

## ACTIVE SOLAR HEATING SYSTEMS IN URBAN AREAS

### Abstract:

The effects and advantages of solar energy have been known to mankind for a long time. With the progress of modern research the systems developed for taking advantage of the solar heat have been improved and solar collectors can now be used for gathering solar heat for both domestic hot water and space heating purposes. Some problems still remain with the technical solutions and experiences from use in cold climate are scarce as the use of solar heating systems in Finland is still rare. The thesis aims at evaluating and analyzing the experiences from the solar heating project in Eco-Viikki, Helsinki and at discussing the critical success factors for future solar heating projects in urban areas in a cold climate.

The theoretical part of the thesis consists of a literature review that defines the general principles of solar heating systems. In the empirical part the solar heating systems in Eco-Viikki are evaluated in detail and the experiences are compared to two cases set in similar circumstances. The conclusions are formed as a synthesis of the literature review and of the comparison between the experiences from the three cases studied. The conclusion also includes recommendations for future similar projects.

The study confirms that the use of a solar heating system in an urban area in combination with district heating in a country with cold climate is a method for reducing energy consumption in real estate. It is stated that the complicated system planning of the Eco-Viikki solar heating systems is partly responsible for the defective condition of some of the solar heating systems in use. The use of solar heat for both domestic hot water and space heating must thus be carefully thought through. A contributing reason for the operational problems and the low efficiencies of the systems in Eco-Viikki are the house managing agencies' lack of knowledge about the maintenance and the operation of the systems. The thesis also emphasizes that careful monitoring of the systems is needed to achieve optimal performance of the system.

### Main findings:

1. Solar heating systems in urban areas are a way of achieving reduced energy consumption
2. Monitoring of the system is necessary
3. A competent house managing agency increases the benefit of the solar heating system
4. The solar heating system must be optimally planned
5. The use of solar heat for underfloor heating purposes should be considered carefully
6. District heating is a possible choice as auxiliary heating system for a solar heating system