

Energy-saving, Costs and Environmental Impact of Renovation of Residential Buildings

Degree project information

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Introduction

- This study looked into three residential buildings located in Lund, Sweden. Five different renovation measures concerning insulation, window, ventilation, heat source and solar energy are studied from energy saving, costs, and environment protection.

Why do we renovate the buildings?

- Replacing wearing components
- Saving energy by improving the buildings
- Money-saving caused by energy saving
- Protecting the environment by saving energy or using environmental products
- Creating a more comfortable indoor climate

How can we renovate?

Five renovation measures were proposed:

- Putting more insulation materials on the external walls
- Replacing the old double-glazed windows with more insulated triple-glazed windows
- Including heat recovery to the current ventilation system
- Replace district heating with ground source heat pumps to supply heating demand
- Install photovoltaic panels (PV panels) on the roofs to collect solar energy

What should we consider when renovating?

- How much energy can be saved by these renovation measures?
- How much money can be saved in the future because of renovations?
- How can we reduce environmental impact by renovating buildings?
- Can we save some money when renovating on a neighbourhood level?

Which are the optimal renovation strategies?

- In terms of primary energy saving, ground source heat pump, ventilation with heat recovery, and PV panels are efficient measures that save both energy and costs. 120 mm additional insulation helps reduce energy cost also. But thicker insulation is not cost-effective because of its higher initial costs.
- When it comes to environmental protection, PV panels and ventilation with heat recovery are the most efficient measures. However, external wall renovation increases greenhouse gas emission (CO₂).

Curious findings

- If we focus on energy saving and costs, windows do not need to be replaced when installing a ground source heat pump. Because this is less money-saving to carry both measures.
- However, let's look at environmental impact and costs. It reduces more CO₂ emission when replacing windows and installing a heat pump at the same time. Because we only need a smaller heat pump, and fewer CO₂ will be emitted to manufacture heat pumps.