

NATURE-BASED SOLUTIONS FOR WATER IN THE PERI-URBAN

CASE STUDY BRIEF: SWEDEN,
STOCKHOLM, ÅRSTA



2018 JOINT CALL

ABSTRACT

Årstafältet (ÅF) is a large open grass field and a suburb located 5 km south from the city centre of Stockholm. Driven by the environmental quality goals of Stockholm, a water dam and a stream were constructed with the aim of being integrated in a landscape park for purifying runoffs from the surroundings and restoring the natural water flow, and maintaining the ecological value of the grass-field. However, due to the huge housing demand, the landscape plan altered towards urbanising the area and constructing residential buildings. The city decided to capitalise on existing NBS, enlarge, and redesign the water pond and integrate them in green structures including parks, trees planting along roads, green roofs and courtyards, allotment gardens, and deciduous forest, all of which are yet in the planning or implementation phase. The planned NBS are to deal with various water pressures at different scales ranging from local to watershed level including climate change impacts and flood management, improving water quality, groundwater recharge, in addition to other socio and environmental benefits. The construction of the water ponds has been substantially challenged by civic groups' opposition and appeals, uncertainties, high cost and investments, and contestation over roles of actors in planning and design, financing issues, ownership, division of

responsibilities for maintaining NBS, but also the very dynamic and long-term planning process that is exposed to contingences and change.

PURPOSE OF THE CASE STUDY

The ÅF case study in fact represents a multiple case studies of different projects of NBS in a suburb in a Stockholm, a frontrunner European city in responding to urban sustainability challenges. Within this respective context and where NBS are driven by the municipality that has a planning monopoly and public finance is relatively available, the case study is likely to provide a nuanced understanding regarding the planning and governance challenges and opportunities for closing the water gap at the urban scale through mainstreaming NBS in transitional areas towards more urbanisations.

AREA CHARACTERISATION

Country	Sweden
Province	Stockholm County
Municipality	Stockholm
Town	Söderort (the southern area), the borough of Enskede- Årsta-Vantör
GPS coordinates	59.7596° N, 18.7014° E
Area	500000 m ² i.e. 50 hectares



The groundwork started in 2018 with the upcoming Årstafältet (Stockholm city, 2021). Stage 1 of planned Årstafältet stage includes the construction of the city park and water ponds.

PHYSICAL CONTEXT

Physical context

Årstafältet (Årsta field or farm) is located 5 km from the city centre of Stockholm. The field is located between adjacent residential areas of Årsta and Östaberga and Enskedefältet. The area has been publically disadvantaged being surrounded by busy traffic routes, Huddinge Street "Huddingevägen" and Årsta Link "Årstälänken". Årsta Link was abandoned in 2004 and replaced by South Link "Södrälänken" and a tunnel under Årsta. The new development closest to Huddingevägen has also helped to shield the area from traffic noise. All the urban changes have made the area attractive to development

Local geography/topography

Årsta field is situated in a valley that was a sea bay of the Baltic Sea during the latest period of the Stone Age, which ended in Årstaviken. The large estate was bordered by historic farms such as Bägersta farm, Valla farm, Ersta, Östberga and Enskede farm and, farthest in the northwest, Årsta farm. Årsta field was historically an agriculture area but half of the original Årsta field is today exploited. Årsta field is a large open field of 50 hectares covered by grass with isolated trees and shrubs that is being developed into residential area to comply with housing demands

Main water courses

Constructed water dam, a stream in which water flows through pumping if no enough rainfalls, and Årsta bay

Main soil types

The area is flat and consists of postglacial clay with a thickness of 12-22 meters. The area is waterlogged and hydrologically sensitive and that is why the groundwater is highly regulated in the Årsta field. Small ditches drain the water out of the area but there may be a risk of soil stability and land sliding.

Precipitation (monthly averages as well as climate change projections)

2017: 34.0, 18.3, 29.8, 23.0, 11.7, 74.9, 14.6, 70.3, 66.6, 102.6, 54.5, 56.9 (46.43)
2018: 47.6, 27.5, 13.7, 27.0, 4.1, 40.6, 5.9, 43.2, 49.4, 21.9, 30.6, 33.7 (28.77)

Temperature

2017 (Jan.-Dec.): -0.3, 0.2, 3.3, 5.0, 11.3, 15.2, 17.4, 17.0, 13.1, 8.0, 3.8, 1.5
2018 (Jan.-Dec.): 0.2, -3.2, -1.6, 7.1, 16.0, 17.2, 22.4, 19.3, 14.3, 8.7, 4.5, 0.8

Critical infrastructure

Existing infrastructure is a historical street i.e. heritage: Göta Landsväg (which has high societal value), the constructed water bond and stream, and the allotments gardens that were re-allocated in preparing the area for urban development. In the new plans that have started to build a new pond and replace an old one and heavy sewage and runoff water pipes replacing old ones. In the new city district of Årstafältet there will be roads for cars and buses, biking roads and pedestrian roads. There will also be a new subway line passing Årstafältet (Fridhemsplan-Älvsjö) with a station on Årstafältet

SOCIO-ECONOMIC CONTEXT

Population	101 116
Population demography	Families (N.) 47,722, Males (%) 49.9, Females (%) 50.1, Foreigners (%) 12.3 Average age (years) 37.5 https://ugeo.urbistat.com/AdminStat/en/se/demografia/dati-sintesi/enskede-arsta-vantor-stockholm/18014/4
Economic status (i.e. low income, high income)	Household with societal security Average wage: 33 800 kr Male: 33 800 kr Female: 33 800 kr Close to Middle income

OBJECTIVE OF THE NBS

The NBS addresses water quality, water quantity (mainly excess but also drought) and aspire to restore the natural water flow in a dry stream. .

NBS (water ponds & parks) deals with climate change impacts and aims to manage **water quantity** mainly flooding but also droughts for a time span of 100 years and refill groundwater levels. NBS also aims to purify and safeguard and the **water quality** of the receiving water bodies (Årstaviken) from pollutions arising from the runoffs in ÅF and its neighbouring districts and from possible overflow and overload on the existing water treatment plant systems. Together with hard engineering solutions (pumping stations and cement lined water ponds), NBS aims **at restoration of water flow in the dry stream**-Valla å, that has been laid in in pipes and rock tunnels, that originally flows into Årstaviken.

POLICY AND GOVERNANCE CONTEXT

The **regional plan for Stockholm**, RUF5 2050, indirectly mentions NBS. They lift the importance of new innovations, green and blue infrastructure, circular and blue green cycles, and using ecosystem services (Stockholm stad, 2018).

The Comprehensive plan of **Stockholm city** mentions the intention to implement ecosystem services and green infrastructure. They also discuss the importance of green and blue areas to reduce health issues in the city and prevent flooding (Stockholm stad, 2018)

Stockholm stormwater strategy (2015) that promotes the LOD approach (Locally managed stormwater) and provides examples of this in neighborhoods and public spaces such as green roofs, natural infiltration surfaces and ditches, tree plantation and plant beds. The excess stormwater could later be directed to “collected drainage” solutions such as stormwater ponds or flood storage basins through open ditches or smaller canals. The strategy further states: “By giving space to the stormwater near its origin and mimicking a natural runoff in the urban environment, a number of benefits are obtained from a sustainability perspective” (translated from Stockholms Stad, 2015, p. 8).

A greener Stockholm, Grönare Stockholm, is a strategic document that discusses where nature can help with climate change and water issues such as storm water and floods (Stadsledningskontoret, 2017).

The EU Water Directive is enforced in Sweden through Environmental Quality Norms (MKN in

Swedish) and is written into the Swedish Environmental Act (Miljöbalken, SFS 1998:808). Authorities and municipalities are responsible for making sure that the Environmental Quality Norms are followed. The county administrative board (Länsstyrelsen) makes sure that these are being followed in each municipal plan, through reviewing plans and making sure the plans do not lead to increased pollution (Christensen, 2021).

The city of Stockholm and its administrations has the main responsibility for planning and implementing the NBS through established contracts between the city and constructors as well as the financial burden. The two projects would not be implemented without the financial and policy support (mobilisation of financial and human resources) to environmental programs and urban development projects that consider these solutions.

The stakeholders involved in the first project, the landscape plan, included the municipal landscape developers and the water utility (Stockholm water Company). The SWC was the entity that proposed the Nature based solutions project.

The urban developed project is planned by the city planning administrations and private consultants but also include the Stockholm County, a regional authority, for making sure that plans are in line with national laws and regulations. The city administrations (land development planners, city planners, and traffic planners), water utility (SOVA), consulting and architectural companies, project managers, Swedish University of Agricultural Sciences, plantation firms (Vegtech) are involved. A group of citizens was critical to the project and opposed requiring the implementation of the city originally planned, the landscape park, and claiming that the area is wet and hydrologically sensitive.

ACTIONS

In the first project, NBS include a constructed wetland (water pond), ditches, and water stairways (B.57, 2008).

In the extended project (urban development project of New Årstafältet), the city, focusing on social and environmental values of NBS decided to capitalise on existing NBS, enlarge, and redesign the water



Årstafältet, located south from the Stockholm inner city, where NBS are planned

pond and integrate them in planned green structures. Different types of NBS are planned and (to be) implemented using the standardised green space factor (GSF, Grönytefaktor) as a planning tool to measure how much greenish is needed, and include:

- **Stormwater ponds** with sedimentation and water treatment through plants and plant islands that have to pass the criteria of functioning during drought and flood as well as functioning as water purifiers. However, the ponds are a mix of traditional and NBS infrastructure as they have natural aspects as sedimentation and plants but have impermeable surfaces under large parts and have grey infrastructure (tunnels and pipes) to and from the ponds.
- **Two stormwater parks** to handle stormwater through infiltration and delaying the water flow of stormwater
- **Trees planting** along the roads using tree beds of structural and particular soil that enhance the growth of trees (lithosol).
- **Raingardens, green roofs and courtyards** for water infiltration and urban greenery
- **Allotment gardens with meadow landscapes** for biodiversity, and small-scale farming
- **Elevated forest area** next to the highway Huddingevägen. a deciduous forest which is supposed to run along the entire south-east border of the.

POTENTIAL (OR ACHIEVED) IMPACTS AND BENEFITS

In addition to cleaning and improving water quality and manage flooding risk, NBS are expected to deliver **other social and environmental values and benefits** including aesthetic and urban environment attraction, biodiversity, management the risk of erosion and land-sliding and mobilising social interaction by creating public spaces for recreation, meeting, and strengthening relations between Årsta and neighbouring community Östberga.

SUSTAINABLE DEVELOPMENT GOALS AND/OR ANY OTHER WATER-RELATED DEVELOPMENT GOALS ADDRESSED

The ecosystem services provided by the NBS' at Årstafältet include: water provision & regulation, carbon storage, moderation of extremes, habitat biodiversity, and the cultural & spiritual. Given these ecosystem services links, as well as minding the urban context and its related implications, we have appointed the following SDGs as the most relevant associated with the NBS:

SDG 6 Clean Water & Sanitation: The implementation and management of the NBS work to ensure the sustainable management of water in Årsta. The following targets of SDG 6 are focused on with the NBS project in relation to water: implement integrated water resources management at all levels (6.5); protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes (6.6); and support and strengthen the participation of local communities in improving water and sanitation management (6.b).

SDG 9 Industry, Innovation & Infrastructure: The NBS project can be considered as innovative infrastructure for the promotion of sustainable urbanization. The NBS for water management uses natural processes that work in harmony with grey infrastructure and water systems. The pond, for example, is constructed as a fusion of green infrastructure design with pipes and cement as material.

SDG 11 Sustainable Cities & Communities: The ecosystem services associated with NBS have linkages with all the targets imposed by SDG 11. Through its water management and design, the NBS helps ensure an adequate and safe housing area with green and public spaces (11.1,11.7). Services associated with carbon storage, water regulation and moderation of extremes help reduce the adverse per capita environmental impact of cities (11.6). In accordance with making cities and human settlements inclusive, safe, resilient and sustainable, the goal is of high im-



The planned urban development of New Årstafältet

portance at a local and regional scale as the NBS is involved with supporting positive economic, political, social, and environmental links within the community, as part of the city (11.a). Likewise, the implementation of the NBS at Årstafältet, with the scale and its relationship with the municipality network, coincide with the target of having human settlements adopt and implement integrated policies and plans towards resource efficiency, mitigation, adaptation, and resilience to climate change (11.b). This also helps enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning and management (11.3).

SDG 13 Climate Action: The main use of the NBS is to specifically combat flooding from stormwater in the area. Its use for water management strengthens the resilience and adaptive capacity to climate related hazards and natural disasters(13.1). It's implementation promotes the target for mechanisms for raising capacity for effective climate change-related planning and management (13.b).

SDG14 Life Below Water: The NBS at Årstafältet aims to prevent pollution to the end recipient of Årstaviken (and by extension Lake Mälaren and the Baltic Sea). This relates to the target 14.1.

SDG 15 Life on Land: The pond at Årstafältet promotes habitat and biodiversity, in terms of vegetation and space for various wildlife. This ensures the conservation, restoration and sustainable use of terrestrial & inland freshwater ecosystems (15.1). The planning process involved in construction of the NBS project correlates with the target for integration of ecosystem and biodiversity values into national/local planning and development processes (15.9).

LESSONS LEARNT

The case study is still in the implementation phase

TRANSFERABILITY OF RESULTS

The case study is still in the implementation phase

CONTACT INFORMATION

Lina Suleiman
KTH, Royal Institute of Technology, Stockholm
lina.suleiman@abe.kth.se

WHAT IS NATWiP?

NATWiP is an acronym for a project entitled: Nature-Based Solutions for Water Management in the Peri-Urban: Linking Ecological, Social and Economic Dimensions.

This is an EU-Cooperation project funded under the Water Joint Programming Initiative (JPI) Call 2018 and is led by an international consortium of scientists. The NATWiP team works towards promoting sustainable implementation of nature-based solutions to address water challenges in peri-urban areas.

EDITORS

Amy Oen

RiSC, Norwegian Geotechnical Institute, Oslo, Norway

Sarah Hale

Sustainable Geosolutions, Norwegian Geotechnical Institute, Oslo, Norway

AUTHORS

Lina Suleiman

Department of Urban Planning and Environment, School of Architecture and the Built Environment, KTH, Royal Institute of Technology, Stockholm, Sweden

The authors would like to thank the European Commission and the Swedish Research Council for Sustainable Development (FORMAS), Water Research Commission (WRC) in South Africa, Ministry of Economy, Industry and Competitiveness – through the State Research Agency (MINECO–AEI) in Spain & the Research Council of Norway (RCN) for funding in the frame of the collaborative international consortium NATWiP financed under the 2018 Joint Call of the WaterWorks2017 ERA-NET Cofund. This ERA-NET is an integral part of the activities developed by the Water JPI.

© NATWiP 2022

DOI: 10.5281/zenodo.7825779

This work is licensed under the Creative Commons Attribution 4.0 International License. Any reproductions, modifications, publications or public displays of this work or any of its contents are authorized.

WEBSITE: <http://NATWiP.solutions>

FOLLOW US: [facebook.com/nbsforwater](https://www.facebook.com/nbsforwater)