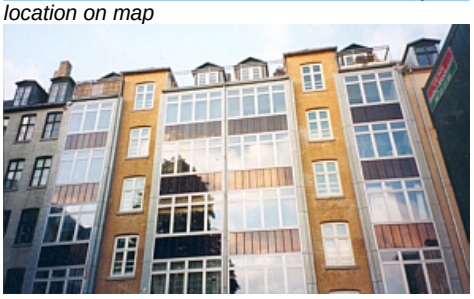
location on map



Inner-courtyard facade

Hedebygade

location: Copenhagen, Denmark

dates: Original construction was in 1880s. Initial reconstruction begun 1972; Various ideas and plans for the Hedebygade block continued into the 1990's; Final plans produced 1996; construction completed 2004.

type: Urban ecological renovation (experimentation and demonstration) project

use: Residential

size: 9 buildings in an urban block, 150 apartments reduced to 115

people: 600 inhabitants before the renovation and 430 after

actors: Copenhagen Municipality, Ministry of Housing, SBS (Urban Renewal Company), several consulting architects, engineers, and residence.

goals:

- to establish a greater demonstration project in Copenhagen of ecological (environmentally sound) renovation
- to contribute to ecological solutions for renovation of old houses
- to demonstrate Danish capacity of ecological renovation
- to promote commercial utilisation of ecological solutions for urban renewal

energy use	KWh/m^2
warm water&heating, urban renewal environmental target	100
warm water&heating, goal for new construction	75
warm water&heating, achieved average	110
el. use kWh/person, urban renewal environmental target	2000
el. use kWh/person Copenhagen, average	1550
el. use kWh/person, achieved	1073-2039

construction

- existing load-bearing masonry

amenities

- shared community house
- waste-sorting facilities

systems	
district heating	x
combined heat & power	
solar panels	x
solar cells	x
biomass and refuse	
wind power	
natural ventilation	x
forced vent.w/heat recovery	x
non-renewable energy	x
individual metering	x

site ecology

- new planting areas
- rainwater collection
- plant selection to encourage native birds and insects

special features of the project

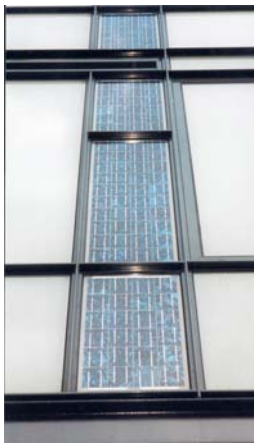
- tenant involvement
- individual metering
- heliostat-focussed daylight
- indoor planting beds used to clean air
- sun walls with solar cells and heat exchanger
- energy saving facades
- a prism with light-shaft effect
- focus on pedestrian, bicycle and public transport

process and history

Some of the first buildings built outside the original city limits of Copenhagen were built in the Vesterbro district for working class families, along with trade and industrial buildings. Within this district is the dense Hedebygade block, consisting of approximately 18 residential buildings grouped around a long and asymmetrical courtyard. The courtyard, typical to this type of housing, initially had housing within it as well; this had been cleared in 1972 as the City Council prepared to renovate portions of the Vesterbro district rather than demolish the entire district as earlier urban renewal projects had done in other neighbourhoods.

Inner courtyard

Site



PV cells integrated in the facade

process and history

Various action plans were considered and taken up in the ensuing years, until a proposal acceptable to both the residents of the buildings and the City Council resulted in a plan for renewal of the Hedebygade block in the spring of 1996. This renewal plan coincided with an increased focus by the city in urban ecology, supported by public sentiment. This led to a grant of 5 Million Euros by the city government to assist with demonstration projects as part of the renewal of Hedebygade, which would showcase Danish innovation, technology, and knowledge within the field of ecological and sustainable building, construction, and planning.

description of special project features

As a part of the urban renewal of the Hedebygade block, 11 out of 12 different projects of urban ecology have been completed. This includes projects in 9 buildings, and 2 projects covering the whole block. Each project dealt with a different subject: prism, flora, 'green' kitchen, sun wall, flexible facades, integrated ecological renewal, sun in the urban renewal, waste sorting, shared courtyard and community house, house end project, and measurement of consumption. The municipal plan which was developed for the area stated that existing houses had to be preserved with regard to environment, architecture and social life. Many different technical solutions were tested, among these several innovative ones. The facade solutions were the most convincing: The sun walls with solar cells (photovoltaics) and heat exchanger, and the energy saving facades demonstrated in the subprojects 5, 6, 7 and 8. Subprojects 6, 8 and 11 are examples of the successful integration of photovoltaics into the facade. Some of the more successful projects were the following:

1. Project 5, the Sun Wall project. This project utilized passive solar techniques combined with solar air collectors on the roof, added insulation, low-e glazing, and heat recovery.

2. Project 6, the Flexible Facades project. PV's and low-e glazing added to the facades and balconies.

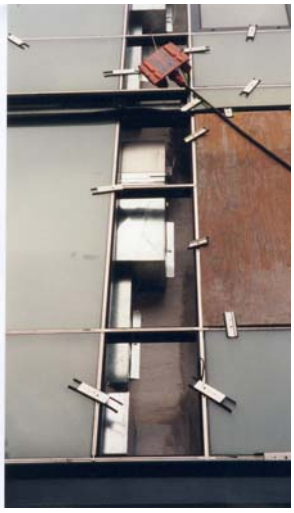
3. Project 8, Sun in the Urban Renewal. In this project, solar cells were integrated into the roof, ventilation with heat recovery was implemented, daylight to the apartments was increased, low-e glazing was used, and solar panels were integrated into the facades.

4. Project 10, Shared Courtyard and Community House. This project was responsible for arranging the waste-sorting stations, the rainwater collection ares, planting bed locations, and a community house with a kitchen and laundry facilities located centrally in the courtyard.

Solar cells make a visionary impression, although photovoltaic panels of that size and of that location provided only a small supplement to the total electricity consumption.

results

Following the concept of Eco-accounting (Environmentally accounting) improved by the Danish Builiding and Urban Research, five indicators for the extent of sustainability are used. These 'urban ecology indicators' are heat consumption, electricity consumption, water consumption, waste production and CO2 emission. All indicators are based on annual accounting (y) and related to the amount of residents' (p). An additional indicator makes up the heat account in relation to the area being heated.



While 2 of the buildings do achieve a lower energy consumption than the goal, it has been pointed out that this does not result in less carbon emissions. This is due to the fact that the district heating system emits less CO2 than the electricity required to power the heat recovery ventilation and other systems that partially replaced the demand on the district heating.

Water consumption per person was reduced to 89-120 l/per, where the average for Copenhagen is 126l/per and the goal is to have 110l/per. Household waste was increased from 279hk/per year in 1996 to 300 kg/per year in 2003, where the average for Copenhagen for the mentined years rose from 231 kg to 241 kg.

Architecturally, the renovation project is a success.

Extra investment in urban ecological solutions will return the whole investment within a period of twenty years – a period that could be shortened considerably by increased energy prices.

To the participants the many projects that were gathered in one location revealed some basic principles for renovation of the older building stock. Furthermore it revealed how far it is possible to advance by using new aesthetic expressions.

Visualisation of individual metering

One of the critical lessons to be taken from this project is the value of visualisation metering. This has been successful in other projects as well, such as Gårdsten in Gotebörg, Sweden. When households are given the opportunity to visualise their consumption of electricity, hot water, and heating, their consumption levels drop. In many ways this is tied to economics, where a direct correlation between utility bills and resources consumed becomes visually apparent.

In the case of Hedebygade, where the residents have been a part of the dialogue concerning ecology throughout the project, this visualisation also encourages and supports an attitude throughout the community where lower resource consumption is a goal, and so it could be said that the motivation is not entirely economic.

The meters, placed in each fl at, allow household members to view the daily, monthly, or yearly consumption of water, heat, and electricity. These meters read from the radiators, hot water sources, and electricity sources for each flat. The meters are also connected to and inform a central computer that registers consumption by each unit but also generates quarterly accounts and Eco-accounts. These accounts are posted in the central hallway or stairways of the buildings and allow tenants to compare their consumption against other tenants.

costs

The total cost was 50 million euro. The Ministry of Housings granted a total of 40 million DKK (app. 5.3 million €) for the greening of the buildings. The funding came from the national campaign "Project Renovation", where a number of different renovation processes and technologies were tested and developed.

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sources:

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