

**CASE STUDY:** Source Separating Wastewater System in Ekoporten, Norrköping, Sweden

**SECTOR:** Water/Sewerage  
**COUNTRY:** Sweden



### **BACKGROUND**

The housing company “Hyresbostäder i Norrköping AB”, owned by the local government, in 1995-1996 reconstructed the existing apartment house Ekoporten, located in the Porten area in the city of Norrköping. The objective was to test new technical solutions for resource-saving and recycling living. Another important goal was to create an interesting and positive object in an area with big social problems. The project has been followed up during the years of construction and under the first living years. The follow-up has been documented in four reports, covering Energy, In-door climate, Water and wastewater, and Ventilation. This case-sheet focuses on the water and wastewater study.

The house was originally constructed in 1967 and was fairly typical for this period. It is a three-floor house with today 18 apartments. The reconstruction of the house included many kinds of ecological and resource-saving solutions concerning construction materials, insulation, ventilation etc. Moreover, the house and the apartments were given a modern and nice design as a whole. The house has

become a symbol for the Porten area and for the housing company.

The house is heated with local district heating, except during the warmer season, when sun-panels heat the tapwater, which is stored in accumulator tanks.

The tenants are educated in environmental thinking. Education comprises what detergents to use, how to sort out the garbage and how to use the toilets. The toilets are urine separating. The urine is stored in big tanks and later used by local, ecologically cultivating farmers. The faeces are composted in an automatic composting device together with paper-, kitchen- and garden waste. The compost product is used by the tenants as fertilizer in cultivation of vegetables and flowers.

The flush water is separated from the faeces and treated with ultraviolet radiation for disinfection. The flush water is then together with the grey water from kitchens brought to a three-chamber-tank. At first it then was brought to a reedbed where the plants took nutrients from the water before discharging to the stream Ljurabäck. In a later stage it was brought to the municipal sewage system.

The heart of the technological systems in Ekoporten is the great computer-establishment in the basement. The establishment controls and registers most states and flows. All data, which have been stored in the computers, are used in a comprehensive evaluation.

A multi-scientific research group has studied the house from different points-of-views.

### **EVALUATION**

The house has since the reconstruction been evaluated by a multi-scientific group of researchers. The evaluation has comprised measurements of all kinds of flows, and interviews with the tenants and the administrators. The water and wastewater system is evaluated and reported annually.

In a separate study, the psycho-social experiences have been observed. The households of Ekoporten were interviewed 1998. The conclusions were in summary: a/ The tenants appreciated very much the living in Ekoporten, to a high degree depending on the extraordinarily high standards of the apartments, the installations and the generous common facilities; b/ The ecological living caused only small problems, mainly concerning the urine-separating toilets (insufficient information); c/ The ecological living did not increase the general environmental concern in other sectors.

Ekoporten was in 1998 presented at the conference "Green Building Challenge" in Vancouver, Canada, and arouse great interest. In comparison to several other projects, Ekoporten got the highest score regarding five out of six major aspects considered. Just regarding energy, the project got a medium grade. The potential for energy savings with the sun-power systems is not high enough to get the highest grade. Further, the energy system at this time was not yet operating optimally.

The water consumption in the households was 1996-1997 44% lower than in conventional houses, although the measurements show a considerable variation between the households.

The sewage water treatment effects in the reed-bed did not match the treatment effect in the ordinary central waste water treatment plant in Norrköping, Therefore, the reed-bed was taken away, and the sewage water pipe was connected to the regional sewage water

system. When the whole wastewater system is taken into account (including the urine-separation), the reductions of nitrogen has been 83% and of phosphorus 89%. The toilets, the separating units and the storage tanks need continuous maintenance (daily).

In the beginning, the housing company did not succeed to find a market for the urine because EU regulations do not permit using humane urin as fertilizer on crops cultivated for people. Since 2002 two ecologically orientated farmers in the vicinity take advantage of the urine as fertilizer. The urine is spread at pasture land, and works quite well as fertilizer.

The composting of kitchen refuse and faeces in the automatic composting device works according to the intentions.

Data are also available for all other technical systems in the house, e.g. the ventilation system and the energy system.

The total cost for the reconstruction of Ekoporten was approximately twice as high as for other houses in the area. Lower consumption of energy and water will not compensate for this extra cost. Still, the rent is not higher in Ekoporten, due to temporary national subsidies for construction of ecological municipal projects. However, if the whole residential area Porten is taken into consideration, the project has been economically beneficial. The reason for this is that Ekoporten has made the area popular, and the letting rate regarding all apartments in the area has increased. As an experiment, feed-back has been very important when reconstructing a much bigger residential area.

### **DRIVERS**

The Porten area suffered after 25 years of social problems and of physical wear. The houses were not up to modern standards regarding energy saving, accessibility for disabled, waste management etc. In the year 1995 the housing company Hyresbostäder i Norrköping AB had already reconstructed all houses in the area except one. The company then decided to make this last house an experiment in environmental-friendly construction and living, using the latest technology. The purpose of the company was to use the house for gaining experiences for future reconstructions, for marketing the company's environmental profile, and to create a positive symbol for the area.

All the former tenants moved out during the construction phase, and none wished to move back. The new tenants were picked by the company according to its normal procedures. No special requirements concerning environmental concern etc were raised.

### LESSONS LEARNT

During the first few years considerable effort was spent to make all the complicated equipment to work properly. Probably more time devoted to the detailed design would have been beneficial.













The house is now in normal operation and performs very much according to the intentions. The complicated technology of the

house makes it hard to say that it is more physically robust than other houses. However, it has definitely turned out to be more socially robust, due to the comfort and well-being of the tenants and to the deepened social contacts that have developed.

### APPLICATION and TRANSFERABILITY

The house is today, due to the comprehensive follow-up program, an important source of knowledge for housing companies, researchers and product developers in Sweden and internationally. The many positive implications of the reconstruction of the house and of the living in it are today mainly contradicted only by the high investment cost.

### IMPACT ON SUSTAINABILITY AREAS

Ecology		Economy		Social aspects	
Emissions? <sup>a)</sup>		Cost/effective? <sup>c)</sup>		Participation? <sup>d)</sup>	
Use of natural resources? Recycling? <sup>a)</sup>		Willing to pay?		Transparency?	
Bio-diversity? <sup>b)</sup>		Effective organisation?		Safety?	
<b>Total</b>		<b>Total</b>		<b>Total</b>	

- a) Less emissions and use of natural resources due to local system and recycling, but phosphorous has nowadays to be distributed to the regional sewage system.
- b) Dependent on the interest in cultivation by the local residents; no special arrangements done.
- c) However, cost effective looked upon as an experimental station for feed-back to other projects, and very cost effective if the attractiveness of the whole area Porten is taken into account.
- d) The local residents did not take part in the design process, but are involved in management.

Lindgren S. & Grette S. (1998) Ekoporten Norrköping. Vatten- och avloppssystem. SABO utveckling. (Unpublished)

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