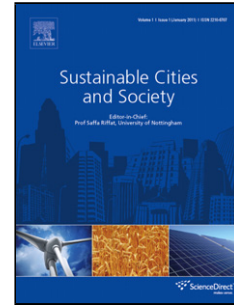


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Authors: João Francisco Pinto, Guilherme Carrilho da Graça

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Comparison between geothermal district heating and deep energy refurbishment of residential building districts

First author:

João Francisco Pinto

jfp@natural-works.com, ¹ Natural Works, Rua Ricardo Esp. Santo N5 CVD, 1200-790 Lisboa, Portugal

*Corresponding author:

Guilherme Carrilho da Graça^{*2}

gcg@fc.ul.pt ² Instituto Dom Luiz, Faculdade de Ciências, Universidade de Lisboa, 1749-016 Lisboa, Portugal

Highlights

- Study of energy refurbishment of residential buildings, versus geothermal district heating system
- Applying all refurbishment measures results in an 86% reduction in yearly gas consumption.
- Energy refurbishment approach has lower costs and financial risk.
- Geothermal grid has the lowest environmental impact.

Abstract

A substantial part of the energy demand of residential buildings is due to fossil fuel powered space and domestic hot water heating. Reductions in the energy use of these buildings can be achieved by improving the thermal envelope, installing efficient building energy systems and improving user behavior. Alternatively, it may be possible to use hydro, solar, wind or geothermal to meet the energy demand. This paper presents a study of energy refurbishment measures and a direct geothermal powered district heating system for a neighborhood of existing residential buildings in Groningen, Netherlands. The study uses detailed thermal simulation models that rely on accurate building typologies and thermal characteristics, outdoor air infiltration data and occupant behavior profiles taken from an existing comprehensive survey of Dutch home user behavior. The predicted energy savings and costs show that both the geothermal and the energy refurbishment approaches are economically viable and result in large reductions in the environmental impact of space heating. Applying all refurbishment measures results in an 86% reduction in yearly gas consumption for heating with an investment payback time of fifteen years. The energy refurbishment approach has lower costs and lower financial risk while the geothermal grid has the lowest environmental impact.

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