

## Case Study 4

### Stockholm, Sweden: Eco-District of Hammarby

The most innovative feature of the Ecodistrict Hammarby *Sjöstad* was to integrate several infrasystems in the planning from the very beginning: technical infrastructure, mobility and communication infrastructure, building infrastructure and to some extent green-blue infrastructure. Another strong feature is the system of interdisciplinary planning of physical flows of energy, water and waste. *The Hammarby model* is today mimicked around the world — e.g. in the **Caofeidian Ecocity** development in China and in the Swedish SWECO consultant concept *Symbiocity* in Brasil.<sup>i</sup>

**Means: TOOL CUD 3, CUD 2**

	<b>Secondary Tools</b>
	✓ Energy conservation (mostly through a 59% reduction in heat consumption),
	✓ High share of renewable energy,
	✓ Large-scale local wastewater and stormwater harvest and filtration
	✓ High-tech waste sorting and waste transportation vacuum waste suction system).
	✓ New modes of mobility (ferry, new tram line).
	✓ Micro-garden plots or small greenhouses



View of Hammarby Sjöstad<sup>ii</sup>



Hammarby benefits from the presence of water<sup>iii</sup>



**Background.** Since 1995, the city of Stockholm has developed Hammarby Sjöstad (Hammarby Lake City), built on a previous industrial site at a harbor area which has been cleaned up, developed and converted into a modern and eco-friendly district. Hammarby Sjöstad is Stockholm's largest urban development project with its own environmental programme incorporating energy supply, water and wastewater treatment and waste management. Hammarby is meant to provide 10,000 apartments for 35,000 inhabitants and it occupies 200 ha of land in Southern Stockholm. Hammarby was developed to support Stockholm's bid for hosting the 2004 Olympic Games. Mixed forms of tenure apply throughout the district, with a 45%-55% split between tenancy and tenant ownership. Hammarby is a well-planned area with its own recycling model and local sewerage treatment plant. Energy is being produced in the district heating plant, based on renewable fuels. Combustible waste is burnt to generate heat. The integrated model for energy, waste management, water management is now known as the "Hammarby model". Sweden's environmental code came into effect in 1999, and demands the integration of environmental concerns in all public planning activities. Today, the development of Hammarby almost complete.

**Environmental targets and the Hammarby model.** The city council aimed to make this district two times more sustainable than other best practices of energy-efficiency in Sweden, which normally is 200kWh/m<sup>2</sup>. Other cutting edge practices produce an average annual energy use of 120kWh/m<sup>2</sup>, while Hammarby's target is 100kWh/m<sup>2</sup>. Other environmental targets include water conservation, waste reduction, reduced hazardous materials in construction, use of renewable energy sources, and integrated transport solutions. Representatives from different key departments of the city administration were concentrated into a project team to synergize all sectors (planning, energy, waste management, real estate, traffic, water and sewerage). Jointly they developed the "Hammarby model". The Hammarby model is a unique eco-cycle system that integrates energy, solid waste, water and wastewater for homes, offices and other activities in the area. Seen as a blueprint for city systems of the future, the cycle also includes all stormwater, rainwater and meltwater.

The following accomplishments are being reported:

**Land use.** Industrial brownfields have been redeveloped into attractive residential areas, with parks and green spaces. This fulfilled the city's intention to develop the city without opening up virgin land through greenfield development, in accordance with the 1999 Stockholm City Plan.

**Building materials.** Healthy, dry and environmentally sound materials utilized. These have been selected according to their ecological characteristics. No harmful materials allowed. All materials used - inside and outside the buildings - were carefully selected based on environmental considerations. The philosophy is to use proven, sustainable materials and products with environmental declarations, and to avoid chemical products or building materials containing hazardous substances.

**Water.** Reduction water consumption per person by 60% has been achieved.

**Solid waste management.** Waste is treated as resource. Waste recycling being practiced widely. Combustible energy is being returned to the community as energy and hot water. Domestic refuse is separated into different chutes and the various fractions are then transported by vacuum to containers at a central collecting station. Reduction of land fill waste by 90% through recycling and environmental consciousness. 40% reduction of all waste produced. Recovery of 50% of nitrogen and water discharged, recovery of 95% of phosphorus for usage as fertilizers in agriculture.

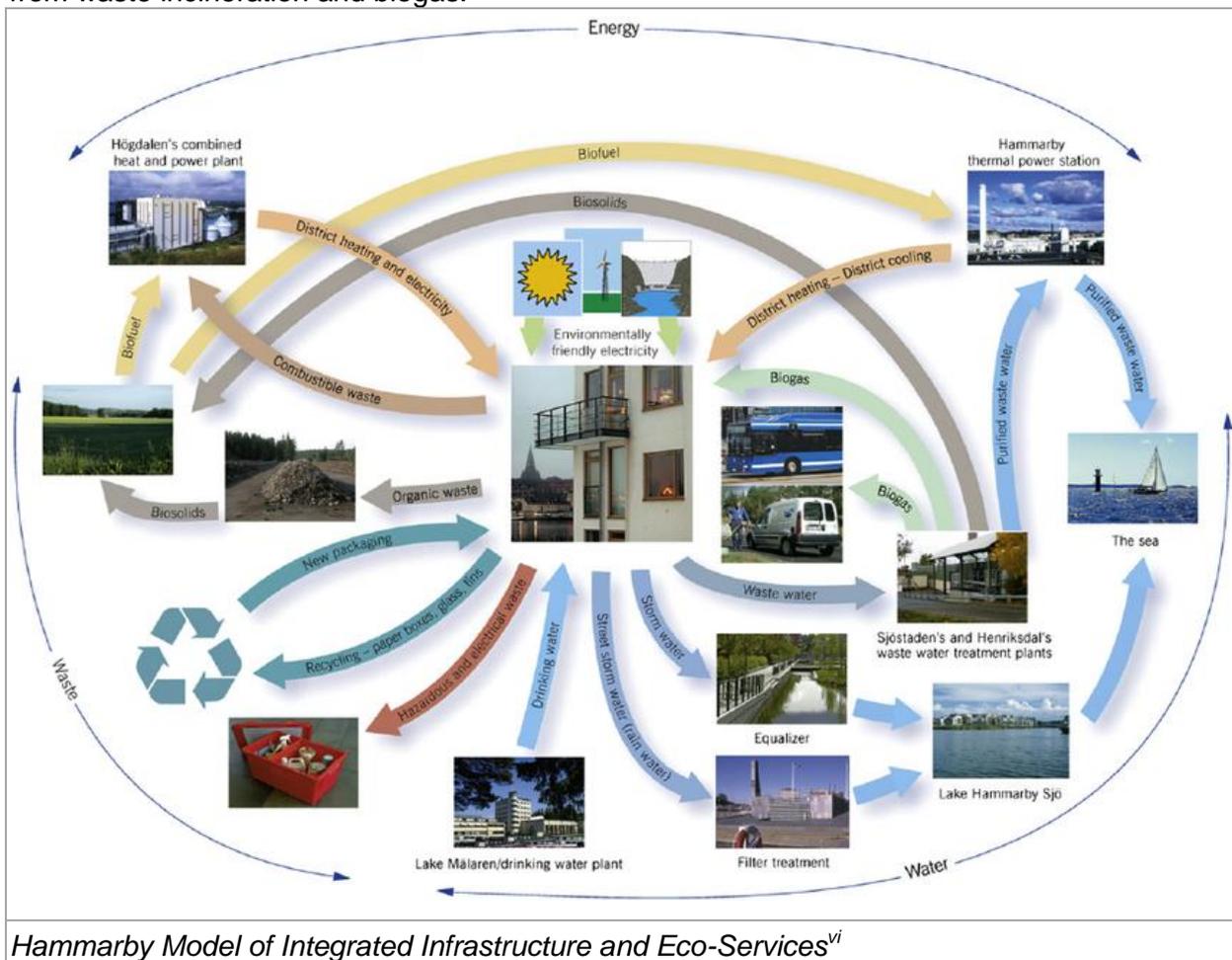
**Transport.** A fast and safe tramway system and a ferry provide public transport. A network of cycling paths is the backbone of the non-motorised transit system. The district has a car-sharing system. Individual car parking has been limited, with voluntary contributions by community members giving up private car use. Numerous bicycle parking facilities. 80% of the population is travelling on public transport. 25% electric or biogas vehicles. “Hammarby’s transit spine goes through the main areas of the district so that every residence is within walking distance from a transit stop. Density is also concentrated along the transit lines. The transit spine’s ability to link all residences to a major transit source exemplifies transit-oriented development.”<sup>iv</sup> → Tool CUD 3



*Hammarby’s transit spine goes through the main areas of the district so that every residence is within walking distance from a transit stop.<sup>v</sup>*

**Energy.** Hammarby Sjöstad produces half the energy it needs. The energy concept is based on sustainable and renewable fuels, re-use of waste heat, biogas and household energy efficiency. The adjacent Hammarby thermal plant extracts heat from the treated wastewater and also contributes by-product energy to the district cooling network. The Högdalen co-generation plant separates combustible waste as an energy source in electricity and district heating production. Energy consumption of buildings was target at 50kWh/m<sup>2</sup> out of 15 kWh/m<sup>2</sup> for electricity. 100% is sourced from renewable energy sources (RES): usage of energy from waste incineration - 80%; biogas production from sludge (and waste water) accounting for the remaining 20%. Centralised production of district heating and cooling is another feature, with cooling generated as a clean by-product of district heating production. Hammarby Sjöstad also has solar panel installations on its walls and rooftops that use photovoltaic cells to convert sunshine into energy for heating water. Renewable energy sources such as biogas, and reuse of waste heat have been coupled with efficient energy consumption in buildings. 23,000 tons of sludge are being treated annually and 3,5 million cubic me-

ters (m3) of biogas are being produced. District heating is being supplied to all Hammarby from waste incineration and biogas.



**Social facilities.** Public facilities include schools, kindergarten, homes for the elderly, sports facilities, libraries, bookshops, concert halls, hair dressers, restaurants, pharmacies, post offices, and various commercial establishments. The environmental information center provided advice on ecological technologies and resource conservation. The district also provides a healthy environment for residents, offering ample opportunities for exercise, sport and local culture.

**Social participation.** Involvement of citizens in planning and implementation. Creation of attractive places for living and work. Recreation for better health is encouraged.

**Decentralization and management.** In Sweden, cities, however, do have legal and financial autonomy. Since that date, Stockholm has developed its Local Investment programme of Euro 693 million for ecological sustainability. The Hammarby project was estimated to cost about 15-20 billion Swedish Crowns. Various different parties have financed the project. The City of Stockholm joined forces with 25 construction companies to build the district, with the latter contributing 80% of the total cost. Other funding comes from two government agencies - the Swedish Rail Administration (rail transport) and the Swedish Road Administration (routing of the Southern Link ring road). Great emphasis placed on collaboration of different social and economic actors, and holistic thinking being encouraged between the city administration, real estate sector, technology companies, the water company, city waste management company, city environmental information centre (GlasHuset).

**Evaluation.** Initial findings of the first cycle of development indicate a 30% of reduction in non-renewable energy (NRE) use, a 41% reduction in water use, a 29% reduction in global warming potential (GWP), a 41 % reduction in photochemical ozone creation production (POCP), and 36% reduction in acidification potential (AP), a 68% reduction in eutrophication potential (EP), and a 33% reduction in radioactive waste (RW).



High quality outdoor space<sup>vii</sup>



Hammarby Sjöstad, Stockholm - canals<sup>viii</sup>

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**Sources and Further Reading:**

<sup>i</sup> Source: <https://www.thenatureofcities.com/2014/02/12/hammarby-sjostad-a-new-generation-of-sustainable-urban-eco-districts/>

<sup>ii</sup> <http://blog.bearing-consulting.com/wp-content/uploads/2015/06/Hammarby-Sjostad.jpg>

<sup>iii</sup> Source: [https://www.symbiocity.org/Global/Images/undersida/case\\_L\\_hammarbysjostad.jpg](https://www.symbiocity.org/Global/Images/undersida/case_L_hammarbysjostad.jpg)

<sup>iv</sup> Source: China Development Bank Capital (CBDC). 2015. *12 Green Guidelines. CDBC's Green and Smart Urban Development Guidelines*. Beijing (draft).p. 15. <http://energyinnovation.org/wp-content/uploads/2015/12/12-Green-Guidelines.pdf>

<sup>v</sup> <http://energyinnovation.org/wp-content/uploads/2015/12/12-Green-Guidelines.pdf>

<sup>vi</sup> Source:

[https://www.researchgate.net/publication/257408762\\_Implications\\_of\\_systems\\_integration\\_at\\_the\\_urban\\_level\\_The\\_case\\_of\\_Hammarby\\_Sjostad\\_Stockholm/figures?lo=1](https://www.researchgate.net/publication/257408762_Implications_of_systems_integration_at_the_urban_level_The_case_of_Hammarby_Sjostad_Stockholm/figures?lo=1)

<sup>vii</sup> <http://ecodistricts.org/wp-content/uploads/2013/05/Hammerby.pdf>

<sup>viii</sup> [http://www.plataformaarquitectura.cl/cl/799017/estocolmo-ya-tiene-su-primer-barrio-sustentable-y-desde-los-90?utm\\_medium=email&utm\\_source=Plataforma%20Arquitectura](http://www.plataformaarquitectura.cl/cl/799017/estocolmo-ya-tiene-su-primer-barrio-sustentable-y-desde-los-90?utm_medium=email&utm_source=Plataforma%20Arquitectura)