

Nature-based Solutions in the field: a journey to the Aarhus ULL

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Årslev Engsø

In a valley to the West of the city of Aarhus, Denmark, there was a problem. For over a century, the waters had been modified, with pumps installed to keep the area dry so that the land could be used for farming. But this solution caused another problem as excess nutrients caught up in the runoff waters were swept downstream, threatening Aarhus Bay with an overload of phosphorus. The situation wasn't too favorable for farming either, and despite best efforts, it was difficult to achieve good conditions. Perpetually wet soils caused the gradual shrinking and sinking of the land, the farms were subjected to regular flooding, which also affected the nearby road.

The problems persisted from year to year, and permission was finally granted in 2002 to try a Nature-Based Solution; returning the Årslev Engsø area back to its natural state. Today the lake and surrounding areas are thriving. For the first time in over a century, the Aarhus and Lyngbygård rivers can flow freely again, helping retain nutrients that would otherwise flow into the nearby Brabrand lake and Aarhus Bay, and improving conditions for wildlife and plants, all which goes hand-in-hand with better recreation opportunities.

Årslev Engsø has significantly strengthened nature-based recreation opportunities in the area, with a large network of publicly accessible trails for walking and horse riding, and good linkages to other trails in the wider catchment area. The old pumping stations have also been converted into bird observation towers, providing opportunities for visitors to observe and learn about the local wildlife.



The lake and the flooded meadows provide the basis for rich plant and animal life, creating space for many of the species that have returned to the area after their absence for the last century. The natural development of the area has also seen the return of the European Otter to the watercourses around the lake. Measuring the success of such projects can be tough, especially with how slow natural areas can be to develop, but in this case, the lake is now recognized as an EU-protected Natura 2000 area – a testament to the success of the project.

Even with this impressive transformation, Årslev Engsø is still seen to hold further potential. The more frequent and heavier cloudbursts expected under climate change will mean that the threat of flooding will only intensify in the coming decades, requiring further intervention in the water catchment, and Årslev Engsø will play a part in this plan. Finally, a challenge remains in ensuring viable fish stocks. High fish mortality rates in the shallow lake challenges compliance with EU goals, and the municipality are seeking a solution to this that continues to provide the nutrient retention that the lake provides in its current form.

Before and after aerial photos. Note, the “before” picture is taken facing the coast, and the “after” in the opposite direction.



Søbakke skov badeskov

The residents of the neighbourhood of Tilst enjoyed a view of the rolling green landscape between them and Geding lake. Yet despite their proximity to this vast green space, the residents were denied access to the area, which was rented out by the municipality for agricultural use. The area had been identified for development to publicly accessible greenspace, climate adaptation and groundwater protection, but the lack of funds to make this a reality held back the project, until an unlikely sponsor stepped in.

As part of a wide 2050 environment strategy, the car manufacturing giant, Toyota, has committed to targeted action, including working towards the establishment of a future society that lives in harmony with nature. In cooperation with the Growing Trees Network Foundation, Toyota Danmark have pledged to donate a tree for every hybrid car sold in the country, and 3,000 of these trees have found a home in Tilst, to be planted between 2020-22. As well as having a positive contribution to nature and the climate, Toyota wanted the project to contribute to the welfare of the population. With this in mind, the concept for Søbakke skovbadeskov was created.

Comprising 3,000 trees of 16 species, the 18-hectare area has 3km of trails including those leading into the project area. The forest's name makes reference both to Søbakke hill, which the forest is planted near, and the theme of the forest, which is designed around the Japanese concept of Shinrin-yoku; forest-bathing, or "skovbadning" in Danish. This practice of "bathing" in nature refers to the act of taking in the atmosphere of the forest using all the body's senses; experiencing nature mindfully and therapeutically.

Forest bathing has been a part of Japanese culture for centuries, but recent research on this practice has revealed that time spent among plants and trees contributes to reducing stress, lowering blood pressure, improved immunity, and increased energy. Together these benefits help combat a long list of sicknesses and conditions, meaning time spent in forests can improve physical and mental welfare.

Søbakke badeskov therefore represents a nature-based approach to achieving benefits of huge value, both human- and nature-wise. In the coming years, residents will be able to meander along the winding paths through a growing canopy of native tree species, smelling the scent of flowering herbs and bushes in more open areas. From the hillside, their eyes will wander between brilliant yellow fields of rapeseed, seven town churches, and the restored wetlands of Kasted Mose and Egå Engsø; dotted with wild horses and cattle.

In the coming years of growth, signage will be designed and placed, to guide visitors in getting the most out of their forest bathing experience. The area will also be integrated into a landscape-wide vision to create a large crescent of green, coherent areas around Aarhus city; connecting Tilst, Geding Sø, the new forest by Geding, and beyond to Kasted Mose.



Aerial photo of Søbakke skov badeskov, shortly after tree planting.



View from the hilltop

Åbyhøj/ Klokkeparken

Over the next 50 years, 40% more rainfall is expected in Denmark from cloudburst events alone. Current wastewater management is not up to the task, and residents, including those in the Åbyhøj neighbourhood, face the threat of flooded greenspace, roads, and homes. The Aarhus Vand supply company is cooperating with the municipality on a large-scale climate adaptation plan, centered around the separation of water from sewage and runoff to increase the system's capacity. But instead of just solving this problem with grey infrastructure, *the Aarhus method* showed that the solution could bring so much more than protection from flooding.

For Åbyhøj, a local vision was created. The vision serves to guide planning and construction projects, placing local needs and wider synergies at the center of development, by involving municipal planners, residents, politicians, as well as the latest knowledge. In collaboration with the local community, 6 values were identified that reflected Åbyhøj's existing qualities, including the engaged character of its residents.

These 6 values underlie the plan for a Nature-based Solution (NBS) to elevate and complement the necessary infrastructural changes for water management, resulting in added value for the residents, the municipality, and for nature. The NBS here is a 2.7km long park that includes trees, play areas, and ponds. As well as channeling water flow and increasing capacity for retention, the NBS is also intended to boost the social qualities of Åbyhøj, while wildflowers and ponds provide precious space for birds, insects, and aquatic life in this urban suburb.

The greenspace in the centre is intended to create a more liveable, nourishing, and safe environment for residents from all corners of the neighborhood – from social housing areas to the more affluent. This general greening of the area serves to improve integration and connection across Åbyhøj, and provides more meeting and breathing spaces for locals. The playgrounds not only create meeting places for families in green surroundings, but also serve the local kindergartens and institutions. The values developed in connection with the local climate adaptation plan will also be used to inspire further development of the neighborhood.

The work here is ongoing, especially with regard to water. The slopes of existing water detention ponds, used for temporary storage of excess runoff, will be adjusted, making them into wet retention ponds. These retention ponds will comprise a step in the water purification process before its distribution to recipients. In addition to water treatment, these ponds will be reinvented to add recreation value through, for example, including bridges to make the space more accessible, allowing closer encounters with the water.

The project also forms part of wider work in developing a method for incorporating the value of blue-green solutions into cost-benefit analyses for better inclusion of the value of NBS into decision processes surrounding climate adaptation.

A further note on funding and governance: With a point of departure in water management, the project was funded by Aarhus Vand, with all added value co-funded by the municipality's different departments (Green spaces, climate adaption, mobility etc.). To work effectively with the different partners and stakeholders, the project was set up with an interdisciplinary working group at its heart, made up of members from Aarhus Vand supply company and Aarhus Municipality. The core group was supported by diverse working groups, a steering group, as well as external and internal follow-up groups representing the interests of local stakeholders and actors, and relevant city council departments.



One of the ponds at Klokkeparken, with the surrounding greenery in bloom with wildflowers.

Godsbanen

After a century as a terminal for the transport of goods, the Godsbanen area in Aarhus was given a second life as a residential area and cultural centre, which has become known for its quirky arts and music scene. In recent years, it has seen a surge in development, with new residential buildings and an Architecture school springing up in the vicinity. Yet, planning here actively works to emphasise that this is a place where the city meets nature. While stormwater management, recreation, and biodiversity conservation are key themes, an eye is also kept to emphasising a connection to nature in an otherwise highly urbanized area.

The Godsbanen area extends from Møllengen to Ringgadebroen, and covers 100,000 square kilometers. The low-lying nature of the area means it is at risk of flooding, especially under increasingly frequent cloudburst events. This risk is exacerbated by the hard, impermeable surfaces characterising much of the area and its surroundings, but instead of draining and channeling the water directly away, the municipality have opted to embrace and implement Nature-Based Solutions: Water is seen as a resource to be used in synergy with giving the area its character, as well as strengthen recreational possibilities, and support biodiversity.

Excess water is directed in part by re-structuring the terrain so that water flows into a combination of above- and below-ground basins and channels. Yet, instead of being hurried and hidden away, stormwater is used as a dynamic, visible part of Godsbanen that provides a tangible connection to nature. For example, the filling and emptying of detention basins varies according to the weather, and even the chosen cladding of the surrounding buildings shift in character when wet or dry.

Local residents and visitors are also provided with strengthened blue and green nature-based recreation opportunities. For example, the planned building of a stairway down into one of the open rainwater basins is intended to encourage its use, while the wedge-shaped "Kilen" park includes a path suitable for walking and cycling that links up to the longer Brabrandstien. This provides a continuous trail out into the larger nature areas and the city's outskirts, with the intention of drawing the landscapes of the Natura 2000 protected Brabrand Lake and Århus river into the city; bringing recreational opportunities that will benefit the whole city.

Finally, even in this urbanised vision of nature, biodiversity is not forgotten. Not only is new planting confined to native species, but the trees that have sprung up in between the old train tracks are kept. Excitingly, biodiversity surveys in the relatively small area of Kilen have found over 500 species of flora and fauna. This pocket of astonishing biodiversity is home to species that are rare in the rest of the country, and so special attention is paid to maintaining the unique conditions found here, in the midst of an otherwise concrete jungle.



*Top: View of Godsbanen from the slanted roof of the Godsbanen arts building;
Bottom: Aerial view of the Godsbanen area*