high water levels in the bay, combined with large amounts of water in the Aarhus River, the pumps may struggle to keep up.
The project area Maden is located in the catchment for Brabrand Lake and Aarhus city center.

Main idea
In synergy with an ongoing state-funded climate-related lowland restoration project, this project explores the possibility of temporarily retaining rainwater (= 'water parking') in the open country under special circumstances. The goal is to reduce the risk of severe flooding in the areas around Brabrand Lake and the city center in the future. Maden is located south of Borum and primarily consists of agricultural land, with nature areas and parts of a golf course. Studies show that it is technically feasible to temporarily store 1.1 million m³ of water. The method for water storage will involve building a dike with an integrated sluice, where the valley is narrow, making it possible to temporarily retain the water from Lyngbygård Stream in Maden during specific situations.

Potential Actors
Landowners and the golf course owner, who own part of the area. Local citizens and relevant stakeholders who will use the recreational area. The state, which finances the climate-related lowland restoration project and possibly also a water retention synergy project.

Time and budget
Current Status: Project. Soon transitioning to detailed project, assuming land redistribution is successful.
Short to medium term. The project can be implemented by 2025-2026 at the earliest.
The figures below are preliminary estimates and will depend on the solutions identified and the search for funding opportunities.

Brabrand Lake. Risk Mapping, 100-Year Event in 2020.

Overview map

Short term 2024 - 2026	Medium term 2027 - 2030	Long term 2030 - 2050
DKK 1 million	**DKK 10-50 million**, of which DKK 10 million is allocated for construction	DKK 1 million per year on average
Feasibility study, detailed project, and management practices. This assumes that voluntary agreements can be reached with the landowners, and that sufficient replacement land can be found to make the land redistribution feasible.	*Establishment. The price depends on the state's ability to finance synergies in the climate-related lowland restoration project. The project may also require the purchase of project land. Possibly compensation or re-establishment.*	*Operation/maintenance and compensations/restoration upon activation.*

Water retention in Maden near Borum

Time and space for water

Impact potential in relation to strategic sub-goals

Space for water on the terrain	High
Improving the entire water cycle	High

We are adapting the landscape to reduce flooding in urban areas. The climate adaptation project is being implemented as a synergy with a state-funded climate-related lowland restoration project. The plan for Maden is a multifunctional valley project that - on a daily basis - functions as a lowland project with significant CO2 retention, nutrient reduction, and also supports recreational interests, new nature, environmental goals in watercourses, and biodiversity.
In rare cases, when significant community values are at stake, the area can be used to retain substantial amounts of rainwater, thus reducing the risk of flooding in the surroundings of Brabrand Lake and the city center. Such a situation was nearly encountered in 2020, when the forecasted storm surge could have coincided with a long winter period with critically high water-levels in the river system.

Initiative-specific sub-goals:

- *In 2024, the focus will be on land redistribution, landowner agreements, detailed project planning, and management practices.*
- *In 2025, the focus will shift to regulatory approval and tendering for construction work. If voluntary agreements with landowners can be reached, the project is expected to be completed between 2025 and 2026.*

A liveable city for everyone

Impact potential in relation to strategic sub-goals

Blue-green connections	High
Urban quality and frameworks for healthy living	Low

We are strengthening the blue-green connections and contributing to increasing the proportion of natural areas. The synergy project at Maden removes agricultural land from production and transforms the area into a natural habitat. At the same time, stream restoration is being carried out in the project area to achieve good ecological status in Lyngbygård River and Yderup Brook. In the long term, nature management, such as grazing, will be implemented to enhance nature and biodiversity in the area.

Initiative-specific sub-goals:

- *The project removes agricultural land and restores natural hydrology. The project area will serve as a recreational space for the local community.*

Socioeconomics and synergy

Impact potential in relation to strategic sub-goals

Synergy with other developments and projects	High
Dynamic and adaptive planning	Medium

We are adapting to climate change in synergy with a government-funded climate-related lowland restoration project. The climate adaptation project is located in the catchment of Aarhus City, where there is a risk of significant socio-economic damage. Calculations for water retention ('water parking') in Maden and climate projections indicate that the project, with a water retention volume of 1.1 million m^3, will be sufficient to manage flooding at the levels we experienced in 2020 up until 2070.

Initiative-specific sub-goals:

- *Synergy with the climate-related lowland restoration project for added value.*

Innovation and Collaboration

Impact potential in relation to strategic sub-goals

Private Ownership and Citizen Responsibility Awareness	Medium
Innovative Collaborations	Medium

We collaborate with the local landowners. For climate lowland projects, it is crucial that voluntary agreements can be made with the landowners.

Initiative-specific sub-goals:

- *In 2024 and 2025, voluntary agreements must be made with approximately 26 landowners in the project area.*

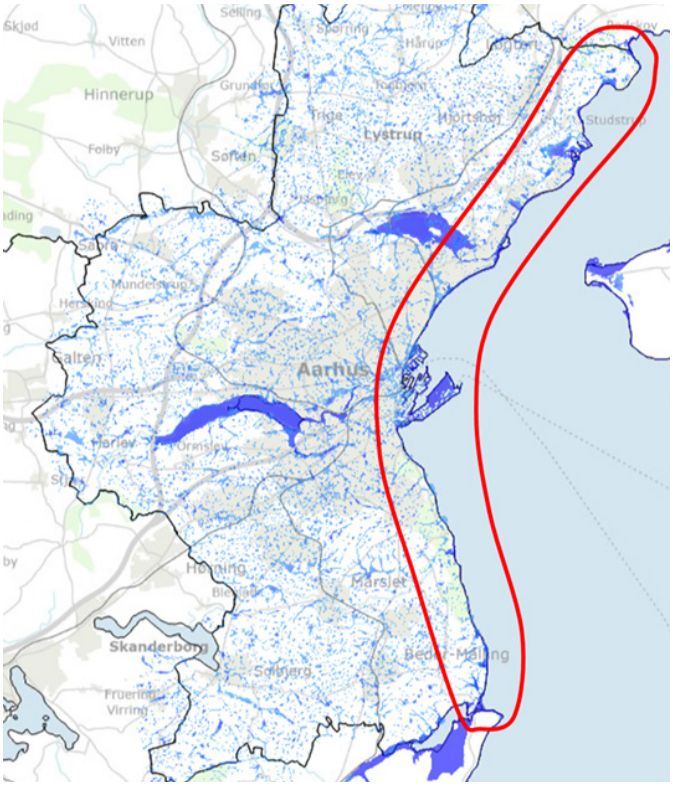
Coastal Strategy - The Living Coast

Challenge
Aarhus Municipality has about 40 km of coastline, ranging from steep cliffs in the south to low-lying areas at the mouths of the Aarhus and Egå rivers. The low-lying, densely populated areas are particularly vulnerable in light of general sea level rise, storm surge risks, rising groundwater levels, and simultaneous flooding from large watercourses. Along the undeveloped cliffs at Moesgaard and Fløjstrup, the existing coastal protection measures pose a barrier to the natural environment's ability to develop freely and meet international nature conservation requirements.

Main idea
The "Coastal Strategy: The Living Coast" will, once developed, provide a solid foundation for adaptive development along the coast for several sections, each with its own unique characteristics, challenges, and potential. The strategy links land and water together and supports the many different interests and stakeholders in the coastal zone. It outlines a catalog of opportunities for storm surge adaptation, usage, and a sequencing plan as a basis for prioritizing specific actions, which will largely be managed by property owners.
The coast as a major attraction is a theme in the 2023 Municipal Planning Strategy, and with this initiative, coastal management in Aarhus Municipality will be strengthened to support the broader climate adaptation efforts.

Potential stakeholders
Citizens, local community councils, Aarhus Vand (water utility), Aarhus Port, Aarhus Bay Cooperation, neighboring municipalities, homeowners' associations, coastal protection associations, Digelaget Vejlby Fed, Vejlby-Egå Enges Land Reclamation Association, etc. The state, which has designated the area for a supportive initiative, is also a stakeholder.

Time and budget
Current status: A strategy needs to be developed.
The amounts below are preliminary estimates and will depend on the available solution options and the search for funding opportunities.



Risk mapping, 100-year event in the year 2020


Beach at Risskov after storm surge, 2024

Short term 2024 - 2026	Medium term 2027 - 2030	Long term 2030 - 2050
DKK 2 million	>DKK 50 million	
Development of the coastal strategy. Investigation of sub-segments, challenges, and potential.	*Long, at least until 2120. Subsequent phases will include feasibility studies for subareas with the aim of identifying projects. In other areas, a project may potentially be initiated. There is a connection to the feasibility study for Egå, Risskov, and Fedet, as well as the upcoming feasibility study for the city center.*	

Coastal Strategy - The Living Coast

Time and space for water

Impact potential in relation to strategic sub-goals

Space for water on the terrain	Low
Improving the entire water cycle	Medium

Adapting to rising sea levels is not just about keeping water out, but also about recognizing the opportunities and benefits in a landscape that will inevitably change, where proximity to water is not solely a threat. Areas can be designed multifunctionally to serve both recreational purposes and temporarily flood during high-water events. Water can also support the municipality's efforts for increased biodiversity, where it is possible to invite the sea permanently into coastal meadows and collaborate with coastal marine measures such as stone reefs and eelgrass.

Initiative-specific sub-goals:
In 2025, an overview of the total challenges from various sources of flooding and their inter-dependencies will be established.
In 2026, the coastal strategy will identify subareas to be investigated, climate adaptation projects to be carried out, and actions to be taken as part of citizen involvement and emergency preparedness.
In 2026, the coastal strategy will specify the protection levels for future sea levels and storm surges in the short, medium, and long term.
By 2030, proposals for measures supporting natural coastal dynamics will be developed.
By 2030, potential areas for flood buffer zones from the sea will be mapped, designated, and reserved.

A liveable city for everyone

Impact potential in relation to strategic sub-goals

Blue-green connections	Medium
Urban quality and frameworks for healthy living	Medium

In a growing and densely populated city like Aarhus, there will be a constant and increasing need for recreational urban spaces. It is natural to look towards the coast to strengthen and expand the environments that already exist. New landscapes can be created on and in front of existing beaches, where it is necessary to maintain some distance between buildings and the sea, and where nature-based solutions combine protection with utilization. In the city, elements can be integrated that invite daily activity and gatherings, while also managing water at high water events to prevent damage.

Initiative-specific sub-goals:
In 2025, a comprehensive overview of municipal projects, plans, and initiatives that can align with climate adaptation and create a liveable city for everyone is established.
In 2026, an overarching site analysis and landscape study for the coastline will be conducted with the aim of dividing the stretch into sub-sections.
In 2026, an overview of the general potentials for increased recreational and natural values, health, and the enhancement of urban and landscape spaces in relation to climate adaptation will be prepared.
In 2026, the coastal strategy will outline how the city can adapt to future sea level rise and storm levels in the short, medium, and long term.

Socioeconomics and synergy

Impact potential in relation to strategic sub-goals

Synergy with other developments and projects	Medium
Dynamic and adaptive planning	High

We prioritize climate adaptation in areas with a risk of significant socio-economic damage, and we plan for adaptive climate adaptation across the municipality. Coastal interventions are prioritized where the connection between socio-economic analyses and the potential for synergy with other projects shows the greatest benefit. It is important to integrate the connection with other water sources. The potential for synergy in relation to BlueCarbon and CO2 sequestration in seawater is also a key factor.

Initiative-specific sub-goals:
In 2025, an overview of the damage costs in millions of DKK over a 100-year period will be created for the coastal sections.
In 2026, an overview will be developed of which projects and actions have economic synergy with climate adaptation.
In 2026, the coastal strategy will specify an overarching sequence for climate adaptation actions along the coast. This sequence will be adaptive and revised annually as part of the blue-green infrastructure program.

Innovation and Collaboration

Impact potential in relation to strategic sub-goals

Private Ownership and Citizen Responsibility Awareness	Medium
Innovative Collaborations	High

We are working to increase citizens' knowledge about responsibility for climate adaptation, ensuring there is a clear strategy for when citizens and other stakeholders are involved in projects. We are constantly seeking new collaborations.
The coastal zone includes many different actors and stakeholders, ranging from public areas, infrastructure, and utilities to private landowners, users, and interest groups. It must be clear to everyone where the responsibility for climate adaptation lies, and we aim to support private initiatives and create ownership in local communities. We must continually focus on opportunities for innovative projects, preferably in the context of the EU or in collaboration with other municipalities, as well as financing them.

Initiative-specific sub-goals:
In 2026, the theme of the coast will be further developed in the Aarhus Municipality Plan with guidelines to provide citizens, developers, and municipal employees with a better understanding of how to address climate adaptation and flood risks along the coast.
In 2026, citizens' knowledge and ownership of climate adaptation will be increased through a communication effort about responsibility on their own land.
In 2026, new models for public-private partnerships will be developed.

Vesterbro Square

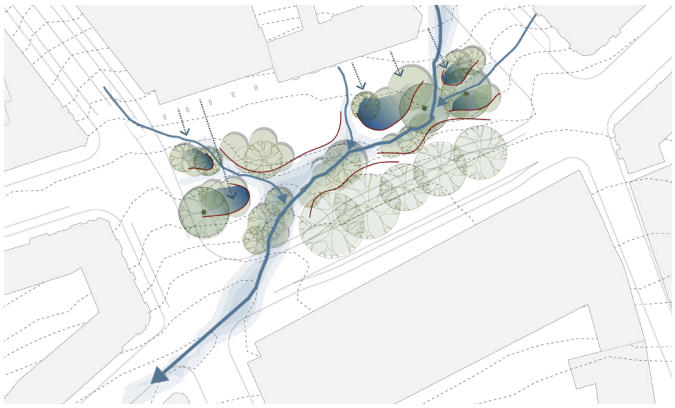
Challenge
Vesterbro Square is a central hub in Aarhus that is undergoing transformation. The square and its surrounding area face significant challenges due to the area's topography, where the low-lying terrain at the foot of the hill leads to the risk of heavy rainfall flooding in the streets around Vesterbro Square, including the streets Vester Allé, Vestergade, and Museumsgade.
The desire to create a more peaceful area with a transformed square has prompted the area to be designated for simultaneous climate adaptation, enabling synergy between the projects.

Main idea
Vesterbro Square is being climate-adapted to handle a 20-year rainfall event. Along with significant changes in mobility in the area, the square and the surrounding streets are turned greener and are climate-adapted. Stormwater ponds are being established north of the square, in the Botanical Garden, and at Langelandsgade, where water can be delayed. In addition, blue-green connections are being strengthened with swales along the roads and on the square itself, contributing to the vision of a blue-green city. Finally, runoff water from heavy rainfall is being appropriately diverted through the city area towards Aarhus River.

Potential stakeholders
Aarhus Vand A/S (water utility)

Time and budget
Current status: Project
The amounts listed below are preliminary estimates and will depend on the available solutions and funding opportunities. The approx. DKK 10 million for climate adaptation from Aarhus Municipality will be supplemented by DKK 7 million from Aarhus Vand (water utility).

Risk Mapping: 100-year event in 2020



Project illustration

Short term 2024 - 2026	Medium term 2027 - 2030	Long term 2030 - 2050
DKK 10 million		
Current Status: Project in the planning stage.	*Delivery and Commissioning.*	

Vesterbro Square

Time and space for water

Impact potential in relation to strategic sub-goals

Space for water on the terrain	Low
Improving the entire water cycle	Medium

The project at Vesterbro Torv creates time and space for water through both climate adaptation basins and swales spread throughout the area around Vesterbro Torv.
A total volume of at least 250 m3 will be established for heavy rain events. Alongside the delay of rainwater, the new public space will be designed so that the water can be directed through the district without causing damage, eventually flowing out to the recipient, Aarhus River. On the square, people will be able to experience rain trickling over the square and into the swales.

Initiative-specific sub-goals:

- *The area will be able to handle up to a 20-year rainfall event and is scheduled for implementation between 2025 and 2027.*
- *Cloudbursts will be delayed in a retention volume of at least 250 m³.*
- *Stormwater will be directed above ground and through pipelines to the Aarhus River.*
- *Everyday rain will be directed over terrain into swales, where it will be filtered and discharged through at least 20 rain gardens.*

A liveable city for everyone

Impact potential in relation to strategic sub-goals

Blue-green connections	Medium
Urban quality and frameworks for healthy living	High

The project incorporates a clear enhancement of the blue-green corridors, where both roads and urban spaces are designed with stormwater ponds planted with trees and perennials. This strengthens the visual and functional connection between the Botanical Garden, Vesterbro Torv, and Aarhus River.
The design of the urban space respects the existing area's character, ensuring a high-quality public space where shade, sunlight, and urban nature play a key role in shaping the aesthetic environment. Whether in heat or rain, visitors will have an enjoyable experience of the square.

Initiative-specific sub-goals:

- *Blue-green connections will be established through at least 20 stormwater ponds between 2025 and 2027.*
- *The swales, trees and plants will enhance urban nature and promote both mental and physical well-being by creating new green oases and improving conditions for pedestrians and cyclists. Additionally, they will help mitigate heat effects by providing shaded gathering spots in the city.*
- *At Vesterbro Torv, a distinctive urban environment will be created, inviting people to stay and enjoy benches, swales and trees between 2025 and 2026.*

Socioeconomics and synergy

Impact potential in relation to strategic sub-goals

Synergy with other developments and projects	High
Dynamic and adaptive planning	Medium

Climate adaptation at Vesterbro Square is being launched as a synergy project alongside the traffic-calming initiative, that will have a significant impact on the area's character and structure. Socioeconomic calculations have been conducted for the Vesterbro Square catchment, demonstrating a positive economic benefit in adapting the area to a 20-year rainfall event. As a result, Aarhus Vand (water utility) can contribute to climate adaptation efforts.

Initiative-specific sub-goals:

- *Calculations have shown that establishing a higher service level for a 20-year cloudburst event is economically viable. Based on these calculations, Aarhus Vand A/S (water utility) is contributing approx. DKK 7 million to the project.*
- *The project is being carried out in synergy with the traffic-calming measures outlined in Aarhus Municipality's Mobility Plan.*

Innovation and Collaboration

Impact potential in relation to strategic sub-goals

Private Ownership and Citizen Responsibility Awareness	Low
Innovative Collaborations	High

The project, which establishes an elevated service level for cloudbursts, is the first of its kind at the national level. The broad coordination of collaboration within Aarhus Municipality and with Aarhus Vand (water utility) highlights Aarhus as a frontrunner in this relatively new field of climate adaptation.
Additionally, the project has involved extensive citizen engagement, ensuring that residents' wishes were considered early and clearly in the development of the square project.

Initiative-specific sub-goals:

- *The project has utilized the latest socio-economic methods for a synergy project between Aarhus Municipality and Aarhus Vand. (water utility)*
- *Citizen involvement has been integrated in various ways throughout all phases of the project, from temporary transformation to the final square design.*

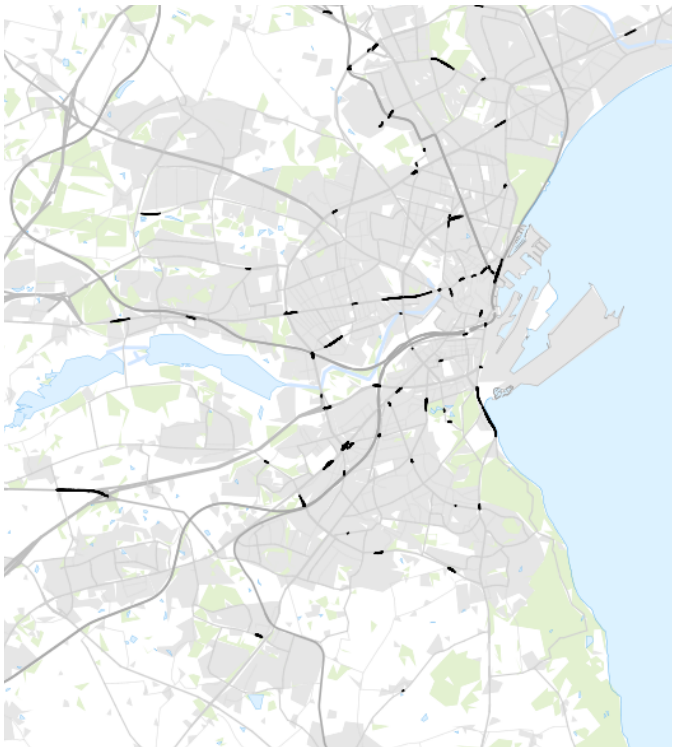
Climate Adaptation of Critical Roads

Challenge
During extreme rainfall events, sections of connecting transport routes in the municipality become flooded. These routes are particularly critical for maintaining accessibility, emergency response, rescue operations, etc. It is of great importance to the city, its citizens, and emergency services that passage through the critical road network is maintained at all times. More than 100 critical road sections have been identified as at risk of flooding.

Main idea
Climate adaptation of critical infrastructure is essential to ensuring mobility in the city under all weather conditions. However, the costs are very high, and the need for climate adaptation of critical road sections is spread across the entire Aarhus Municipality. Achieving a robust and resilient road network is a long-term endeavor. This makes it especially important to plan and implement projects in coordination with other construction projects - whether private, municipal, or utility-driven - to minimize costs as much as possible. Therefore, the selection of projects will take place continuously.

Potential Stakeholders
Aarhus Vand (water utility), Aarhus Magistrate Departments, Kredsløb (local utility company), private actors

Time and Economy
Current Status: Project
The amounts listed below are preliminary estimates and will depend on the available solution options and the exploration of funding opportunities.



Identification of Flood-Prone Critical Road Sections

Flooding of Ringgaden

Short term 2024 - 2026	Medium term 2027 - 2030	Long term 2030 - 2050
>DKK 10 million	>DKK 10 million	>50 million
Funds have been allocated until 2027 for mitigating flooding on critical roads.	*Requires ongoing funding allocations and prioritization. Preliminary funds have been allocated for 2027.*	*Requires ongoing funding allocations and prioritization.*

Climate Adaptation of Critical Roads

Time and space for water

Impact potential in relation to strategic sub-goals

Space for water on the terrain	Medium
Improving the entire water cycle	Low

The road network often functions as the main flow path. Large amounts of water can accumulate on the roads, gaining significant speed without obstruction, which can cause severe damage and pools in low-lying areas.
Therefore, it is crucial that roads are designed appropriately as part of climate adaptation, allowing water to flow toward green areas and depressions where it poses no harm. Additionally, ensuring that critical roads remain passable reinforces the need to create space for water around the roads and design them to efficiently channel runoff.

Initiative-specific sub-goals:

- *In 2024, the first two projects will be established at Viby and Åby Stadium in collaboration with Aarhus Vand (water utility) and Aarhus Municipality's Culture and Citizen Service, Sport & Leisure departments.*
- *In 2025, subsequent projects will be carried out in synergy with Aarhus Vand's pipeline relocations on Chr. X's Vej and in synergy with the establishment of artificial grass pitches on the street Halmstadsgade.*

A liveable city for everyone

Impact potential in relation to strategic sub-goals

Blue-green connections	Medium
Urban quality and frameworks for healthy living	Medium

Large and heavily trafficked roads often have a high concentration of asphalt and concrete. However, many of these roads are also lined with green areas that play a significant role in the climate adaptation of the critical roads. The goal is to enhance blue-green connections so that they provide increased recreational and aesthetic value, contributing to a sense of urban quality.
Climate adaptation of critical roads also includes the treatment of paved areas directly connected to adaptation measures, aiming to green the space. This can extend from road corners to urban parks, sports facilities, and similar areas. Finally, there is an inherent benefit in improving traffic mobility through all these measures.

Initiative-specific sub-goals:

- *Improved Mobility through Flood Reduction in Local Areas.*
- *Greening and planting trees as part of climate adaptation measures.*

Socioeconomics and synergy

Impact potential in relation to strategic sub-goals

Synergy with other developments and projects	High
Dynamic and adaptive planning	Medium

Climate adaptation of critical roads is economically costly because roads and paved areas are expensive to work with. In the initial studies of flooding on critical roads, it was estimated that DKK 150-200 million would be needed from 2017 to 2030 to prevent flooding from the mapped critical road sections.
To achieve synergy, measures on critical roads are planned in different time horizons, depending on when other larger construction projects, such as Aarhus Vand's separation projects, urban renewal projects, or works near and in flood-prone road areas, are expected to begin.
When roads are dug up for new utility lines, as is happening in Viby, simple coordination of the road's new profile can hold great potential for climate adaptation and create synergy between the projects by adjusting how water flows over the road and through the area. This is precisely one of the measures that will ensure fewer floods on the street Søren Frichs Vej and the surrounding properties in the future.

Initiative-specific sub-goals:

- *Climate adaptation measures are carried out in 80% of cases in synergy and co-financed with other major projects.*
- *Damage costs are reduced for the entire catchment.*
- *Measures are planned in different time horizons to ensure they align with synergy projects.*

Innovation and Collaboration

Impact potential in relation to strategic sub-goals

Private Ownership and Citizen Responsibility Awareness	Low
Innovative Collaborations	Medium

Projects for critical roads will involve all relevant partners who either have ongoing projects or own properties that can be incorporated into the climate adaptation of critical roads. Exploring partnerships is an integral part of climate adaptation for the critical roads due to the space limitations that are often encountered.
Exploring innovative solutions, as well as establishing collaborations, is necessary to find the right solutions for both diverting or storing water from extreme rainfall when space is limited. Therefore, climate adaptation of critical roads is continuously exploring the development of innovative measures that can contribute to improved management of extreme rainfall.
In Åby, the climate adaptation of critical roads, in collaboration with Aarhus Vand A/S (water utility) and the Culture and Citizen Service, Sport & Leisure departments, has planned solutions that can both address the climate adaptation of a large catchment in Åby and Søren Frichs Vej, while also mitigating water volumes that may prevent the sports fields from being used collectively.

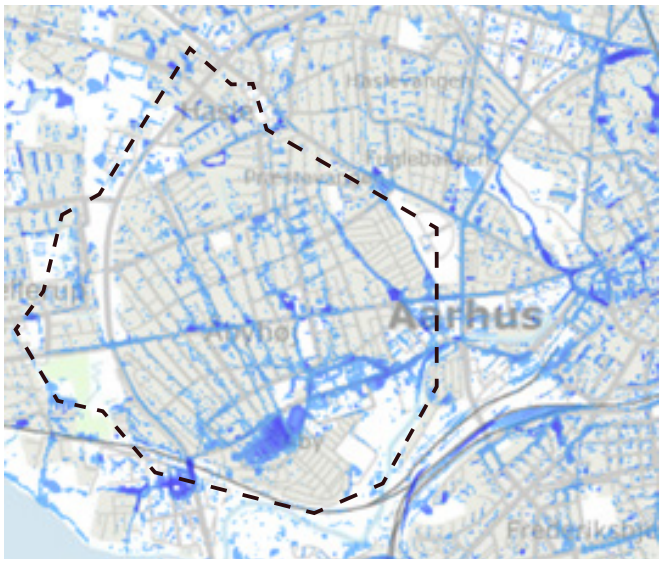
Initiative-specific sub-goals:

- *In 2024 and 2025, stakeholders around the selected locations will be involved in the design of climate adaptation facilities.*
- *In 2025, new collaboration partners will be explored regarding flooding on critical road sections.*

Added Value, Sewer Separation, and Climate Adaptation in Hasle, Åbyhøj and Åby

Challenge
The increased rainfall means that the capacity of the sewer system in many areas is insufficient, and there is an increased risk that the water cannot be contained within the system. As a result, excess combined wastewater and rainwater may flow untreated into lakes, rivers, and the Aarhus Bay. The excess water can also cause flooding of basements, roads, and green areas.

Main idea
By separating rainwater and wastewater, the risk of wastewater flooding is reduced, and rainwater can be directed away from buildings and other valuable areas, minimizing damage. In Åby, Åbyhøj, and parts of Hasle, the sewer separation also prepares the area to pump wastewater exclusively to the upcoming new treatment plant, ReWater. This prevents the unnecessary pumping and treatment of rainwater. Climate adaptation is implemented where it is economically beneficial for society. Hasle, Åbyhøj, and Åby are planned to be fully sewer-separated by 2030.
Sewer separation and climate adaptation are created in collaboration with the citizens and contribute added value to the area with new meeting places, more urban nature, improved trail connections, and swales that help slow down traffic in the area.



Risk Mapping, 100-year event in the year 2020

Potential Stakeholders
Hasle and Åby-Åbyhøj Local Council, representing the key stakeholders in the area, as well as a number of citizens collaborating on specific solutions in the individual subareas, Aarhus Vand (water utility), Aarhus Technical and Environmental Services, including Mobility, Green Areas, and Citizenship. Two advisory groups have been established in Åbyhøj, which are involved through meetings with Aarhus Municipality and Aarhus Vand (water utility).

The vision, developed in collaboration with local residents and stakeholders in Åbyhøj in 2019, has set the direction for the added value created in connection with the separation projects and climate adaptation of Åbyhøj

Time and Economy
Current Status: Project
The sewer separation is well underway, and ongoing subprojects are emerging within the overall project area. The amounts below are preliminary estimates. Aarhus Vand (water utility) will spend approx. DKK 40 million per year from 2019 to 2030, while Aarhus Municipality's contribution is estimated at around DKK 2 million per year for added value.

Short term 2024 - 2026	Medium term 2027 - 2030	Long term 2030 - 2050
DKK 6 million (DKK 2 million per year)	DKK 8 million (DKK 2 million per year)	
Larger added-value projects: • *Transformation of Åby Park to include more blue areas* • *Swales and added value with green space at Kærvej* • *Stormwater ponds at Klokkervej* • *Planning of the overall project for transforming basins in the northern part of Klokkerparken, development plan for Haslehøj, and Light Rail/BRT phase 2 at Ryhavevej.*	*To be carried out by 2030, including:* • *Transformation of Mjølnersvej and Valhalvej to include more blue and green areas – linking to the new bridge district along Søren Frichs Vej.* • *Transformation of Præstevang Park.*	*Transformation of Åby Wastewater Treatment Plant into a recreational area with large stormwater lakes.*

Added Value, Sewer Separation, and Climate Adaptation in Hasle, Åbyhøj and Åby

Time and space for water

Impact potential in relation to strategic sub-goals

Space for water on the terrain	High
Improving the entire water cycle	Medium

Based on an overall master plan, Aarhus Vand (water utility) separates rainwater and wastewater in Åby, Åbyhøj, and parts of Hasle. A cohesive rainwater system is established, so that rainwater, where possible, is directed via the terrain to green areas. Here, flow paths with greenery and green spaces are created, allowing the water to be delayed and treated, while also maintaining and enhancing other purposes such as recreation, sports, and urban nature.

Initiative-specific sub-goals:

- *By 2030, the entire catchment of approximately 8 km² will be sewer-separated. In the final project, approximately 2 million m³ of rainwater will be treated and delayed annually before being directed to the Aarhus River.*

A liveable city for everyone

Impact potential in relation to strategic sub-goals

Blue-green connections	High
Urban quality and frameworks for healthy living	High

When Aarhus Vand (water utility) separates the sewers and implements climate adaptation in the neighborhood, both through pipes and on the terrain, the projects aim to support blue-green connections, making the areas feel greener with improved recreational value and coherence. New meeting places will be created as the areas are adapted to include more water, planting, and various facilities such as picnic tables, fitness equipment, benches, and information signs.
The project helps highlight the characteristic landscape of Hasle, Åbyhøj, and Åby, the urban areas located on the edge of the Aarhus River Valley, by adapting new lakes to the landscape, creating flow paths that follow the terrain, and ensuring views across the valley.

Initiative-specific sub-goals:

- *By 2030, new roadbeds with trees will be established on residential streets, covering approximately 2,000 m² of new urban nature in Åby, Åbyhøj, and Hasle.*
- *By 2030, resting and meeting places will have been established or strengthened within the project area.*
- *By 2030, trees, bushes, and perennials will have been planted as part of the added value in the climate adaptation in Åby, Åbyhøj, and Hasle, contributing to an improved microclimate.*

Socioeconomics and synergy

Impact potential in relation to strategic sub-goals

Synergy with other developments and projects	High
Dynamic and adaptive planning	Low

Based on cost-benefit analyses, it is assessed where it makes sense from a socio-economic perspective to increase the capacity for handling water on the terrain. This means that, in addition to creating more space in the sewer system by separating rainwater and wastewater, Aarhus Vand (water utility) will only implement climate adaptation measures in areas where the investments in measures balance with the calculated damage costs.
When Aarhus Vand (water utility) invests in sewer separation, Aarhus Municipality contributes funds for added value, helping to achieve several of the municipality's goals. Additionally, we seek synergy with the municipality's other projects, including the Development Plan for Haslehøj, Light Rail Phase 2, strategic urban spaces, and sewer separation, thus ensuring that multiple projects can contribute to financing.

Initiative-specific sub-goals:

- *Overall, there are savings in damage costs of approx. DKK*
- *52 million over 100 years, corresponding to a socio-economic gain of around DKK 21 million. All climate adaptation measures have a positive cost-benefit analysis.*

Innovation and Collaboration

Impact potential in relation to strategic sub-goals

Private Ownership and Citizen Responsibility Awareness	Low
Innovative Collaborations	Medium

To achieve shared ownership and good collaborative solutions, citizens and other stakeholders are involved in the projects.
We distinguish between small and larger projects, so for small projects, affected property owners are involved, while for larger projects, we collaborate with community councils, associations, schools, institutions, and others.

Initiative-specific sub-goals:

- *Several follow-up meetings are held annually, where updates are provided on the status of sewer separation, and individual projects are discussed.*
- *For each larger project, citizens and relevant stakeholders are involved to ensure that the project is tailored as best as possible to local preferences.*

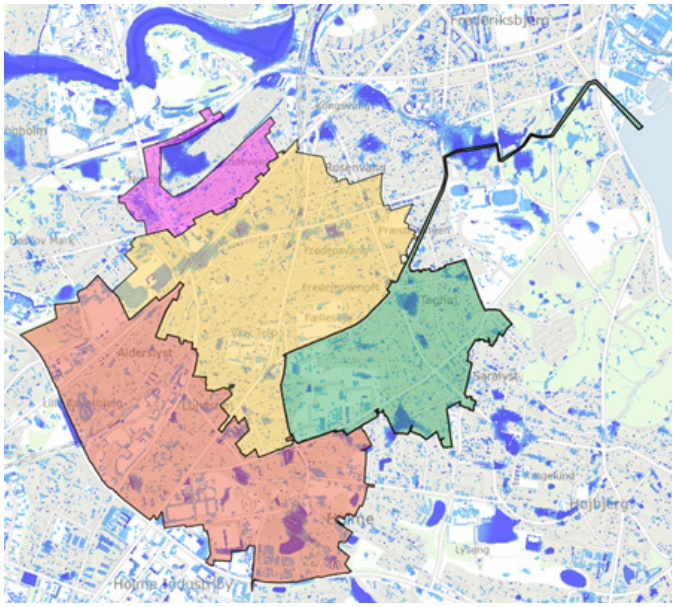
Added Value, Sewer Separation, and Climate Adaptation in Viby

Challenge
The increased rainfall means that the capacity of the sewer system in many areas is too small, leading to an increased risk that the water cannot be contained within the system. This results in excess mixed wastewater and rainwater being released untreated into lakes, streams, and the Aarhus Bay. The excess water can also cause flooding of basements, roads, and green areas.

Main idea
By separating rainwater and wastewater, the risk of wastewater flooding is reduced, and rainwater can be directed away from buildings and other assets to minimize damage. In Viby, sewer separation also prepares the area to pump wastewater exclusively to the upcoming new treatment plant, ReWater. This way, unnecessary pumping and treatment of rainwater is avoided. Climate adaptation measures are implemented where they are economically viable. Viby is planned to be fully sewer-separated by 2040.
Sewer separation and climate adaptation are created in collaboration with citizens and contribute to added value in the area, including new meeting places, more urban nature, improved pathways, swales, and traffic speed reduction in the area. However, there are few public green spaces where water can be managed. Therefore, rainwater is primarily delayed in green strips along roadways and in the few parks available in the area.

Potential Stakeholders
Viby Community Council, Aarhus Vand (water utility), Aarhus Department of Technology and Environment, including Mobility, Green Areas, and Citizenship. A follow-up group has been established in Viby, which is involved through meetings with Aarhus Municipality and Aarhus Vand (water utility).

Time & Budget
Current status: Project
The sewer separation process is well underway, and climate adaptation measures such as swales have been implemented. New projects are in the planning/design phase, and additional projects may emerge as the separation progresses in the neighborhood.
The amounts listed below are preliminary estimates. Aarhus Water will invest approx. DKK 50 million per year from 2019 to 2040, while Aarhus Municipality's contribution is estimated at around DKK 2 million per year for added value.



Viby sewer catchments marked with pink, yellow, orange, and green


Photo: Viby Square


Photo: Viby Square, combined event on October 3, 2023

Short-term 2024 - 2026	Medium-term 2027 - 2030	Long-term 2030 - 2050
DKK 6 million (DKK 2 million per year)	DKK 8 million (DKK 2 million per year)	DKK 10 million (DKK 2 million per year)
Greening and water management at Chr. X's Vej and Grundtvigsvej *Stormwater pond on the area between Ormslevvej and the Motorway.*	*Water management and further greening of Jyllands Allé, Fredensvang Runddel, and Chr. X's Vej* *Diverting pipelines to ReWater and greening of the street Vilhelm Becks Vej*	*Projects not yet identified and planned* *Added value initiatives related to the planning for the Fredensvang neighborhood* *Stormwater ponds at Viby Water Treatment Plant*

Added Value, Sewer Separation, and Climate Adaptation in Viby

Time and space for water

Impact potential in relation to strategic sub-goals

Space for water on the terrain	Medium
Improving the entire water cycle	Medium

Aarhus Vand (water utility) separates rainwater and wastewater in Viby as part of the overall separation strategy for Aarhus. As a result of the centralization of the city's treatment plants, the Viby treatment plant will be decommissioned. The sewer separation provides an opportunity to create a rainwater system that, through flow paths, can delay and treat rainwater with greenery and green areas, maintaining and strengthening functions such as urban nature, green mobility, and similar.

Initiative-specific sub-goals:

- *In 2030, at least 1.25 km² (paved area) of the catchment in Viby will be fully separated, and 6 million m³ of rainwater will be delayed and treated annually before being directed to the Aarhus River and Aarhus Bay.*
- *By 2040, the entire Viby catchment of approximately 2.2 km² (paved area) will be fully separated, and an additional 1.6 million m³ of rainwater will be delayed and treated annually before being directed to the Aarhus River and Aarhus Bay.*
- *Aarhus Municipality contributes to the work with disposition plans for rainwater in Viby as the separation work progresses.*

A liveable city for everyone

Impact potential in relation to strategic sub-goals

Blue-green connections	Medium
Urban quality and frameworks for healthy living	High

As Aarhus Vand (water utility) separates the sewage system in Viby, the separation projects must contribute, to the greatest extent possible, both to managing rainwater and enhancing the experience of green streets and public spaces that connect the city's green parks.
The separation and climate adaptation efforts contribute to strengthening the blue-green connections, which enhance the quality of urban nature, biodiversity, and green mobility across Viby.

Initiative-specific sub-goals:

- *In 2040, 50 or more roadside trees have been planted as part of the added value in climate adaptation in Viby, providing shade and reducing heat in the areas where they are planted.*
- *By 2040, approximately 5,000 m² of asphalt has been converted into green spaces that strengthen the blue-green connections.*

Socioeconomics and synergy

Impact potential in relation to strategic sub-goals

Synergy with other developments and projects	High
Dynamic and adaptive planning	Low

Based on cost-benefit analyses and the Aarhus method, it is assessed where it makes sense economically to increase the capacity for handling water on the terrain. This means that, in addition to creating more space in the sewer system by separating rainwater and wastewater, Aarhus Vand (water utility) will only climate-adapt the areas where the investments in measures balance with the calculated damage costs.
When Aarhus Vand (water utility) invests in sewer separation, Aarhus Municipality contributes funds for added value, thus helping to fulfill more of the municipality's goals while separating rainwater and wastewater. Furthermore, synergy is sought between the municipality's other projects, including the Development Plan for a better city in Viby, strategic urban spaces, the development of streets and urban areas on Marselis Boulevard, and the sewer separation.

Initiative-specific sub-goals:

- *All climate adaptation measures will have a positive cost-benefit analysis.*
- *In total, there will be savings in damage costs of approx. DKK 270 million over 100 years, corresponding to a societal economic gain of approximately DKK 250 million.*

Innovation and Collaboration

Impact potential in relation to strategic sub-goals

Private Ownership and Citizen Responsibility Awareness	Low
Innovative Collaborations	Medium

We collaborate with citizens, local community councils, associations, schools, institutions, etc., to ensure that the solutions are better anchored and achieve greater co-ownership. We distinguish between small and large projects, so for small projects, affected property owners are involved, and for larger projects, we collaborate with several relevant stakeholders.

Initiative-specific sub-goals:

- *1-2 follow-up meetings are held annually, where the status of the sewer separation and individual projects are discussed.*
- *For each larger project, citizens and relevant stakeholders are involved to ensure that the project is adapted as best as possible to local needs.*

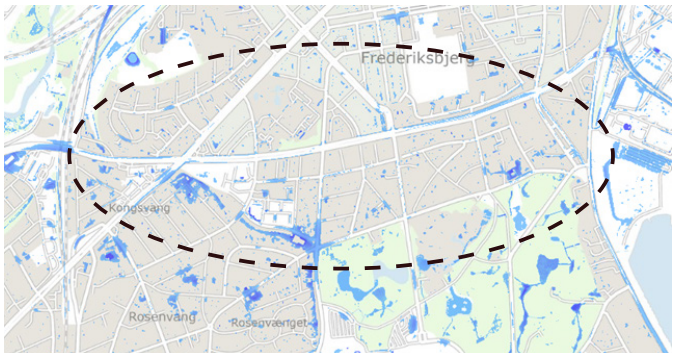
Climate adaptation of the Marselis district

Challenge
The risk of heavy rainfall events in the city is increasing, and it is important to reduce the drainage of stormwater from the area towards Aarhus River, where there is a risk of flooding, and instead direct the rainwater to the Aarhus Bay. The area is undergoing significant development in the coming years: the state is constructing a tunnel under the current boulevard at a cost of DKK 2.7 billion, providing a direct connection from the Aarhus South Motorway to Aarhus Harbor. The municipality is building a new Marselis Boulevard over the tunnel. To the south of the area, a new stadium area is being developed in Kongelunden in a collaboration between the municipality and private investors. The many projects and actors in the area make it crucial to integrate and coordinate climate adaptation into the city's transformation and its sequence over an approximately 10-year horizon.

Main idea
Climate adaptation is integrated as a functional architectural and recreational component of the large infrastructure projects planned for the area, both in the short, medium, and long term. In this way, rainwater management and climate adaptation can be incorporated at early stages of the large transformations, helping to create blue-green connections and good urban quality with multifunctional solutions. This is part of the Vision for Marselis, which was adopted by the city council in 2022 and aims to realize the vision of Marselis Boulevard as a green corridor connecting neighborhoods.
Both on the boulevard itself and from the surrounding areas, the challenges related to water are considered in conjunction with the potential to create added value for the area, including Dalgas Avenue, which connects the boulevard to the coastline.

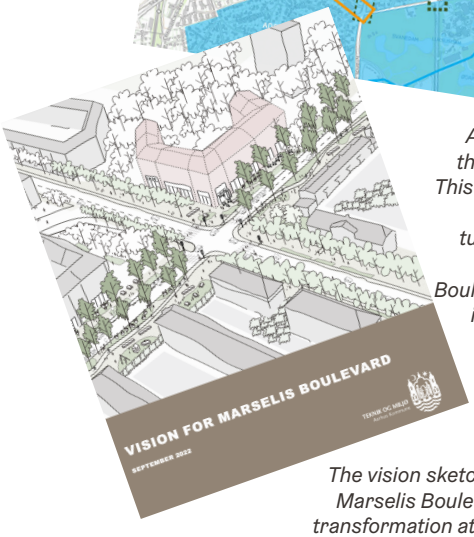
Potential Stakeholders
Road Directorate (Vejdirektoratet), Aarhus Vand (water utility), Department of Technical Services and Environment (especially Urban Spaces and Mobility), and the Kongelunden Secretariat (Aarhus' new stadium and sports arenas, etc.).

Time and budget
Current status: Preliminary study to be completed in 2024.
Short to medium term: To be carried out until 2040.
The amounts below are preliminary estimates and will depend on the available solution options and exploration of financing opportunities. Significant investment will be made in the area in the next 10 years, including the tunnel project estimated at DKK 2.7 billion. Aarhus Vand (water utility) expects to spend over DKK 50 million. Additionally, the realization of the Street and Urban Space project above the tunnel will also take place.



Overview map

An area with many projects that need to be coordinated. This includes the main pipeline to ReWater, the Marselis tunnel, the street and public space project on Marselis Boulevard, a new stadium area in Kongelunden, and sewer separation projects



The vision sketch from the Vision Plan for Marselis Boulevard illustrates a possible transformation at the intersection between Marselis Boulevard and Stadion Allé

Short term 2024 - 2026	Medium term 2027 - 2030	Long term 2030 - 2050
Concept designs as part of projects in the area, including Dalgas Avenue	*Sketch projects and implementation of projects in the area. Expenditures for climate adaptation in the Marselis area will be integrated into the ongoing projects in the area. When Aarhus Vand (water utility) begins the separation in the area, there will be collaboration on climate adaptation and added value, similar to the Åby and Viby areas*	

Climate adaptation of the Marselis district

Time and space for water

Impact potential in relation to strategic sub-goals

Space for water on the terrain	High
Improving the entire water cycle	Medium

In Marselis, we create time and space for water by establishing large stormwater ponds and designing the area so that rainwater from extreme rainfall events can be directed to areas where it will not cause damage, such as Aarhus River and Aarhus Bay. The rainwater is used as a recreational element, which, in addition to cleaning the water, also contributes recreationally to the urban spaces on and around Marselis Boulevard, while simultaneously creating space for the rainwater on the ground in the area.

The project has developed a rainwater management plan for the area to ensure a more climate-resilient district in the future by working on reducing the risk of flooding from extreme rainfall events.

Initiative-specific sub-goals:

- *Extreme rainwater is directed on the ground to Aarhus River and Aarhus Bay.*
- *Time and space for the water are created by establishing at least 5 large stormwater ponds in the project area.*
- *A management plan has been developed for the entire catchment.*
- *A total retention volume of approximately 20,000 m^3 will be established for Kongelunden (Aarhus' new stadium area) and Viby.*
- *The retention volume for Marselis and Dalgas Avenue will be determined through the development of the projects.*

A liveable city for everyone

Impact potential in relation to strategic sub-goals

Blue-green connections	High
Urban quality and frameworks for healthy living	High

The new tunnel connection between the motorway exit and the coast will reduce traffic in the area. Along with the new Marselis Boulevard and urban transformations along the boulevard, climate adaptation will contribute to a clear reinforcement of the city's blue-green corridors and green spaces. The establishment of rainwater collection in key areas of Dalgas Avenue and along Aarhus River will contribute to the creation of valuable recreational areas. Multifunctional spaces with blue runoff along Marselis Boulevard and Chr. Filtenborg's Square will increase recreational value and help realize the vision for the area, where city neighborhoods are better connected by beautiful, recreational corridors.

Initiative-specific sub-goals:

- *Marselis Boulevard can redirect a 50-year rainfall event out of the urban area towards Aarhus River and the bay.*
- *Blue-green corridors from Aarhus River to Aarhus Bay will be realized.*
- *New recreational oases and connections in the city will be established.*

Socioeconomics and synergy

Impact potential in relation to strategic sub-goals

Synergy with other developments and projects	High
Dynamic and adaptive planning	Medium

Synergy and integration of climate adaptation are crucial for the area and its expected significant development. It is essential that, alongside the large projects in the area, coordinated and efficient management of the extreme rainfall events anticipated in the future is ensured. The climate adaptation of the area is adaptive and establishes a sequencing plan that follows the other projects, ensuring synergy and co-financing through the portfolio of projects.

Initiative-specific sub-goals:

- *Synergy with projects such as the Marselis Tunnel, Marselis urban transformation, separation of rainwater and wastewater in Viby, and development of Kongelunden (Aarhus' new stadium and sports arenas, etc.).*
- *Added value and greening through the separation of rainwater and wastewater in the urban area.*
- *Adaptive planning of climate adaptation.*

Innovation and Collaboration

Impact potential in relation to strategic sub-goals

Private Ownership and Citizen Responsibility Awareness	Low
Innovative Collaborations	High

The project represents a new holistic development process for climate adaptation, where the coordination and integration of many synergistic projects contribute to a resilient urban area that is adapted to future climate changes. It supports sustainable, long-term development of the entire neighborhood in collaboration with various stakeholders.

Initiative-specific sub-goals:

- *Citizens and stakeholders in the area are involved via numerous projects, where climate adaptation is a key element.*
- *A large collaboration has been established across relevant actors, contributing to the planning and design of the area to address the various needs especially the climate adaptation of existing neighborhoods and Marselis Boulevard.*
- *Solutions for both handling everyday rainfall and climate adaptation around Marselis Boulevard require innovative and multifunctional solutions, ensuring that the infrastructure gets the necessary space while also meeting multiple goals for the area's development and the Vision for Marselis.*

Water-sensitive urban design plans (WSUD)

Challenge
Climate change involves, among other things, more frequent and intense cloudbursts. When there is no longer enough capacity in the drainage systems in urban areas, the water will follow the natural flow paths on the terrain, leading to potential flooding. Flooding can cause significant damage to buildings and infrastructure, resulting in the loss of value for both citizens and society. The societal consequences of large and intense rainfall events highlight the need for actions to increase urban resilience. This creates a need for a shift in priorities within urban planning, where water and landscape conditions must be considered as important, dynamic, and shaping factors.

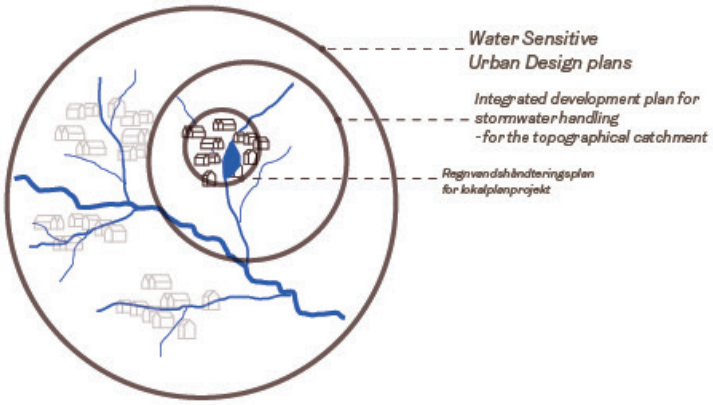
Main idea
Through planning and coordination of climate efforts, it is often possible to reduce or avoid potential damage from flooding, for example by arranging and regulating natural watercourses. When the landscape's characteristics and topography are used as tools for climate adaptation, time and space are created for the water. This ensures that water can flow through the city without causing damage, while also supporting the realization of blue-green connections with added value and multifunctional solutions that strengthen sustainable urban development.
Water Sensitive Urban Design Plans aim to ensure the above connections and, through physical city planning, serve as a tool to minimize the risk of flooding and the associated costs, ensuring that new districts and the existing city are resilient. This can be done either locally or in the catchment, where water can, for example, be "parked" (temporarily retained) before it reaches the city, reducing or minimizing flooding from the catchment. The water sensitive urban design plan supports the municipality's broader planning hierarchy, ensuring consistency from the overarching planning level to the detailed level (Municipal Plan → Master Plan → Local Plan → Construction).

Potential stakeholders
Aarhus Vand (water utility), Department of Technical Services and Environment, Sports and Leisure, public and private developers.

Time and budget
Current status: Ongoing
When developing master plans and larger local plans, water management plans are prepared as a standard procedure. Estimated cost: DKK 5 million over a 5-year period.

Example of a water sensitive urban design plan for an area where land allocation must ensure sufficient space for water

Water sensitive urban design plans at different scales



Short term 2024 - 2026	Medium term 2027 - 2030	Long term 2030 - 2050
DKK 2 million	DKK 3 million	DKK 1 million per year, ongoing

In addition, adjustments in surrounding towns based on water sensitive urban design plans, approx. DKK 10 million.

Water-sensitive urban design plans (WSUD)

Time and space for water

Impact potential in relation to strategic sub-goals

Space for water on the terrain	High
Improving the entire water cycle	High

It is an important approach through physical planning to establish frameworks and strategies for the city's development; this is done in water management plans that plan the development of areas with respect to water. As a framework for urban development, flow paths, low-lying areas, and the placement of areas for water retention in both new and existing parts of the city are highlighted. The first step in ensuring a resilient city is creating the right land allocations for terrain-based, nature-based solutions for water management.

Initiative-specific sub-goals:

- *Water sensitive urban design plans are prepared for urban development and master plans.*
- *Areas are designated for flow paths and rainwater management when land use changes.*
- *Water sensitive urban design plans for new areas must designate spaces for handling extreme rainfall.*
- *In new municipal planning frameworks, areas are allocated in such a way that there is space to manage a 100-year event, possibly in combination with nature and recreational connections.*

A liveable city for everyone

Impact potential in relation to strategic sub-goals

Blue-green connections	High
Urban quality and frameworks for healthy living	Medium

The landscape determines where water flows and accumulates, and through the plans, we ensure that this characteristic increasingly defines the city's development, with flow paths and natural depressions determining the placement of future buildings.
When the characteristics of the landscape and topography are used as a tool to integrate both existing and new urban areas, space is created for the water. This supports the idea that water can flow through the city, while simultaneously creating quality through blue-green connections and good recreational spaces that connect to the natural properties of the landscape.

Initiative-specific sub-goals:

- *Water sensitive urban design plans strengthen blue-green connections through the designated land allocations specified in the plans.*
- *In the long term, these plans can contribute to increasing urban nature, reducing heat effects, and supporting connections for pedestrians and cyclists by allocating areas for water retention and flow paths.*

Socioeconomics and synergy

Impact potential in relation to strategic sub-goals

Synergy with other developments and projects	High
Dynamic and adaptive planning	High

The landscape-based planning approach ensures that we avoid building problems in our cities. By integrating urban development planning with water management plans, we ensure that city growth is adapted to flood risks and contributes to preventing damage in both new and existing urban areas, including high-risk hotspots.
Nature-based solutions provide added value across multiple green agendas while often being more cost-effective and having a lower CO2 footprint. Proactive planning is a more economical solution than reactive mitigation.

Initiative-specific sub-goals:

- *Socioeconomic analyses are conducted in existing urban areas to determine service levels.*

Innovation and Collaboration

Impact potential in relation to strategic sub-goals

Private Ownership and Citizen Responsibility Awareness	Low
Innovative Collaborations	High

Continuous development of our analyses, foundations, and frameworks is essential to ensure that planning is based on the latest knowledge and regulatory frameworks. We collaborate extensively to develop our water sensitive urban design plans, ensuring they encompass the entire water cycle. Currently, these plans are created at the catchment level for our waterways, securing the framework for urban development and water retention in the landscape, as well as for hydrological catchments in both new and existing urban areas to allocate necessary spaces. Furthermore, we aim to utilize both rainwater and groundwater as alternative water sources in the future, reducing the strain on our groundwater resources and aligning our water management initiatives with our water supply plans.

Initiative-specific sub-goals:

- *Continuous development of our analyses in water sensitive urban design plans.*
- *Inclusion of high groundwater levels in water sensitive urban design plans.*
- *Use of rainwater and high groundwater levels as an alternative to drinking-quality groundwater.*
- *Increased collaboration with water supply plans.*

Strong collaboration with utility services

Challenge
Climate adaptation must align with a wide range of politically adopted visions, plans, and strategies, such as the State's Water Area Plans, the Municipal Plan, Aarhus Municipality's Climate Plan, the Wastewater Plan, the Water Supply Plan, and 'Water Vision 2100'. This complexity makes a strong and close collaboration with Aarhus Vand (water utility) essential for success.

Main idea
Climate adaptation is primarily carried out in synergy with other projects where areas are already being excavated and transformed. This includes projects where Aarhus Vand (water utility) separates sewer systems or when Aarhus Municipality and private developers implement major construction projects. In other cases, climate adaptation projects stand alone, addressing significant flood damage that needs urgent action.
Regardless of the project's origin, Aarhus Vand (water utility) holds valuable knowledge and extensive data, which are crucial for developing hydraulic models, conducting analyses, and designing concrete climate adaptation solutions.
We work closely together to enhance decision-making, for example, by improving knowledge about high groundwater levels, which cause both infiltration into sewer pipes and flooding of basements and gardens. Additionally, climate adaptation serves as a catalyst for urban development, creating better public spaces, more nature, improved public health, and recreational benefits.

The collaboration with Aarhus Vand (water utility) has previously been developed through the Aarhus Method for climate adaptation of the existing city, and several projects have been carried out in partnership.

Potential Stakeholders
A close collaboration between the municipality and the utility company is a crucial and necessary foundation for involving citizens, local councils, and other external stakeholders.

Time and Economy
The roles of the municipality and the utility company shift depending on the stage of the process, as illustrated in the figure below. In the initial phases - screening, preliminary investigations, and sketching projects - the municipality takes the lead. However, Aarhus Vand (water utility) plays a major role as the "operator" when it comes to detailed project planning and execution.

Short term 2024 - 2026	Medium term 2027 - 2030	Long term 2030 - 2050
Aarhus Vand's Investments: • *Approx. DKK 5 million per year for climate adaptation in connection with sewer separation projects.* • *DKK 7 million per year to support Aarhus Municipality with data and models.* • *DKK 5 million per year for climate adaptation/enhanced service levels in synergy with major infrastructure projects.*	*Aarhus Vand's investments to be determined in accordance with the Wastewater Plan, Based on the Service Level and Cost Regulation.*	*Aarhus Vand's investments to be determined in accordance with the Wastewater Plan, Based on the Service Level and Cost Regulation.*

Strong collaboration with utility services

Time and space for water

Impact potential in relation to strategic sub-goals

Space for water on the terrain	High
Improving the entire water cycle	High

We work closely together on data and models for screening, the development of water sensitive urban design plans, the identification of water catchments, the determination of service levels, conducting preliminary studies, and creating sketch/detail designs.
Based on the landscape and the overall water cycle, areas are designated for water retention and corridors where water can flow with minimal damage.
We also collaborate on solutions for managing high groundwater levels in the city, which utilities are expected to be permitted to handle under new legislation resulting from the national Climate Adaptation Plan 1.

Initiative-specific sub-goals:

- *Continuation and development of new collaborative projects between Aarhus Municipality and Aarhus Vand (water utility) with solutions that prevent, prepare for, and adapt urban spaces, infrastructure, and open land to increased water levels.*
- *Collaborative projects between Aarhus Municipality and Aarhus Vand (water utility) that manage cloudbursts locally and, as much as possible, retain rainwater on the surface. We work with local (differentiated) climate adaptation goals for both existing and new urban areas, including redeveloped districts.*
- *Activities related to calculating, coordinating, and establishing climate adaptation solutions that align with the municipality's broader plans and projects. This includes surface water retention in parks, green areas, roads, and verges, as well as underground basin solutions where surface storage is not feasible, potential upstream water retention, and transport solutions such as traditional stormwater pipes or open surface channels.*
- *Increased knowledge through expanded monitoring of the hydrological cycle (e.g., precipitation, sewer systems, recipients, and groundwater) and subsequent modeling of selected hydrological components.*

A liveable city for everyone

Impact potential in relation to strategic sub-goals

Blue-green connections	Medium
Urban quality and frameworks for healthy living	Medium

We create added value when we implement climate adaptation. Aarhus Municipality and Aarhus Vand (water utility) collaborate to make space for water at the surface. This not only contributes to a greener city with more blue elements but also ensures that urban spaces can accommodate large volumes of water while offering attractive recreational areas and activities.
When we adapt to climate challenges, we work together to strengthen blue-green connections, link urban and rural areas in new ways through pathways and waterways and provide citizens with more opportunities for a healthy outdoor lifestyle.

Initiative-specific sub-goals:

- *Collaboration between Aarhus Municipality and Aarhus Vand (water utility) on sewer separation, climate adaptation, and added value in Viby and Åbyhøj. Solutions where rainwater is seen as a resource that can support Aarhus Municipality's work in creating a greener and more recreational city, providing more connections for soft traffic, and enhancing health and community.*
- *Collaboration on larger construction projects such as Vesterbro Torv, Østbanetorvet, etc. Solutions where climate adaptation is implemented to prevent damage, while at the same time enhancing urban quality in the form of well-connected urban spaces, recreational opportunities, more greenery, and increased health and community.*

Socioeconomics and synergy

Impact potential in relation to strategic sub-goals

Synergy with other developments and projects	High
Dynamic and adaptive planning	High

In collaboration with Aarhus Vand (water utility), we will design new, holistic rainwater solutions that are balanced economically and provide synergy and added value. When we separate sewers and implement climate adaptation, we do so in synergy with construction projects and urban development where possible.
The constructive collaboration and continuous coordination between Aarhus Vand (water utility) and Aarhus Municipality means that we can more effectively achieve the municipality's goals and create synergy.

Initiative-specific sub-goals:

- *Water areas are identified for potential collaboration projects on climate adaptation between Aarhus Vand (water utility) and Aarhus Municipality, based on screening of the risk of large socio-economic damages.*
- *Preliminary investigations are conducted to assess the possibility of joint climate adaptation projects in the city, where good socio-economic benefits can be documented.*

Innovation and Collaboration

Impact potential in relation to strategic sub-goals

Private Ownership and Citizen Responsibility Awareness	Medium
Innovative Collaborations	High

In the collaboration between the municipality and the utility, we work innovatively on climate adaptation and sewer separation. Our joint climate adaptation solutions will be continuously developed in line with the improvement of data, analyses, tools, and our own experiences with projects. We share knowledge and continuously adjust our activities in line with the latest national and international knowledge on climate change.
We collaborate to inform citizens about their responsibility in sewer separation and involve citizens and relevant stakeholders in the design of joint solutions when we separate sewers and adapt neighborhoods to climate change, ensuring that added value is created that is in demand in the area.

Initiative-specific sub-goals:

- *Increased collaboration on the display of information, knowledge, and data across Aarhus Municipality and Aarhus Vand (water utility).*
- *Knowledge sharing on high groundwater levels and input to new legislation.*
- *A shared understanding of the value-creation of both techniques and models.*
- *Testing and development of new methods and technologies for climate management/climate solutions.*
- *Ensuring good anchoring and implementation of results in both organizations.*

Evaluation of efforts

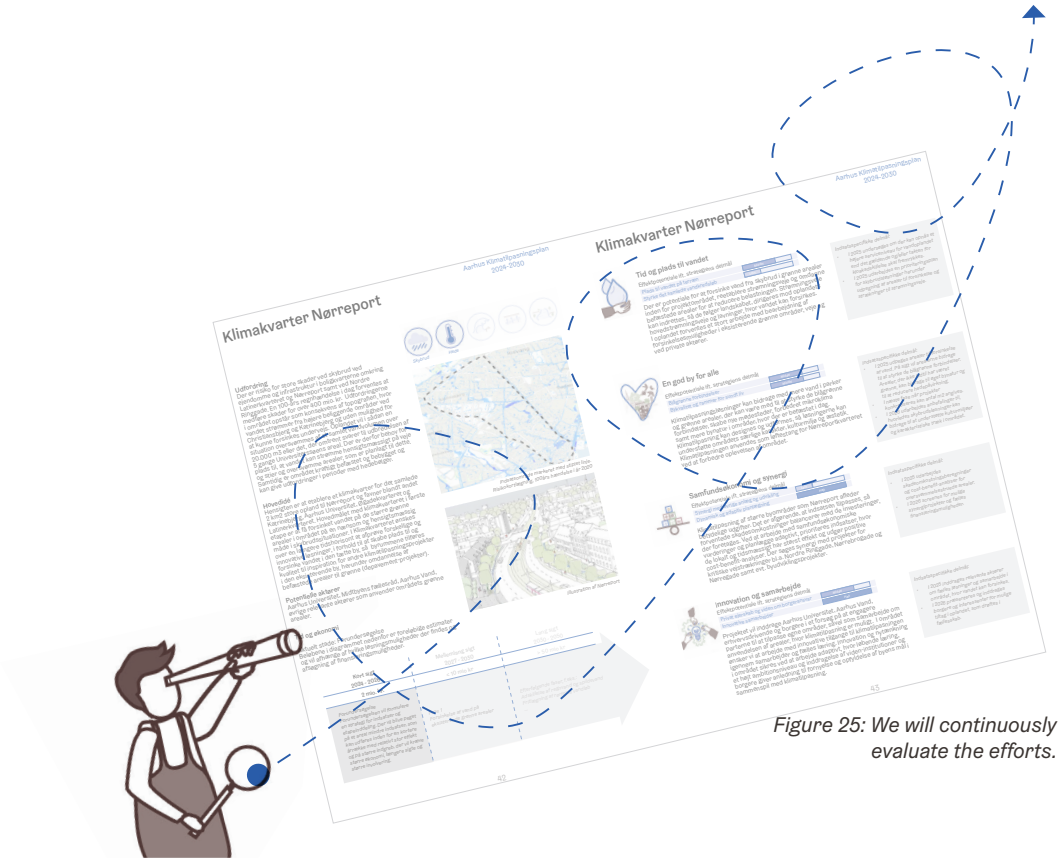


Figure 25: We will continuously evaluate the efforts.

We will continuously evaluate efforts and goals to ensure the necessary progress in climate adaptation work with a systematic follow-up on the described actions and set milestones. The evaluation will be reported annually to the political system. In the evaluation, we will address, among other things:

- What is the status and progress of each action and associated goal?
- Is there a need for adjustment of goals and actions?
- Is the set deadline being met?
- Did we highlight the potential?
- What are the next specific milestones, with associated timelines and funding?
- What funding opportunities are available to achieve the goal?

The need for continuous evaluation is driven by the relatively rapid changes in the risk landscape, ongoing changes in legislation in the area, as well as the fast pace at which we are experiencing technological development of effective solutions. To succeed in creating a climate-resilient Aarhus, it is crucial to continuously work with adaptive goals.

TECHNICAL SERVICES
AND ENVIRONMENT
City of Aarhus

Climate Adaptation Plan 2024-2030
"Together for a resilient Aarhus"

Aarhus' Climate Adaption was adopted by
Aarhus City Council in June 2025

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