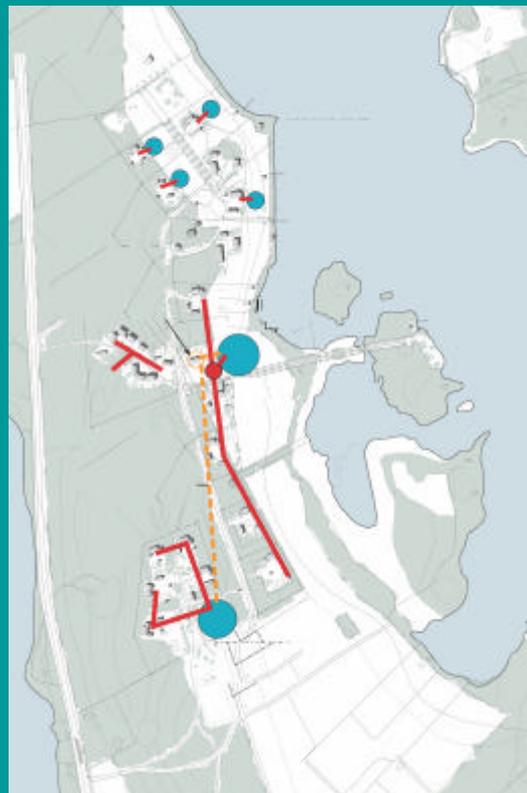
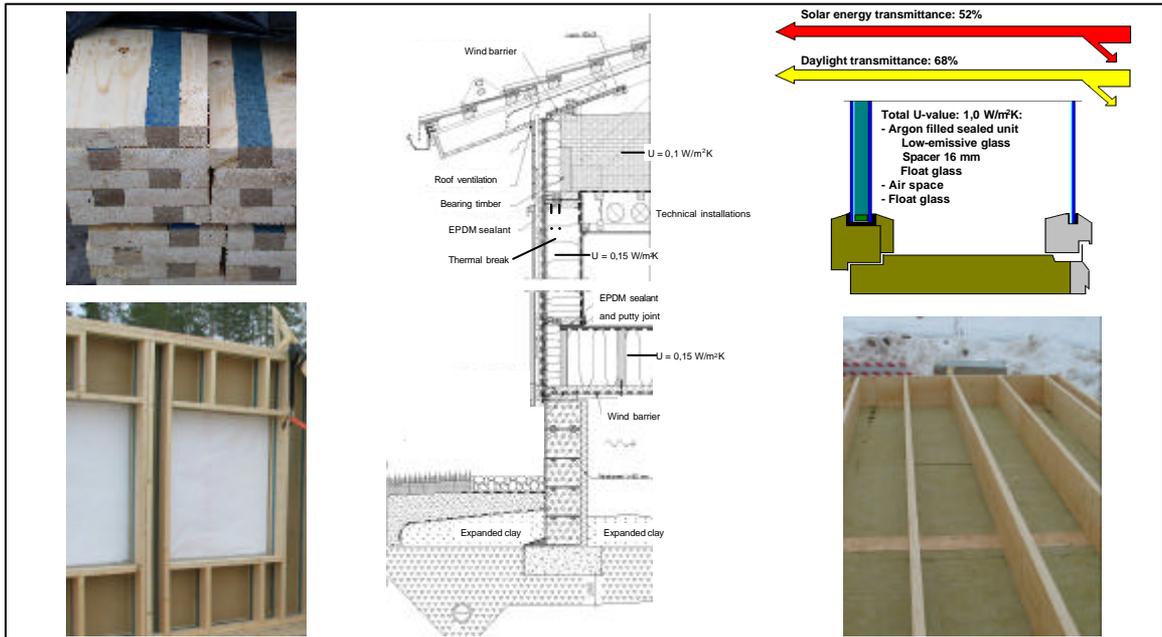


Demonstration houses in Tuusniemi, Finland





The project

Tuusniemi is a small municipality of 3000 inhabitants in East Finland. Tuusniemi is located in less than one hour travel time from two major regional growth centres and university towns Kuopio and Joensuu.

The housing area is located between two lakes, both with extremely pure water, and bounded by traditional rural cultivated area. Peaceful, pure, and safe environment together with eco-efficient housing were chosen as targets for the new housing area. The project demonstrates how eco-efficiency can be utilized as drivers in community economics, new business activities, and employment in municipalities outside growth centres.

The housing area consists of altogether 16 buildings, 13 single-family houses, two linked houses, and a building for common use. The master plan allows for construction of single-family houses up to 250 m². Two types of model houses have been developed. These houses can be extended from 75 - 125 m² up to 195 - 225 m² according to future needs of the users. The houses are built and sold ready-made or with existing building permission for extension. The linked houses are together 1500 m² with 14 apartments

The area has a distributed heating energy supply network based on ground heat and solar energy. The houses are built by a new company that will take over the maintenance and management of the area and its networks. The construction of the area starts on March 1, 2004.

Objectives - Goals

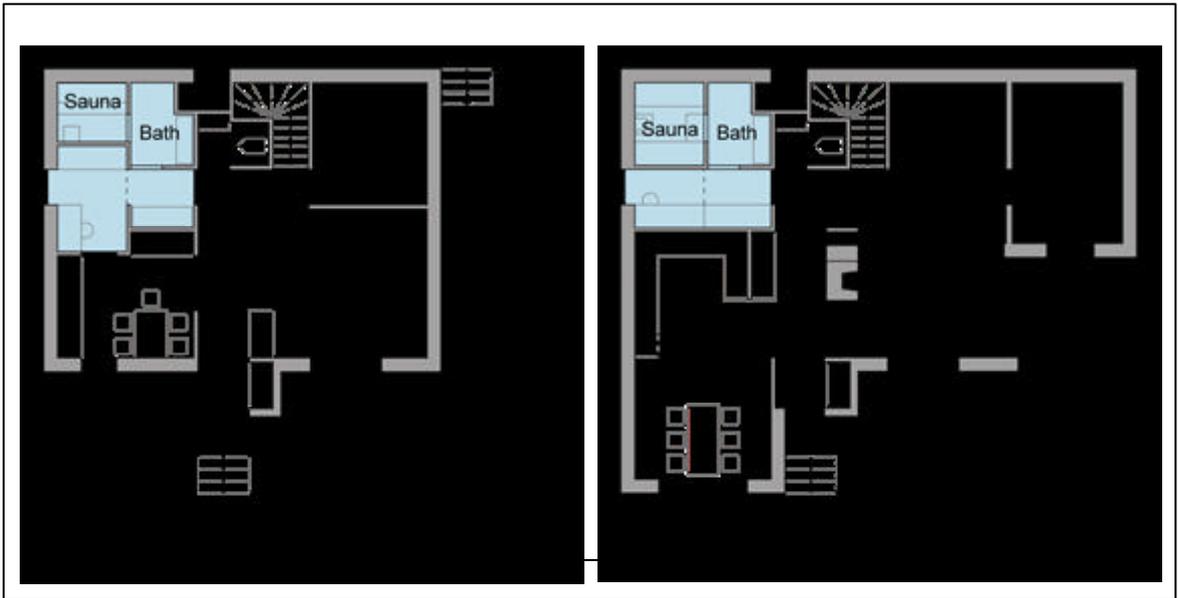
The Tuusniemi municipality suffers from depopulation and distortion of age structure. Due to poor working possibilities, young people move to other locations. This causes growing socio-economic problems.

The community decided to persuade new inhabitants to the community by offering high-class but acceptable cost housing possibilities especially for young families. The housing area is equipped with working facilities for common use to enable remote working. All the houses have high-standard internet connections. Public services, schools, nursery, health care center etc are available within walking distance. Public transport connections serve for working in the cities.

Building construction

Building envelope is based on a new open wood-framed building system Nordic Platform allowing for shorter delivery cycle than with typical construction. Special features of the system are 250 mm wood-frame with thermal break for exterior walls and trussed construction for internal floors. The walls have an air tight additional exterior insulation layer facing air cavity and wooden façade.

Insulation thicknesses and corresponding U-values including thermal bridging in construction are 275 mm (U=0,15 W/m²K) for walls, 450 mm (U=0,15 W/m²K) for floor with crawl space foundation, and 500 mm (U=0,10 W/m²K) for roof. Windows are triple glazed with one argon gas filled sealed unit and one selective coating. Total U-value including frame is 1,1 W/m²K.



Technical systems

All the houses have a mechanical ventilation system with heat recovery. Two heating systems are introduced: floor heating and ventilation heating system.

All the buildings are connected to local distributed heat supply network based on ground source heat pumps. The municipality built distributed heat pump system consists of four separate networks according to plot ration of building sites. Heat pumps are operated by the maintenance company, and they use wind energy. The yearly COP of the heat pumps is estimated 3,0.

All the houses and apartments have a fire place designed for a low-energy building. The design allows for a long heat supply with low supply power.

Energy performance

The houses are designed so that the larger is the house the less energy by m² it consumes. The heating energy demand can vary between 70 - 50 kWh/m², which includes energy produced for heating and hot water by heat pumps, and fire wood used in the fire places. Company built houses are required to have lower consumption than houses built by home builders. The peak auxiliary heating energy power is restricted to 35 W/m².

Consumption, kWh/m ²	Existing buildings	Tuusniemi
Heating energy	140 - 170	25 - 30
HVAC electricity	20 - 30	10 - 20
Household	30 - 40	25 - 35
Total	190 - 240	60 - 85

Costs

The construction costs of the houses correspond to average costs of detached houses. The selling price of the houses start from 100 000 € including the site.

Planning tools

The project started with an intensive briefing using VTT's building properties classification tool EcoProP. The briefing tool produces automatically a document that is the basis for code of practice for construction. Energy analysis with regard to fire places in individual buildings were carried out using simulation tool VTTHouse. Life-cycle costs and life-cycle economy of the area are estimated using VTT's life cycle economy model based on ISO 15686. LCA tool BeCost was used in environmental assessment of the buildings.

Marketing strategy

The marketing of the housing area is based on high environmental values introduced with safe and pure natural environment. The main target group for marketing is young families. A special direct marketing effort for young families in Kuopio and Joensuu is designed by the Design Institute of Savonia Polytechnics. A study on the housing preferences of target group in the regional town is being carried out to serve as marketing aid for the project. Information of the project can be found from the project web-site.

The project progress is followed and publicity gained by a project leaflet is published every two to four weeks. The project is presented in all the major fairs for home builders and annual housing fair in Finland. The houses are sold by a large housing agency in Finland operating country-wide.

Other information

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Project web-site: <http://www.hietaranta.net/>

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<http://www.vtt.fi/>

Nieminen, J. Eco-efficient housing as driver in community economics. Paper to ENHR European Network on Housing Research Biennial International Housing Conference. Cambridge, UK, 2-6 July 2004

Common text about Task 28