

Hammarby Sjöstad

– a unique environmental project in Stockholm



It has only taken a few years for Hammarby Sjöstad to become one of the world's highest profile examples of Sustainable City Development, mentioned in specialist publications worldwide. Hammarby Sjöstad is visited by over 10,000 decision makers and specialists in the field every year, making it one of Stockholm's most important destinations.

Planning work was integrated with environmental goals from the very start of the planning process, and this is, we believe, the main reason why it has been so successful. This approach has been followed ever since by consultations between the City of Stockholm's administrative departments and the companies responsible for waste management, energy, water & sewage, aimed at developing the solutions needed to enable the environmental goals to be met.

We are delighted to have the opportunity to present the environment programme in this publication. We hope that in reading it, you will find our experiences in developing Hammarby Sjöstad of practical use. By learning from each other, we can all make real progress towards a sustainable society in the years ahead.

Stockholm, June 2007

Lars Fränne
GlashusEtt
Chairman of the Steering Group



Hammarby Sjöstad – a unique environmental project in Stockholm

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Hammarby Sjöstad – a new environmental and ecological city district project



The water has inspired the name of the entire project – the town around the lake Hammarby Sjö. The first drawings of what would become Hammarby Sjöstad were pencilled in back in 1990. The idea was to showcase a unique opportunity – expanding the inner city with a focus on the water, while converting an old industrial and harbour area into a modern neighbourhood. Once fully built, Hammarby Sjöstad will have 11,000 residential units for just over 25,000 people and a total of about 35,000 people will live and work in the area. Hammarby Sjöstad will be fully built by 2015.

Architecture and urban design

Hammarby Sjöstad is Stockholm's biggest urban development project for many years. The area's location as a natural continuation of Stockholm's inner city has helped shape the infrastructure, planning and design of the buildings.



This expansion has involved extensive reconstructions of the infrastructure, with traffic barriers removed and the old industrial and terminal areas phased out, concentrated or given a new purpose.

The next phases

The areas around Sickla Udde, Sickla Kaj and Sickla Kanal are now fully developed. The next phases involve Hammarby Gård (1,000 apartments), Redaren and Sjöfarten (500 apartments), Lugnet (650 apartments), Henriksdalshamnen (850 apartments) and Sjöstadporten (260 apartments with 15 000 m² office space and 15 250 m² hotel space). All of these areas offer a range of zoning types.

The expansion of Hammarby Sjöstad coincides with the development of the area's municipal and commercial services, and with increased investment in public transport.

The history of Hammarby Sjö

Every place has its own history, and the area surrounding Hammarby Sjö to the south of Stockholm has changed drastically many times. There can be few areas that have been described as offering “peaceful idyllic scenes from nature” in the 1920s, and which, just a few decades later, were referred to sneeringly as a corrugated steel “shantytown”, only to be reborn, in the new millennium, as a modern and environmentally friendly part of Stockholm’s city centre.



A view out over Fanny Udde and Lugnet bay from Henriksdalsberget. The bay has now been filled in and the Södra Länken highway now runs through a tunnel to the Värmdöleden highway, beyond where the summerhouse stands beside the water in this picture. Stockholm City Museum.

In the 1800s, Sickla was a popular destination for excursions by the inhabitants of the Södermalm district of southern Stockholm, and was popularly known as “Eastern Söder’s Pearl”. The area was partially destroyed when the Hammarbyleden highway was built, and the seabed of the Lugnet bay area was filled in with excavated soil, rocks and refuse as part



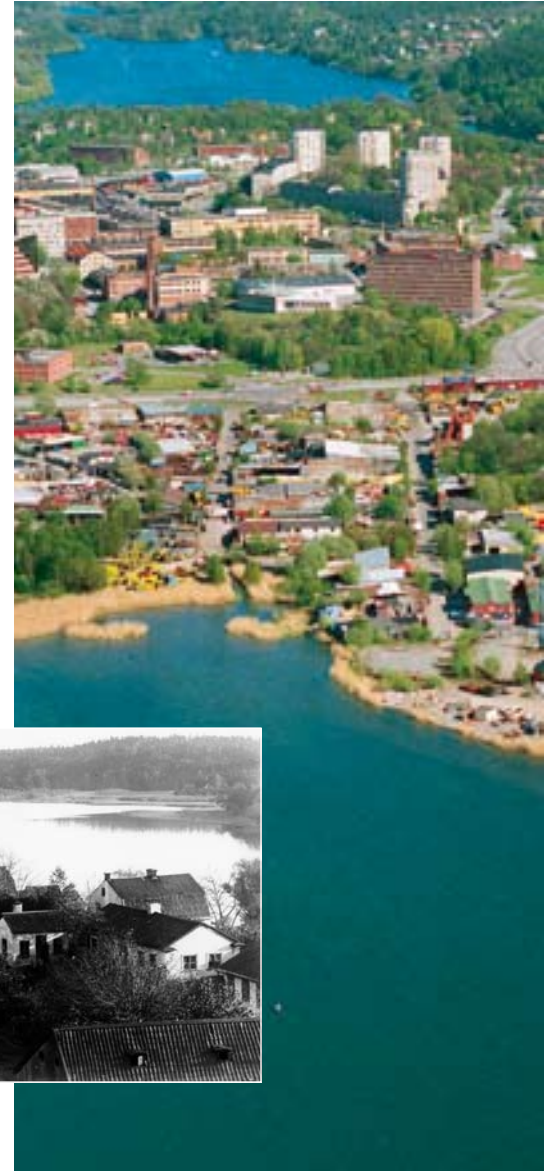
Hammarby Sjö in the 1700s, before the Danvik canal was blasted out. The water level was several metres higher than its current level. Stockholm City Museum.



Sickla Udde, “Eastern Söder’s Pearl”, was Stockholm’s first temperance park, with allotments, a dance floor and a music pavilion. Stockholm City Museum.



View towards Sickla Udde and Sickla Kaj from Barnängen on Söder, 1897. Stockholm City Museum.





of the planned port area.

The plans, however, came to nothing and the land was made available for storage depots and industrial use. But no single company or industry established itself in the area: instead, a shantytown began to grow up, and the area eventually became a small-scale industrial area. Constant threats of demolition meant the buildings in the area were of a temporary nature, largely consisting of a range of corrugated steel shacks. The shantytown lasted until 1998, when it was demolished to make way for Hammarby Sjöstad.

Soil decontamination

The shantytown left numerous environmental “nasties” in the soil, so to ensure that no one is exposed to any risks in conjunction with service work in the future, e.g. repair work on pipes, or tree planting, the City of Stockholm Environment & Health Administration is monitoring the soil decontamination work throughout Hammarby Sjöstad, ensuring that the requisite standards are met to avoid harming either the environment or people’s health.

On Sickla Udde alone, the earth excavated contained 130 tonnes of oils and grease, and 180 tonnes of heavy metals.



The topmost pictures show the Sickla Udde shantytown and Sickla Kaj, just before construction began. The above picture shows the extensive soil decontamination work.

Hammarby Sjöstad – a unique environmental project in Stockholm

Twice as eco-friendly

Right from the start, the city has imposed strict environmental requirements on buildings, technical installations and the traffic environment. The goal of the entire environmental programme is to halve the total environmental impact in comparison with an area built in the

early 1990s. Another way of putting it is that the buildings in Hammarby Sjöstad will be twice as eco-friendly as a normal building.

The architecture is modern, with the focus on sustainable materials such as glass, wood, steel and stone, and the ground was thoroughly decontaminated before building work began.



The City of Stockholm's environmental goals for Hammarby Sjöstad

Land usage: sanitary redevelopment, reuse and transformation of old brownfield sites into attractive residential areas with beautiful parks and green public spaces.

Transportation: fast, attractive public transport, combined with carpool and beautiful cycle paths, in order to reduce private car usage.

Building materials: healthy, dry and environmentally sound.

Energy: renewable fuels, biogas products and reuse of waste heat coupled with efficient energy consumption in buildings.

Water & sewage: as clean and efficient as possible – both input and output – with the aid of new technology for water saving and sewage treatment.

Waste: thoroughly sorted in practical systems, with material and energy recycling maximised wherever possible.





Adapting the area to an environmentally friendly one has also entailed a heavy investment in green public spaces, with maintenance plans for the oak forest, a reed park with wooden jetties, a broad avenue, and several large parks. Attractive forms of public transport are also offered, such as light rail link, boat traffic and access to a carpool.



Conserving nature and creating new green public spaces

An avenue linking the city district's new green public spaces and forming green corridors runs all the way through the southern part of Hammarby Sjöstad.

The parks to the south of Hammarby Sjö are all linked to the major green public spaces of the Nacka nature reserve and Årsta forest, and form green wedges into the heart of Hammarby Sjöstad. The Nacka nature reserve is linked to the town area by means of ecoducts – planted viaducts – over the Södra Länken highway.

New parks in northern Hammarby Sjöstad have been linked up with the Vitaberg park and the Stora Blecktorp park.



Environmental goals for land usage in Hammarby Sjöstad

- Open space standard: There shall be at least 15m² of courtyard space and a total of 25–30m² of courtyard space and park area within 300m of every apartment (equiv. 100m² BTA).
- At least 15 % of the courtyard space shall be sunlit for at least 4–5 hours at the spring and autumn equinoxes.
- Development of undeveloped green public spaces shall be compensated for in the form of biotopes that benefit the biological diversity in the immediate area.
- Natural areas of particular value shall be protected from development.

Existing vegetation has been saved

The natural environment along the shores of Sickla Udde has been recreated using new trees and reed beds. The oak forest on Sickla Udde has been thinned and the living oaks and dead trees that have been left in place together form attractive environments for many species of insect and bird.

The parks are intended to be attractive environments and serve as footpaths for people, but are also intended to serve as dispersal corridors and living environments for animals and plants.



Södra Länken has been lowered and is bridged by two ecoducts to Hammarbybacken and the Nacka nature reserve, a large open air recreation area.



Light rail link, ferries and carpool will reduce car usage



Transportation imposes a heavy environmental burden in a densely built-up city district. Which is why Sjöstad offers energy-saving and attractive alternatives to private car usage. The aim is for 80 % of residents' and workers' journeys

to be by public transport, on foot or by bicycle by the year 2010.

Light rail link

Substantial investments have been made in public transport in the area, both in the form of the new light rail link "Tvärbanan" and bus traffic. Public transport has a central route running through Sjöstad, with four stops along the avenue that connects one side of the city district to the other.



Ferry

Sjöstad has ferry links. The ferry, which traffics Hammarby Sjö between the southern and northern sides of Sjöstad, is run by the City of Stockholm and is free to use. The ferry runs 365 days of the year from early in the morning to late at night.

Carpool

A carpool open to both residents and those working here has been launched in the area. Around 10 % of households have joined the carpool to date, and there are 25–35 carpool cars parked in the area, with the number varying according to demand. Around 75 % of the cars are bifuel cars. The aim is for at least 15 % of households and at least 5 % of the Hammarby Sjöstad workplaces to be signed up to the carpool by 2010.



Environmental goals for transportation in Hammarby Sjöstad

- 80 % of residents' and workers' journeys shall be by public transport, on foot or by bicycle by the year 2010.
- At least 15 % of the households in Hammarby Sjöstad shall be signed up to the carpool by 2010.
- At least 5 % of the area's workplaces shall be signed up to carpools by 2010.
- 100 % of heavy transportation shall be by vehicles that meet current environmental zone requirements.

Eco-inspections and organically sustainable materials

Environmental consideration across the board

Environmental consideration is the key for all of the materials used. This applies both to the visible materials used in the facades and on the ground as well as to the materials used in the internal parts of the buildings – their shells, installations and equipment. The guiding principle throughout has been to use tried and tested, sustainable materials and eco-certified products, and to avoid any use of chemical products or construction materials that contain hazardous substances.

Rainwater must not be contaminated with metals or oils en route to Hammarby Sjö, which is why facade or roofing materials that could release heavy metals or other hazardous substances have been avoided, and why eco-friendly oil has been used for the footpaths along Sickla Canal and stainless steel has been used for the cycle bridge.



Eco-inspections

Everyone who builds in Hammarby Sjöstad must check and declare their chemical products and construction materials before work on their project begins, and eco-inspections are conducted regularly throughout the construction process.



All left-over construction materials are sorted at source.

Environmental goals for construction materials in Hammarby Sjöstad

- Routines shall be drawn up for choosing the best materials from resource-related, environmental and health protection viewpoints, before the planning work begins.
- Pressure-treated timber may not be used.
- Copper may not be used as ducting material in horizontal or vertical piping trunks in the tap water system, either indoors or out. This does not apply to wet rooms and their connections within the apartment.
- Galvanised materials in the external environment shall be surface-treated.
- Use of newly extracted gravel and sand shall be minimised.
- Recycled materials shall be used wherever it is indicated for environmental and health reasons, provided that it is technically and economically feasible.

The healthy city

One of the goals of Hammarby Sjöstad is for the district to be a healthy place for people to live, a place that stimulates the body and soul, and hence a place that offers opportunities for exercise, sports and culture.

Exercise and sports

Sjöstaden has a number of exercise and sports facilities, such as Hammarbybacken, a slalom ski slope with amazing views. The sports facility at Hammarbyhöjden, near the southern side of Hammarbybacken is an important asset, not least for school and youth sports activities. The foot of the slope is also home to the valuable Nacka nature reserve. A sports hall with a large exercise facility has been built in Sjöstaden, and this positive feature is echoed in the annual Sjöstad Games held on Sweden's National Day under the administration of Hammarby IF sports association.

Sjöstaden has numerous footpaths and cycle paths alongside the canals, as well as many attractive paths for strolling through a variety of green public spaces in the district. There are also cycle paths along Sjöstaden's main through-road.

Culture

A variety of different types of cultural activity are also important in terms of overall health. Cultural outlets in Hammarby Sjöstad include not only the Fryshuset social and cultural centre, but Kulturama, which offers tuition in a wide range of Arts for students of all ages, along with a library, not forgetting the cultural centre that will be opening soon.



Sjöstaden also has allotments with a shared greenhouse, playgrounds for active games, and a salmon ladder alongside the lock into Sickla Sjö lake.



Integrated planning with an eco-focus

The real key to the district's success is the integrated planning work that was carried out before the area was developed. All of the various authorities and administrations that normally get involved in the various stages of the process sat down and drew up the plan for the new conceptual approach that would result in Hammarby Sjöstad. The integrated planning work carried out from the start was – and still

is – unique. And the results were – and will continue to be – visible in Hammarby Sjöstad. The goal was to create a residential environment based on sustainable resource usage, where energy consumption and waste production are minimised, and resource saving and recycling are simultaneously maximised.

Sjöstaden is home to exciting new technical solutions for energy supply and energy

usage, a pilot sewage treatment plant facility where new technology will be tested, and a practical automated waste disposal system for waste management.

One tried and tested example of integration solutions comes in the form of the heat extracted from the treated wastewater, which is used to produce district heating and, from the waste product of this process, district cooling.



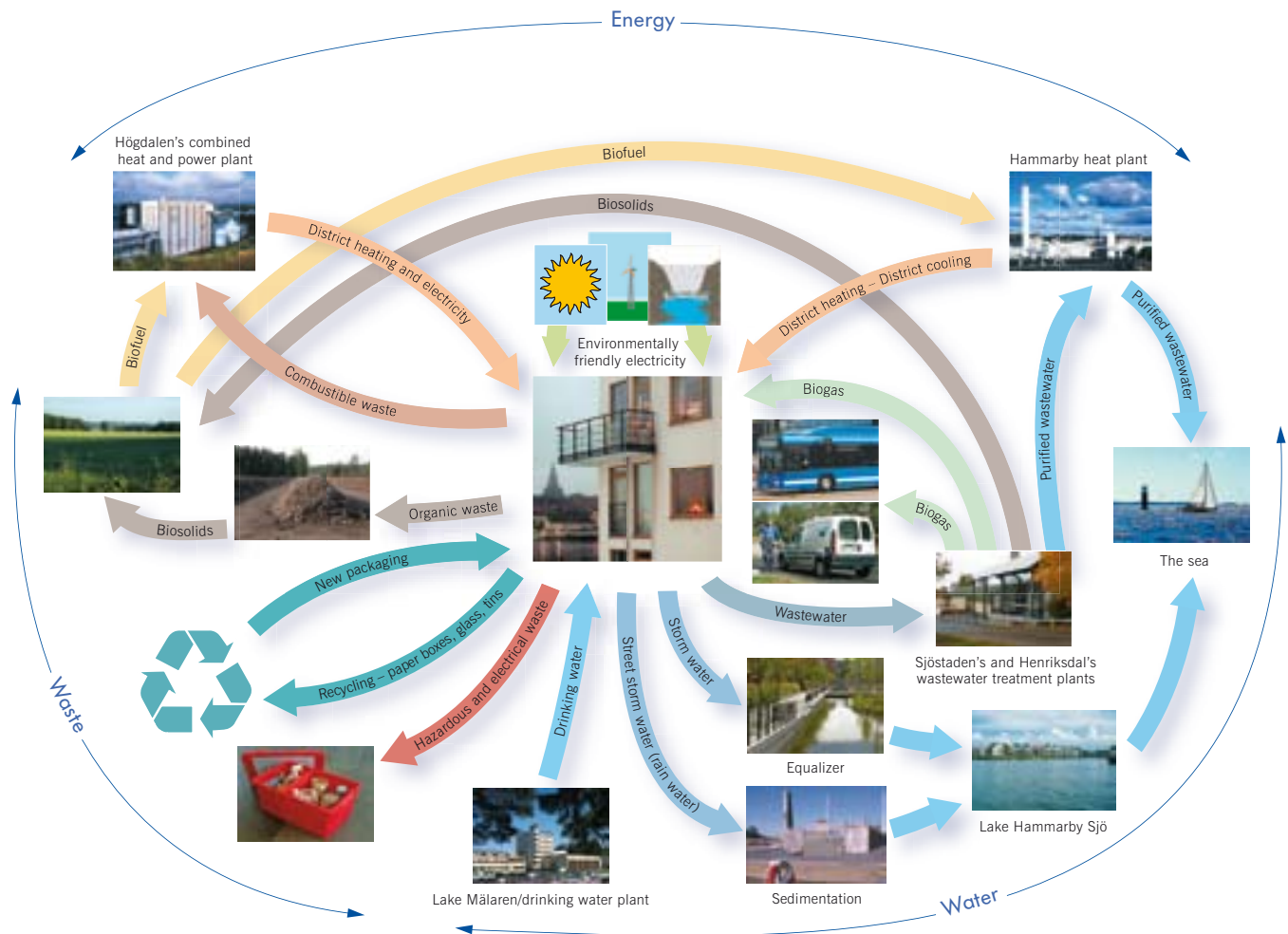
The unique partnership between administrations, authorities, architects and developers has led to numerous innovative environmentally-friendly technical solutions in Hammarby Sjöstad.

The Hammarby model – a unique eco-cycle

The integrated environmental solutions can be followed through an eco-cycle that has become known as the Hammarby model. The eco-cycle handles energy, waste, water and sewage for housing, offices and other com-

mercial activities in Hammarby Sjöstad. The eco-cycle is also designed to act as a role model for the development of equivalent technological systems in big cities. The Hammarby model is shown on the inside of the front cover,

along with explanatory texts, and the various sections of the cycle – namely energy, water & sewage, and waste – are presented on the following pages.



Energy



Solar energy is utilised through solar cells on roofs and walls, and converted into electrical energy.

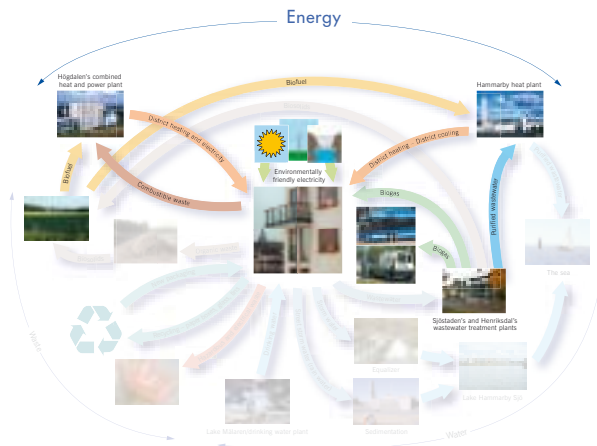
Sustainable and renewable energy

The City of Stockholm has always been well ahead of its time when it comes to finding new and renewable energy sources to make the city a better place to live in. For several decades now, Stockholm has been shifting over to using district heating to heat buildings.

In Hammarby Sjöstad, we have brought

things one step further through the installation of various kinds of energy supply. New technology is being used as part of exciting development projects in Hammarby Sjöstad, e.g. as fuel cells, solar cells, and solar panels. The purpose is partly to test the new technology and partly to demonstrate methods of building a sustainable city.

When the construction work on Hammarby Sjöstad is completed, the area's residents will produce half of all the energy they need. They will do this by utilising the energy present in treated wastewater and the energy to be found in the sorted-at-source combustible waste.



The goal is for residents to produce half of all the energy they need.

The City of Stockholm's environmental goals for Energy in Hammarby Sjöstad

The goals relate to the sum of all the energy bought to heat the buildings and operate them each year. Household electricity is not included.

- District heating connection with exhaust air systems: 100, of which 20 kWh electricity/m² UFA
- District heating connection with heat extraction systems: 80, of which 25 kWh electricity/m² UFA
- The entire heating supply shall be based on waste energy or renewable energy sources.
- Electricity shall be "Good Environmental Choice"-labelled, or equivalent.

Eco-friendly energy, district heating and district cooling

District heating

The Högdalen combined heat and power plant uses sorted, combustible waste as an energy source (fuel) to produce electricity and district heating. Renewable energy sources are used wherever possible in order to spare the environment. Another example of sustainable heat supply is the Hammarby heat plant which extracts waste heat from the treated wastewater from the Henriksdal wastewater treatment plant.

District cooling

Stockholm's focus on centralised production of district heating and district cooling makes the city a world leader in this field. District cooling in Stockholm has developed over a decade into the world's largest system of its kind! From the cooled and treated wastewater that leaves the Hammarby plant's heat pumps, heat is exchanged into cooling in the water that circulates in the district cooling network in Hammarby Sjöstad. Cooling is, in other words, purely and simply a waste product from the production of district heating.



Combustible waste is converted into electricity and district heating in Högdalen combined heat and power plant.



Heat is extracted in the Hammarby plant from the treated wastewater, and the waste product is cooling for the district cooling network.



The sun provides energy and heats water

A variety of different kinds of energy supply are being tried out in Sjöstad. Hammarby Sjöstad has several solar cell installations which capture the energy of the sun's light and convert into electrical power. Solar cells have been installed on several facades and roofs in Sjöstad. The more effective the solar cells and the bigger the area they cover, the more effective the installation is. To date, solar cells have mainly taken the form of test projects from an energy viewpoint in urban environments. Two of the buildings on Sickla Kanal-

gata, for example, have been fitted with solar cells that are contributing to the buildings' energy supply by providing the energy needed for their public areas. Solar panels have also been fitted to the roof of one of Sjöstad's larger apartment blocks.

Solar cells

Solar cells capture the sun's luminous energy and convert it into electrical power in solar cells. The energy from a 1 m² solar cell module provides approximately 100 kWh/year,

which corresponds to the domestic electricity requirement for 3 m² residential floor space.

Solar panels

390m² of south-facing solar panels have been installed on the roof of the Viken block. These panels capture the warm rays of the sun and use them to heat the buildings hot water supply. The solar panels shown in the picture below produce half of the energy required to meet the building's annual hot water requirement.



Solar panels. Solar panels that exploit the sun's heat and use it to heat the hot water supply have been installed on many roofs. The solar panels shown in the picture are sufficient to meet half of the building's annual hot water requirement.



Solar cells. The sun's luminous energy is captured and converted into electrical energy in solar cells. The energy from a 1m² solar cell module produces approximately 100 kWh/year, which corresponds to the domestic electricity requirements of 3m² residential floor space.

Water and sewage



Hammarby Sjöstad's experimental treatment plant, Sjöstadsverket, is evaluating new wastewater treatment technology.



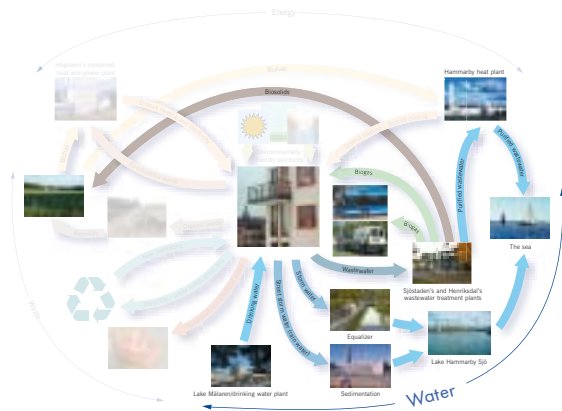
Less water and cleaner sewage

One of Hammarby Sjöstad's goals is to reduce water consumption by 50%. 200 litres/person/day is normally used in Stockholm, but our aim is to reduce this figure to 100 litres/person/day. Thanks to eco-friendly installations (energy class A: washing machines and dishwashers, low flush toilets and air mixer taps), consumption levels are currently approximately 150 litres/person/day.

It is even more important to reduce the amount of heavy metals and non biodegradable chemicals present in wastewater, because

this will result in fewer contaminants being dispersed into the Stockholm archipelago via our treated wastewater, and will also give us a better residual product, known as sludge, which can be reused on agricultural land. The strategy to systematically work with your customers and society to reduce the amount of chemicals flushed into the wastewater system is called the Upstream approach. The Upstream approach is now endorsed by many wastewater companies throughout Europe as being part of their core business.

By monitoring the wastewater, we can see whether campaigns in this area have any effect on the quality of the wastewater. In the spring of 2005, for example, a campaign to reduce the use of the bactericide Triclosan was conducted. Triclosan is an environmentally hazardous substance present in certain toothpastes and which there is no need whatsoever for ordinary consumers to use. Analyses of the wastewater before and after the campaign show that the amounts of Triclosan present had fallen.



The control room of a wastewater pumping station at Hammarby Gärd.

The City of Stockholm's environmental goals for water and sewage in Hammarby Sjöstad

- Water consumption shall be reduced to 100 litres per person per day.
- 95% of the phosphorus in wastewater shall be reusable on agricultural land.
- The quantity of heavy metals and other environmentally harmful substances shall be 50 % lower in the wastewater from the area than in the wastewater from the rest of Stockholm.
- Lifecycle analyses (LCA) shall be carried out to determine the suitability, from an energy and emissions viewpoint, of returning nitrogen to agricultural land and of utilising the chemical energy present in the wastewater.
- Drainage water shall be connected to the storm water network and not to the wastewater network.
- Storm water shall primarily be treated locally.
- The nitrogen content of the purified wastewater shall not exceed 6 mg/litre and the phosphorus content shall not exceed 0.15 mg/litre.
- Storm water from streets with more than 8,000 vehicles per day shall be treated.

Sjöstadsverket – our own wastewater treatment plant, evaluating new technology

Cutting edge technology evaluated in different processes

A new test wastewater treatment plant, Sjöstadsverket, has been built to evaluate new technology in the field of wastewater treatment. The first stage of Sjöstadsverket has four separate treatment lines for wastewater from the equivalent of 600 people in Hammarby Sjöstad. The various lines are being evaluated and a basis for decision-making for stage two – which may possibly see a water treatment plant built for the whole of Hammarby Sjöstad – will also be generated. The treatment lines under evaluation contain chemical, physical and biological processes that are run as efficiently as possible. The goal is both to treat the wastewater and to recycle resources from the wastewater with as little input of external resources, such as electrical energy and chemicals, as possible.

Cleaner biosolids and nutrient recycling

The buildings and infrastructure in Hammarby Sjöstad have been planned and built



Four different treatment lines with chemical, physical and biological processes are being evaluated.

with great care when it comes to the choice of construction and building materials, and the processing of wastewater and refuse, for example. By avoiding the use of certain metals and plastics in the buildings, by ensuring that rainwater and snowmelt are treated and drained separately, and by providing residents with information, e.g. the importance of eco-labelled household chemicals (find out more on page 30), we can ensure that households' wastewater is relatively clean.

The wastewater that goes to the local wastewater treatment plant comes solely from housing in the area, and does not come from storm water and industries. This means that right from the start, the wastewater contains a minimum of contaminants, which makes it easier for us to treat it and for the nutrients it contains to be reclaimed and, hopefully, be reusable on agricultural land.

The environmental goal is for 95 % of the phosphorus to be separated out and recycled for agricultural use, and for the level of heavy metals and other hazardous substances to be reduced by 50 %. The treated sewage has to meet exceptionally high standards.



Biogas and biosolids extracted

Biogas is extracted from the digestion of sewage sludge

At the wastewater treatment plant, organic material is separated out from the wastewater in the form of sludge. The sludge is carried to large digestion tanks, where it is digested. Biogas, which is the most environmentally friendly form of fuel currently available, is produced during the digestion process. The biogas produced is primarily used as vehicle fuel, e.g. in inner city buses, garbage trucks and taxis. Biogas is also used in approximately 1,000 gas stoves in Hammarby Sjöstad.



Biosolids can be used as an efficient fertiliser

Once the digestion process is completed, the sludge – the biosolid – can be used as a fertiliser. The biosolid is nutritionally rich with a high phosphorus content, and is ideally suited for use as a fertiliser. It can be used on agricultural land and in the production of soil conditioners. Stockholm Water sends biosolids to northern Sweden, where they are used as filling material in mines that have been closed down.



Biosolids are currently used as a fertiliser in the forestry industry, but the aim is to expand this usage to the agricultural sector as well.

Architectonic storm water solutions

All storm water, rainwater and snowmelt is treated locally in a variety of ways, and the system is referred to collectively as LOD (the Swedish acronym for "local storm water treatment").

Storm water from developed areas is infiltrated into the ground or drained to Sickla Canal, Hammarby Canal or Danvik Canal. A storm water canal runs through the park Sjöstadsparterren (the Sjöstaden parterre). The water runs from the surrounding buildings and courtyards via numerous small gutters and is then carried on to Hammarby Sjö through a water ladder designed by the artist, Dag Birkeland.

The rainwater is drained into the canal from the surrounding apartment blocks via gutters.



The storm water canal, Sjöstadsparterren, with its surrounding apartment blocks, was awarded the Kasper Salin Prize in 2005 by the Swedish Association of Architects.



The water from the canal then runs out into Hammarby Sjö via the water ladder designed by Dag Birkeland.



Green roofs

The green roofs seen on some of the buildings in Sjöstaden are another link in the local storm water treatment (LOD) chain. Their task is to collect the rainwater, delay it and evaporate it. At the same time, the small, dense sedum plants form living green areas in the cityscape.

Rainwater from the streets is treated locally

Rainwater and snowmelt from the streets is collected and treated in a variety of different ways in Sjöstad.

The most common way involves draining the water into special basins, and Sjöstad has two closed settling tanks. The water is al-

lowed to remain in the tanks for several hours, to allow the contaminants to sink to the bottom (settling), and is then drained out into the canals. Mårtensdal has an open storm water basin where the surface of the water can be seen. Here, the soil and plants in the area can handle the contaminants from dirty water when it sinks down into the ground water.



Open storm water basin at Mårtensdal (above).

Pumping station and closed storm water basin at Lugnets
terass (left). The pumping station was designed by Henrik
Rundqvist of HKR Arkitekter.

Waste and recycling material



Collection of a waste fraction at the central collection station for the stationary automated waste disposal system at Mårtensdal in Hammarby Sjöstad.



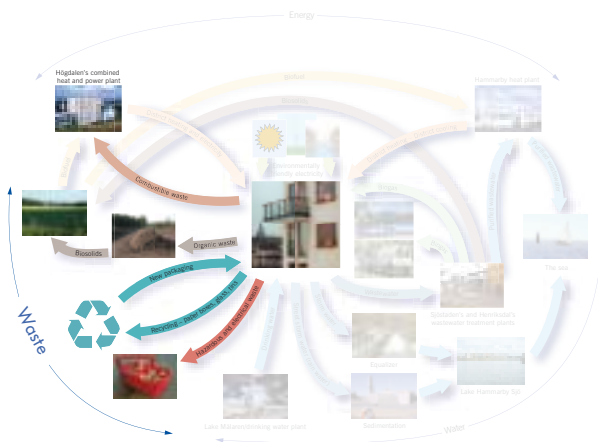
Waste must be reduced and recycled

These days waste is no longer just waste. It is a resource that is being utilised more and more. New things are being produced from recycled materials, allowing us to be more economical with nature's resources.

A lot of things improve when everyone

separates their waste, and if the waste is to be handled properly, everyone must do their bit. When you separate waste, you help ensure that hazardous substances are not incinerated along with the rest of the refuse bags. Extraction of virgin raw materials is reduced, when

the recycled materials can be used instead. This makes waste into a resource that can be used for materials recycling and energy recovery. Quantities of domestic waste are reduced, and the refuse collection personnel's working environment improves.



Food waste is placed in biodegradable bags made from corn starch, for composting.

The City of Stockholm's environmental goals for waste in Hammarby Sjöstad

- Energy shall be extracted from 99 % by weight of all domestic waste from which energy can be recovered by 2010. Reuse or recycling shall, however, be prioritised.
- The amount of domestic waste generated shall be reduced by at least 15 % by weight between 2005 and 2010.
- The amount of domestic bulky waste disposed of in landfill sites shall be reduced by 10 % by weight between 2005 and 2010.
- The amount of hazardous waste generated shall be reduced by 50 % by weight between 2005 and 2010.
- Residents shall be given the opportunity to separate their waste at source into the following fractions:
 - Materials with a producer responsibility, within the building
 - Separated food waste and "refuse bags", within the building
 - Bulky waste, within the building
 - Hazardous waste, in the local area
- By 2010, 80 % of food waste by weight shall be handed in for biological treatment which utilises its component nutrients for plant cultivation and also utilises its energy content.
- A maximum of 60 % (vehicle km) of waste transports and transportation of recycled materials within the area shall involve the use of heavy vehicles, in comparison with the amount transported using conventional waste management transportation.
- A maximum of 10 % by weight of the total waste generated during the construction phase shall comprise waste that is disposed of in landfill sites.

Waste is separated at source and recycled or used to produce heating and electricity

Three-level waste management

In Hammarby Sjöstad, there are three different levels of waste management: building-based, block-based, and area-based:

Building-based separating at source

The heaviest and bulkiest waste is separated into fractions and deposited in different refuse chutes in or adjacent to the buildings.

- **Combustible waste.** Things made of plastic, paper and other forms of non-packaging are placed in ordinary plastic bags.
- **Food waste.** Food product waste is placed in bags made of corn starch which, unlike plastic bags, are biodegradable.
- **Newspapers, catalogues, paper, etc.** Left loose, not packed. Not for the mobile automated waste disposal system.

Block-based recycling rooms

The types of waste that do not belong in the building-based refuse chutes can be left in block-based recycling rooms:

- Glass, paper, plastic and metal packaging.
- Bulky waste, i.e. old furniture.
- Electrical and electronic waste. Items that require an electric socket or batteries to function, as well as light bulbs, fluorescent tubes and low-energy light bulbs.
- Some of the recycling rooms also have containers for textiles.

Area-based hazardous waste collection point

Waste that constitutes a danger to people and the environment, such as paint, varnish and glue residues, nail polish, solvents or



cleaning agents, batteries and chemicals must never be placed in domestic waste or poured down the drain. It must be separated out and handed in at the hazardous waste collection point in GlashusEtt, the area's environmental information centre.

Where does the waste go?

- **Combustible waste** is transported to the Högdalenverket plant in southern Stockholm where it is incinerated and recycled as heating and electricity.
- **Food waste** is transported to Sofielund in Huddinge where it is composted and turned into soil. The ultimate aim is for food waste to be converted into biogas and bio-fertilisers.
- **Newspapers** are delivered to paper recycling companies and then sent on to paper mills where they are turned into new paper.
- **Packaging.** Paper, metal, glass and plastic packaging is recycled as new packaging or as other products.
- **Bulky waste.** Metal is recycled, combustible bulky waste is incinerated and recycled as heating and electricity. Non-combustible waste is disposed of in landfill sites.
- **Electrical and electronic waste** is disassembled and the materials are recycled. Leftover material is disposed of in landfill sites.
- **Hazardous waste** is incinerated or recycled.

The automated waste disposal system reduces transports in the area

Mobile automated waste disposal system

The waste collected in the mobile automated waste disposal system ends up in underground tanks that are emptied by a refuse collection vehicle equipped with a vacuum suction system. There are separated tanks for each fraction: combustible domestic waste and food waste. The refuse collection vehicle stops at docking points where several buildings' waste tanks are emptied simultaneously, but only one fraction at a time per collection round.

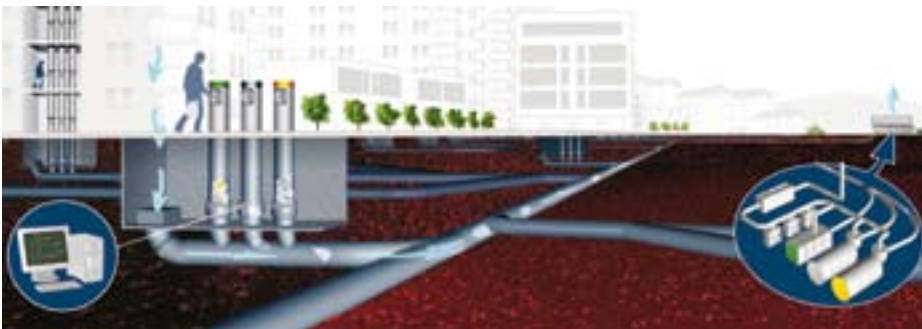


Refuse collection vehicle with vacuum suction system at one of the docking points for the mobile automated waste disposal system.

Stationary automated waste disposal system

All refuse chutes are linked by underground pipes to a central collection station to which they are carried by vacuum suction. The collection station houses an advanced control system that sends the various fractions to the right container. There is a large container for each fraction: combustible domestic waste, food waste and newspapers.

The systems reduce transports in the area, which means the air is kept cleaner than when traditional refuse collection techniques are employed. In addition, the work environment for the refuse collection workers is improved when heavy lifting is avoided.



The waste is separated into different chutes for the stationary system. The various fractions are then transported by vacuum to containers in a central collection station.



An advanced control system ensures that the waste ends up in the right container in the central collection station.

GlashusEtt is the area's environmental information centre

Environmental information centre

The exciting and interesting design and content of GlashusEtt make it the natural focal point for information on environmental issues in Hammarby Sjöstad. This knowledge centre also provides Stockholm with a natural hub for demonstrating the links between modern technology and a better environment in an atmosphere of harmony with exciting new architecture.

The centre is also responsible for its own website – www.hammarbysjostad.se.



Exporting environmental technology

GlashusEtt also plays a very important role in exporting environmental technology. A very close cooperation is taking place with a range of authorities tasked with promoting environmental exports, such as Stockholm Business Region, the Swedish Ministry for Foreign Affairs, and the Swedish Trade Council. In just



Conference rooms

GlashusEtt's conference rooms are used, in part, to receive visitors, but they also function as a meeting place for discussions and conversations about the sustainable city.

GlashusEtt is also used as a teaching centre for a variety of different courses on environmental and urban planning, public meetings, politicians' meetings and customer meetings.



Exhibitions – study visits

The environmental information centre is tasked with spreading knowledge through study visits, exhibitions and demonstrations of the Hammarby Model (see front cover) and new eco-friendly technology. National and international visitors come to Sjöstaden to see not only how the City of Stockholm has planned the new city district, but also how an eco-minded approach has characterised the entire Sjöstaden planning process that went into making it the sustainable city.



a short period of time, Hammarby Sjöstad has become one of the world's most high profile examples of sustainable urban development and is mentioned in specialist publications worldwide. Sjöstaden is visited by over 10,000 industry representatives and decision makers every year. Significant urban projects in Toronto, London, Paris and several cities in China have been influenced by the expertise and technology that forms the basis for our success.

GlashusEtt, the environmental information centre, designed by architect Stellan Fryxell, of Tengbom Stockholm.

A glasshouse built using new eco-technology

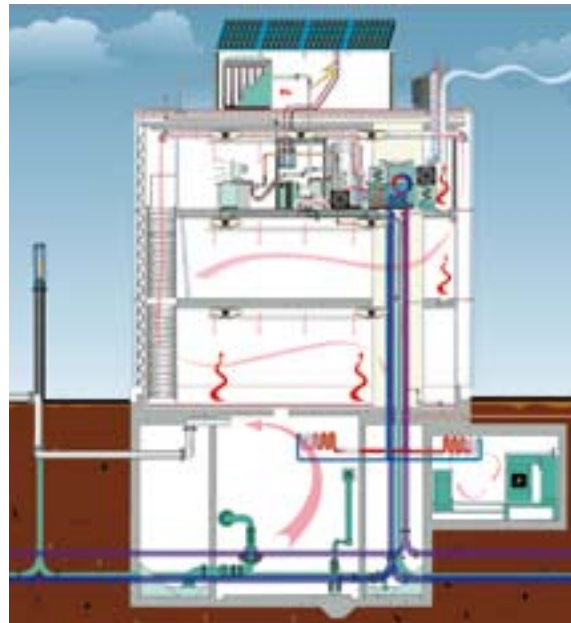
Designing a building for low energy consumption when it consists of three glass and one concrete facades is asking a lot of the planning and design team.

At GlashusEtt, a range of cutting-edge technologies and carefully selected materials, often on the grounds of their eco-friendliness, have contributed towards the successful results. The aim throughout was to achieve a good indoor climate with low energy consumption.

Double-glazed facades and smart-house technology

Double-glazed facades linked to an advanced control system should cut energy consumption to 50 % of that of an equivalent building with glass facades. The double-glazed facades reduce the need for artificial light and the energy requirement for heating, cooling and ventilation.

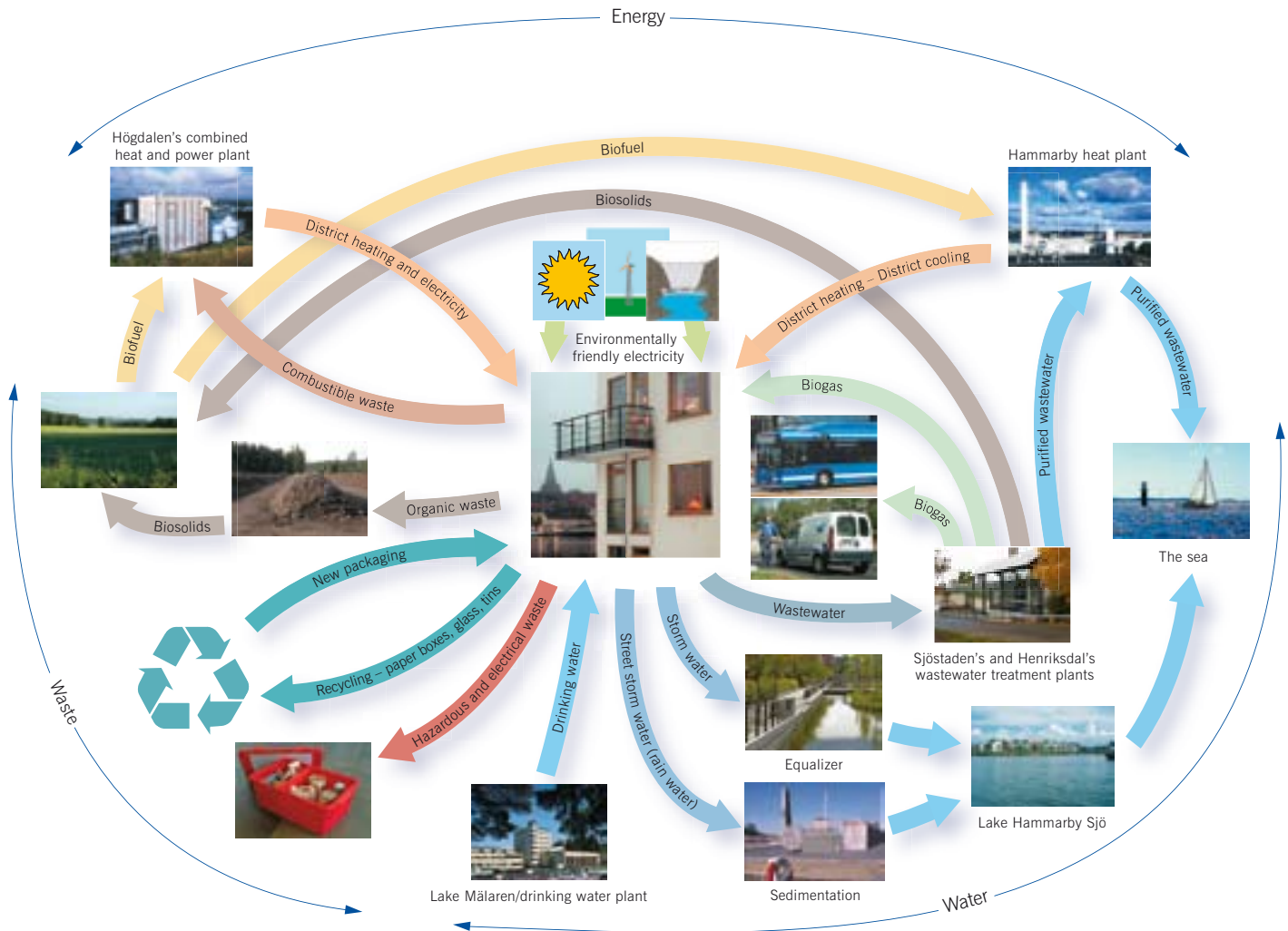
Low-energy lighting has been planned for the entire building. The advanced control system adjusts lighting and ventilation in line with current activities, the amount of daylight etc.



Eco-technology on every floor

- **On the roof**, Sedum plants have been planted to act as a compensation basin during heavy rainfall. A solar power plant, a control system cabinet for the alternative energy system, a weather station and a tank containing hydrogen for a fuel cell are also here.
- **The upper floor** houses most of the building's technical installations, such as a fuel cell and its associated equipment, electrolyser, biogas boiler, an accumulator tank for hot water, control systems for the building's ventilation, etc. A small group meeting room, with a kitchenette equipped with a biogas-powered stove, is also on this floor.
- **The middle floor** is designed as a conference facility where interested parties can be invited and learn more about the project's interested parties and their environmental work.
- **On the ground floor**, which is open to the public, visitors can see how the unique Hammarby Model works, both on computer screens and in the form of exhibitions.
- **The Basement** contains a sewage pumping station, a vacuum-based refuse collection installation and a mains power substation.

The Hammarby model



Hammarby Sjöstad's own eco-cycle

Energy

- Combustible waste is converted into district heating and electricity.
- Biofuel from nature is converted into district heating and electricity.
- Heat from treated wastewater is converted into district heating and district cooling.
- Solar cells convert solar energy into electricity.
- Solar panels utilise solar energy to heat water.
- Electricity must be a "Good Environmental Choice" product, or equivalent.

Water & Sewage

- Water consumption is reduced through the use of eco-friendly installations, low flush toilets and air mixer taps.
- A pilot wastewater treatment plant has been built specifically for the area in order to evaluate new sewage treatment techniques.
- Digestion is used to extract biogas from the sewage sludge.
- The digested biosolids can be used for fertilisation.
- Rainwater from yards and roofs is drained into Hammarby Sjö, rather than into the wastewater treatment plant.
- Rainwater from streets is treated locally using settling basins and then drained into Hammarby Sjö, rather than being drained into the wastewater treatment plant.

Waste

- An automated waste disposal system with various deposit chutes, a block-based system of recycling rooms and an area-based environmental station system help the residents sort their waste.
- Organic waste is converted/digested into biosolids and used as fertiliser.
- Combustible waste is converted into district heating and electricity.
- All recyclable material is sent for recycling: newspapers, glass, cardboard, metal, etc.
- Hazardous waste is incinerated or recycled.



Map of the Environmental Projects in Hammarby Sjöstad

Hammarby Sjöstad's Environmental Map

GlashusEtt

1. GlashusEtt – The environmental information centre of Hammarby Sjöstad. The place to find information on both environmental issues and exciting green technology (solar cells, fuel cells, sedum roofs, etc.). A partnership between the Stockholm Water Company, Fortum, the Stockholm City Development Administration and the Stockholm City Waste Management Administration.

Environmental blocks

2. Holmen, NCC. Winner of the first prize in the City's environmental competition, Best New Construction.
3. Kobben, SBC Bo. Winner of the second prize.
4. Viken, Svenska Bostäder. Winner of the third prize.
5. Sundet, JM. Winner of the third prize.
6. Lugnvattnet, Familjebostäder. Winner of the third prize.

Water

7. Prepared soil for filtration of storm water from streets.
8. Storm water basin with wetland for storm water from streets.
9. Storm water basin with filtration (also power grid station).
10. Channel for storm water from buildings and gardens only.
11. Green roofs and yards collect storm water locally.
12. Sjöstadsverket. Experimental wastewater treatment plant and spearhead-projects for new wastewater treatment techniques.
13. Pumpstation for wastewater.

Energy

1. Solar cells on GlashusEtt.
2. Solar cells for the Holmen block.
4. Solar panels on the Viken block to heat the hot tap water used by the tenants.
6. Solar cells for the Familjebostäder's building.
9. Power grid station (also storm water basin).
14. Fortum's Thermal Power Plant. Supplies Hammarby Sjöstad with district heating and district cooling from treated wastewater and biofuels.
15. Biogas cookers are installed in approximately 1,000 apartments on Sickla Udde and Sickla Kaj.
16. Biogas production facility.
17. Solar cells on the roof of JM's block, Fjärden, providing electricity used in the communal areas.
18. Solar cells for the Grynnan block.

Waste and recycling material

1. GlashusEtt also houses a collecting point for hazardous waste.
19. One of the docking points where the refuse collection lorry connects to the automated waste disposal unit.
20. Collection centre for the stationary automated waste disposal system.

Communications/transport

21. Tvärbanan, a light rail link.
22. Ferry berth with boat traffic to Södermalm (also to central Stockholm at certain times of the year).
23. Old quay restored to form a footpath and cycle route.

24. Footbridge made from stainless steel for long-term durability.
25. Car-pool parking with the best parking spots, right in front of the door.
26. Fuel station for cars running on electricity, biogas or ethanol.

New and existing green spaces

27. New tree-lined avenue that stretches throughout Hammarby Sjöstad.
28. Luma Park. New local park with green hills, Japanese cherry trees (*Prunus serrata*) and a playground. The park also contains a preserved old house.
29. Preserved old trees (birch, elm and lime).
30. Nesting rafts for seabirds. The City of Stockholm Environmental Administration's project designed to promote the biological development of Stockholm.
31. Reed park with oiled wooden footbridges. Viewing points and rest areas.
32. Preserved riparian woodlands with birch and alder.
33. Ecoducts. A green crossing providing enhanced access to the Nacka nature reserve. (A vast forested area with footpaths and cycle routes).
34. Oak-covered slope with 150 old oaks. One of the finest stands in the southern part of the city of Stockholm.
35. Special adaptation of buildings for the oak-covered slope.
36. The Sjöstad parterre and surrounding blocks – awarded the Kasper Sahlin prize for the best block in Sweden, 2005.
37. The Lugnet parterre – scheduled.

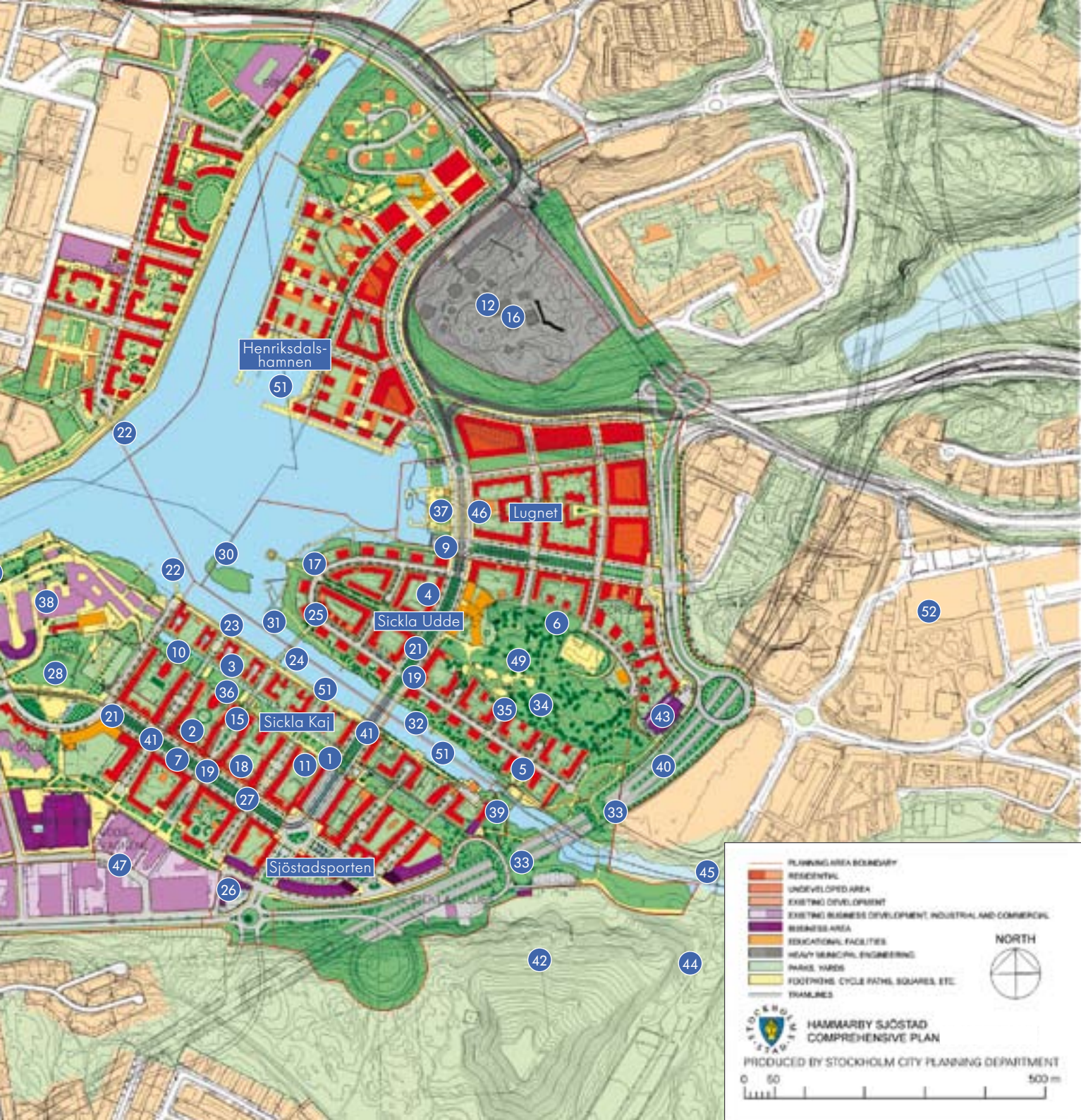
Other

- 38. Listed factory buildings from the 1930s. Restored and now used as office premises.
- 39. Sickla lock and salmon ladder.
- 40. Södra Länken (motorway) lowered to reduce traffic noise.

The healthy city

- 41. Cycle route along the Lugnets Allé and Hammarby Allé thoroughfares.
- 42. Hammarbybacken – slalom ski slope.
- 43. Sports hall.
- 44. The Nacka nature reserve.
- 45. Beach at Sickla Sjö.
- 22. Old quay restored to form a footpath and cycle route.
- 46. The Culture House – scheduled.
- 47. Kulturama – school and culture house.
- 48. Fryshuset – upper secondary school specialising in sports and culture.
- 49. Playground in Ekbacken.
- 50. Playground in Redaren and Sjöfarten – scheduled.
- 51. Pleasure boat moorings.
- 52. Dieselverkstaden - culture house.





- PLANNING AREA BOUNDARY
- RESIDENTIAL
- UNDEVELOPED AREA
- EXISTING DEVELOPMENT
- EXISTING BUSINESS DEVELOPMENT, INDUSTRIAL AND COMMERCIAL
- BUSINESS AREA
- EDUCATIONAL FACILITIES
- HEAVY MECHANICAL ENGINEERING
- PARKS, YARDS
- FOOTPATHS, CYCLE PATHS, SQUARES, ETC.
- TRAILWAYS



**HAMMARBY SJÖSTAD
COMPREHENSIVE PLAN**

PRODUCED BY STOCKHOLM CITY PLANNING DEPARTMENT



GlashusEtt

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