Augustenborg Botanical Roof Garden in Malmö, Sweden

Year of issue

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Summary

Augustenborg’s Botanical Roof Garden is a large, publicly accessible green roof complex built within the Eco-city Augustenborg regeneration in Malmö. It was created to reduce local flooding and to add green space and wellbeing benefits in a district facing social challenges. The City of Malmö led and funded the installation. The Scandinavian Green Roof Institute provided maintenance and outreach. SLU and Lund University carried out long-term monitoring.

About 9,500 m² of extensive roofs were implemented on buildings with low load capacity, following Agenda 21 principles for local stormwater management. The roof garden was tied to the wider Ekostaden programme alongside open stormwater elements at ground level.The botanical roof garden opened to the public in 2001 as part of the award-winning Eco-city Augustenborg project.

Hydrologic performance has been documented on thin sedum-moss systems typical of southern Sweden. Monthly water balance studies show much lower annual runoff than hard roofs due to evapotranspiration. Field capacity is about 9 mm. For peaks, a 1.5-year runoff corresponds to only a 0.4-year rain, indicating strong detention. At the district scale, the regeneration report states that green roofs intercept roughly half of total annual runoff.

Vegetation studies on similar Malmö-region roofs found sedum dominance and limited spontaneous diversity in unfertilised thin systems. Over 2 to 22 years, substrates accumulate nitrogen, with estimated gains around 2.9 g N/m²/yr, while plant biomass and diversity remain broadly stable.

Governance and financing sat with the City of Malmö, complemented by national funds, LIFE and research councils. Community discussions accompanied the broader open stormwater redevelopment, with some concerns about space use and perceived costs. A local assessment notes costs were not higher than rebuilding underground drainage, though operating costs can be higher and co-benefits are hard to monetise.

Today, formal maintenance is very limited and the roof garden project itself is reported as closed, while research on Augustenborg-type roofs continues through universities.

Photo Gallery





Location

55.577, 13.027

Project

NWRM

Sector

Urban

Installation Date

1999–2001

Implementation status

Completed

Contact

City of Malmö (building owner; manager of installation).

Overview

Location of the project

Augustenborg district, City of Malmö, Skåne County, Sweden.

Country

Sweden

NUTS2 Code

Sydsverige

Sponge measures implemented in the case study

Green Roofs

Objectives

Reduce local flooding

Increase wellbeing and green space.

Involved partners

Authority type	Authority name	Authority role	Comments	Authority responsibility
Local water authority	City of Malmö	Implementation	Owner and main funder; led installation and management	Responsible
Research institute / University	Scandinavian Green Roof Institute	Monitoring	Knowledge and outreach; maintained the roof garden until recently	Supporting
Research institute / University	SLU (Swedish University of Agricultural Sciences)	Monitoring	Long-term research and monitoring	Supporting
Research institute / University	LTH (Lund University)	Monitoring	Long-term research and monitoring	Supporting

Site Information

Climate Zone

Cool temperate dry

Precipitation

652.00 mm

Temperature (°C)

9.20 °C

Elevation range

18 m

Vegetation class

Sedum-moss succulents; mixtures tested and monitored at Augustenborg roof plots.

WFD Ecological status

Moderate

WFD Chemical status

Failing to achieve good

Design and Implementation

Project scale

Micro

Project scale specifications

site/district roof complex

Project area

9,500 m²

Principles

Local stormwater treatment under the Agenda 21 umbrella; designed under low weight-bearing constraints of existing buildings.

Constraints

low load-bearing capacity of the buildings

Financing

Financing authorities

Authority name	Type of funding
City of Malmö	Local funds

Authority name	Type of funding
Sweden	National funds
European Union	EU-funds: LIFE+
research councils	Other

Compensations

Non

Policy and Governance

Policy description

In the 1980s and 1990s, Malmö, Sweden, was a physically dilapidated, economically challenged, and socially deprived region. Floods routinely impacted the area because the drainage system was inadequate. Health problems were severe and unemployment was high. Approach: In 1998, the Augustenborg District in Malmö initiated an extensive urban renovation program under the name of Ekostaden (econeighborhood). Under this approach, officials sought to recreate the area as an integrated whole and to transform it into an ecologically, socially, and economically sustainable city district. Collaborating with area residents and other stakeholders, local officials succeeded in building a new neighborhood with public space and community-run cafes and activities. One of the most important features of this initiative was the use of green roofs to solve some of the flooding problems the area faced. The green roofs have been highly effective in capturing runoff, and on average intercept half of the total runoff over the course of a year. A botanical roof garden covers 9,000 m2 of the industrial area and contributes to the flood risk reduction efforts.

Land ownership

City of Malmö

Target remarks

Mitigate local flooding; increase green space and wellbeing.

Pressure remarks

Local flooding

Impact remarks

Area-wide runoff reduced; biodiversity increased; enhanced public realm (district level).

Part of a wider plan

Oui

Wider plan

Wider plan type	Wider plan focus	Name	Comments
Local	Water	Eco-city Augustenborg	Local urban regeneration and water management plan. Integration with open stormwater system and green roofs at district scale.

Public consultation

Oui

Consultation activities

Activity stage	Comments
Implementation phase	There were a lot of discussion regarding the redevelopment of courtyards and the open stormwater system.

Has contractual arrangements

Non

Impacts and Monitoring

Monitoring System

Monitoring parameters

More than 20 years of studies on stormwater runoff, vegetation development, and stormwater quality by SLU, LTH and partners.

Maintenance

Maintenance requirements

Very limited at present; previously maintained by the Scandinavian Green Roof Institute (now closed).

Impact Assessment Methodology

Biophysical impact assessment method

Empirical monitoring on the roof garden and related roofs; peer-reviewed studies underpin hydrologic and ecological findings.

Socio-economic Impacts

Direct benefits

Multiple benefits, but difficult to isolate from wider city transformation during the same period.
Flood mitigation through runoff reduction and detention. Added urban green space and habitat.
Employement in the area.

Direct benefits information

Trade-offs of open stormwater elements at ground level: space use near homes, perception of high costs vs other needs.

Biophysical impacts: Hydrology

Information on retained water

At district scale, green roofs intercept roughly half of annual runoff. For the roof type studied in southern Sweden (sedum-moss, ~3 cm), peak flows are significantly attenuated: runoff with a 1.5-year return period corresponds to only a 0.4-year rain, indicating strong detention. An evaluation (Kibirige and Tan 2013) concluded that the “open stormwater system in Augustenborg is well suited to handle current climatic conditions and a 10 year extreme event.

Biophysical impacts: Biodiversity

Information on improved biodiversity

Biodiversity increased in the area; the Botanical Roof Garden attracted birds and insects.

Biophysical impacts: Water & Soil Quality

Information on water quality overall

Green roof ecosystem development shows long-term N accumulation along a chronosequence in southern Sweden roofs.

Lessons Learned

Key lessons

Joint work by all involved parties was crucial, with periods when participants felt like quitting. This level of commitment underpinned delivery over time. Obstacles were extensive across physical, technical, human and regulatory aspects. Low load-bearing capacity of the buildings strongly constrained design options.
Community acceptance required substantial discussion around courtyard redevelopments and the open stormwater system. Open elements occupy space near homes and were perceived as costly, competing with other priorities.
Maintenance is currently very limited; the garden was previously maintained by the Scandinavian Green Roof Institute. The roof garden project itself is now closed. However, long-term monitoring has provided evidence on runoff, vegetation development and water quality for over two decades, supporting learning from the site.

Barriers

Barrier type	Barrier role	Comments
Other	Main barrier	Low structural load capacity of existing buildings; broad set of physical, technical, human and regulatory obstacles.

Drivers

Driver type	Driver role	Comments
Past flooding events	Main driver	Local flooding problems

Success factors

Success factor type	Success factor role	Comments
Successful coordination between authorities	Main factor	The joint work by all involved parties was a so very important for the success. There were times when everyone was feeling like quitting.

Cost effectiveness

Not more expensive than remodelling an underground stormwater system; running costs may be higher, with co-benefits that are hard to monetise.

Transferability

This large, integrated model is difficult to transfer wholesale; specific technical solutions such as green roofs have diffused widely. Some technical solutions live on and green roofs have certainly taken off, but the project as a whole must be seen as unique.

Sources

Sources

Vegetation development on extensive vegetated green roofs: Influence of substrate composition, establishment method and species mix

Carbon, nitrogen, and phosphorus variation along a green roof chronosequence: Implications for green roof ecosystem development

Eco-city Augustenborg, Sweden. Peer Exchange and Analysis