

PARAMETRIC STUDY ON THE TRADE-OFF BETWEEN SOME HEALTH FACTORS AND SUSTAINABILITY IN BUILDINGS – CASE EKOVIIKKI

Heidrun Faninger-Lund¹, Peter Lund²

¹ SOLPROS, Finland

² Helsinki University of Technology, Finland

SUMMARY

Using the Helsinki-Ekoviikki ecological building site for a parametric study, new concepts with improvements both in sustainability and building health were developed.

INTRODUCTION

Several physical factors effect both the sustainability and healthiness of a building. One objective was to find the relation between building healthiness and sustainability and to develop optimum strategies for fulfilling both requirements.

METHODS

The new ecological housing area Ekoviikki in Helsinki was used as the reference case. In Ekoviikki, special consideration has been given to ecological and sustainable planning principles and health issues.

Criteria for the sustainability and healthiness of a building: life-cycle CO₂ emissions and energy as a function of different parameters effecting the healthiness (ventilation, thermal and visual comfort) are the main factors to be determined.

The main assessment tool is a numerical all-in-one building energy design tool, which is capable to perform an accurate energy and environmental analysis of a building with different energy or construction approaches.

RESULTS

A good and representative example of the whole “sustainable and healthy” building approach is the HELAS site.

Increasing the ventilation rate in HELAS from 0.5 to 0.8 l/h, increases CO₂ emissions and energy use by 5-6%. Tripling to 1.5 l/h would mean a 20% increase. Improving the thermal efficiency by 50% may compensate the sustainability reduction.

Increasing the window area from 9% to 20% of the total perimeter area and adding intelligent dimming control, would increase the daylight factor from 38% to 58% and improve sustainability by 6%.



Figure 1. The HELAS house in Ekoviikki.

DISCUSSION

A concept toward improved sustainability and healthiness of a building is illustrated in Figure 2. It increases the visual comfort, thermal quality and IAQ (air exchange rate >0.8 1/h) but drops by one third the life-time CO₂ emissions and energy use compared to the reference Ekoviikki HELAS case.

The European Commission is acknowledged for providing support on the solar demonstration at Ekoviikki (DGXVII REB71/98/FI).

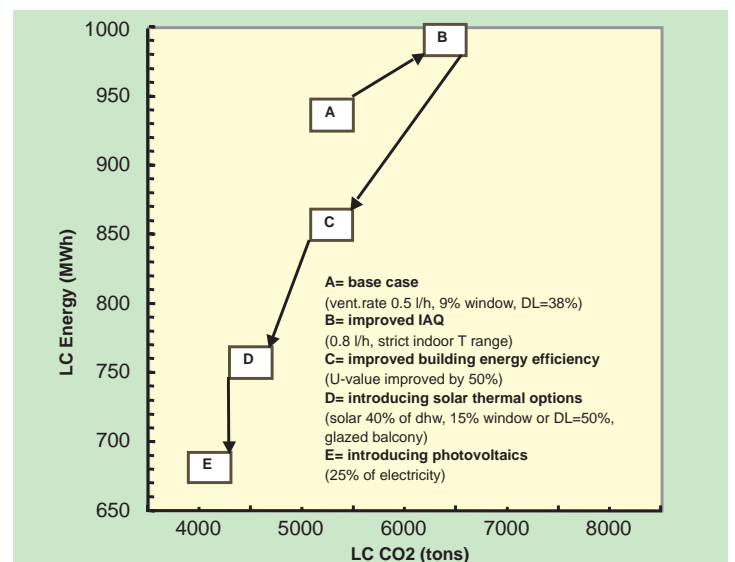


Figure 2. An example of a strategy in which different measures are added.