Transforming urban heating systems

The multi-scalar connections for water use, committed emissions and energy justice

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LETTER

The water use of heating pathways to 2050: analysis of national and urban energy scenarios

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Abstract

Sustainable energy systems can only be achieved when reducing both carbon emissions and water use for energy generation. Although the water use for electricity generation has been well studied, integrated assessments of the water use by low-carbon heat systems are lacking. In this paper we present an analysis of the water use of scenarios for heat and electricity production for the year 2050 for the Netherlands and its capital, Amsterdam. The analysis shows that (i) the water withdrawal for heating can increase up to the same order of magnitude as the current water withdrawal of thermoelectric plants due to the use of aquifer thermal energy storage, (ii) the virtual water use for heating can become higher than the operational water consumption for heating, and (iii) the water use for electricity production becomes a relevant indicator for the virtual water use for heat generation because of the increase of power-to-heat applications.

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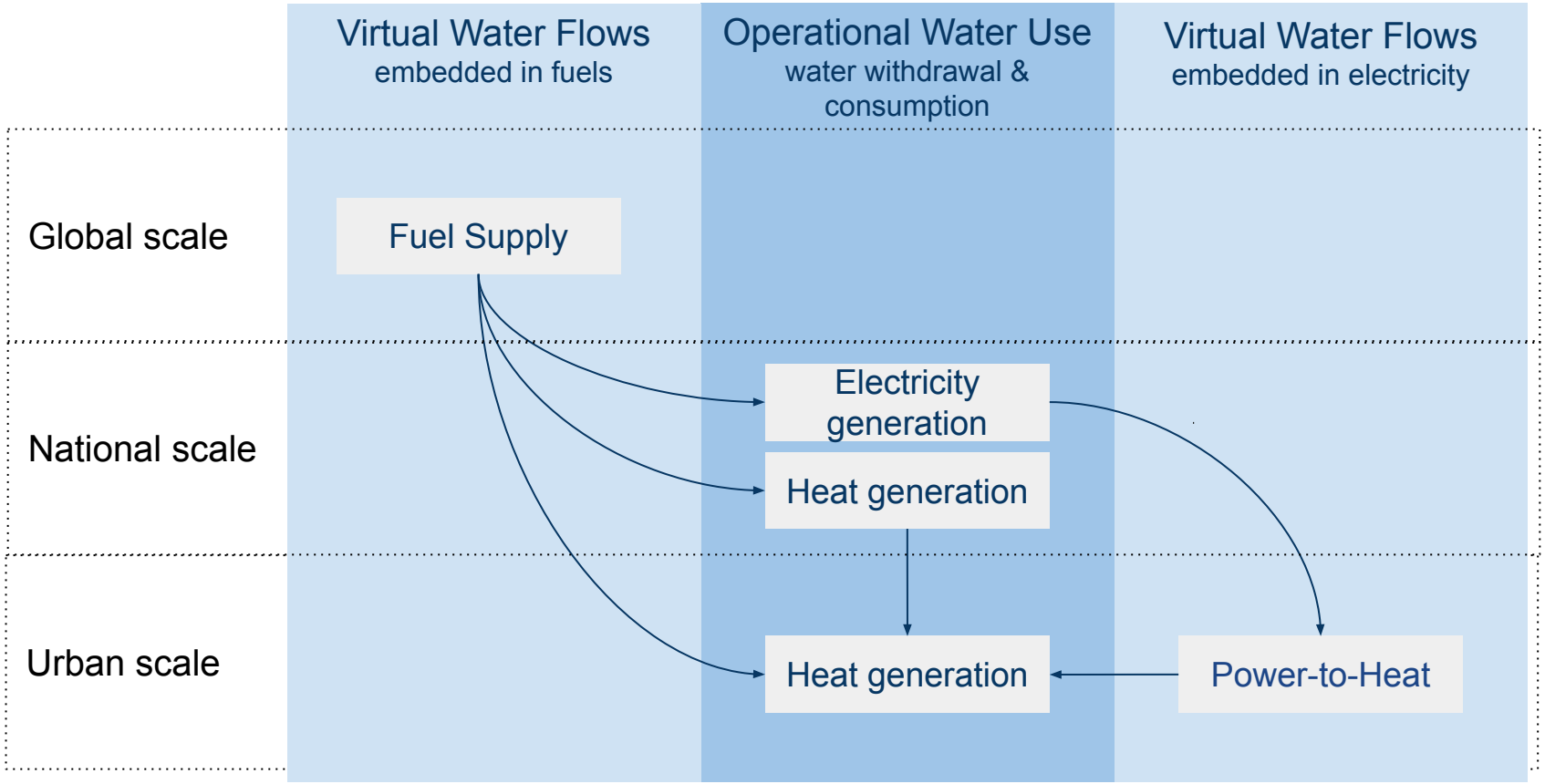
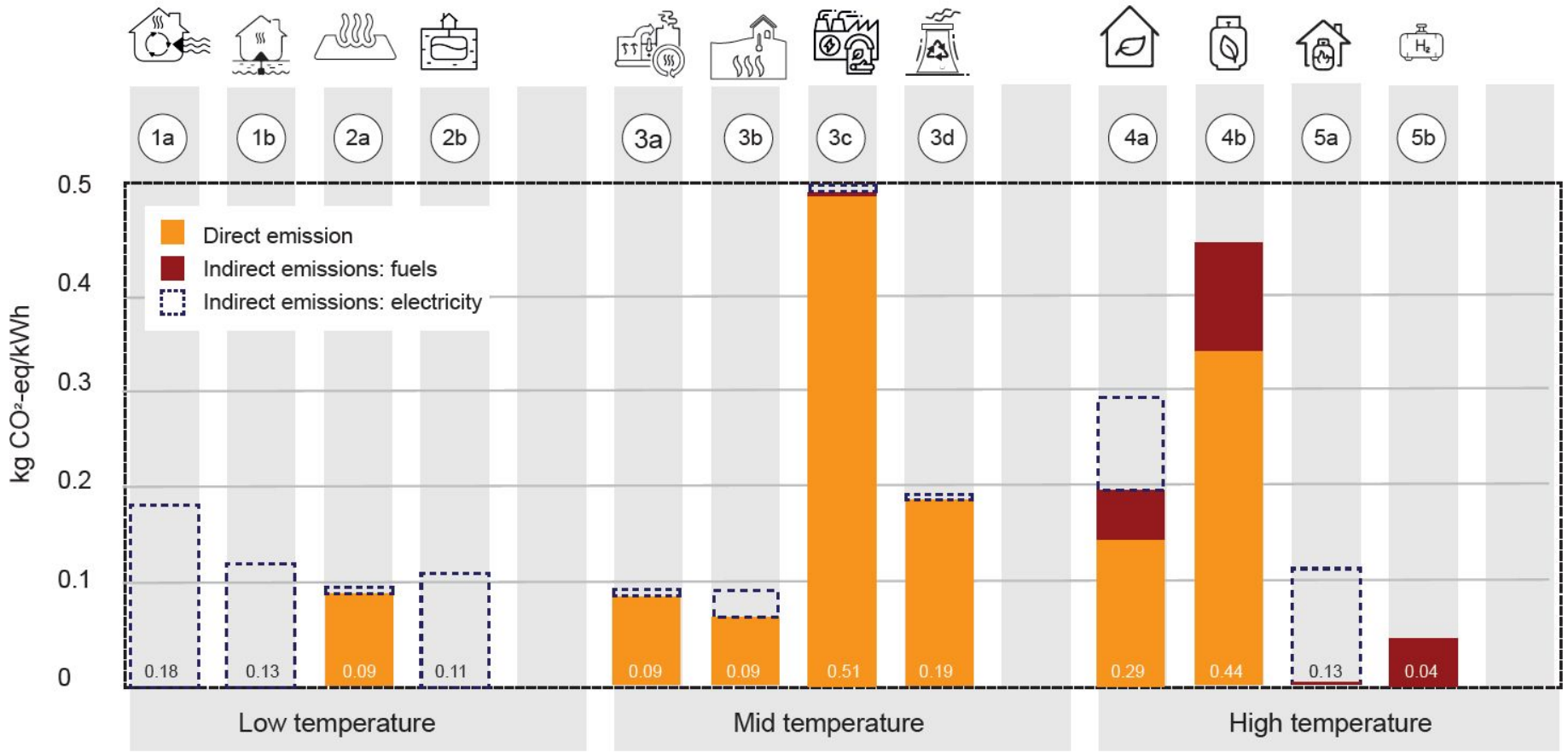


Multi-scale Water-Energy use model



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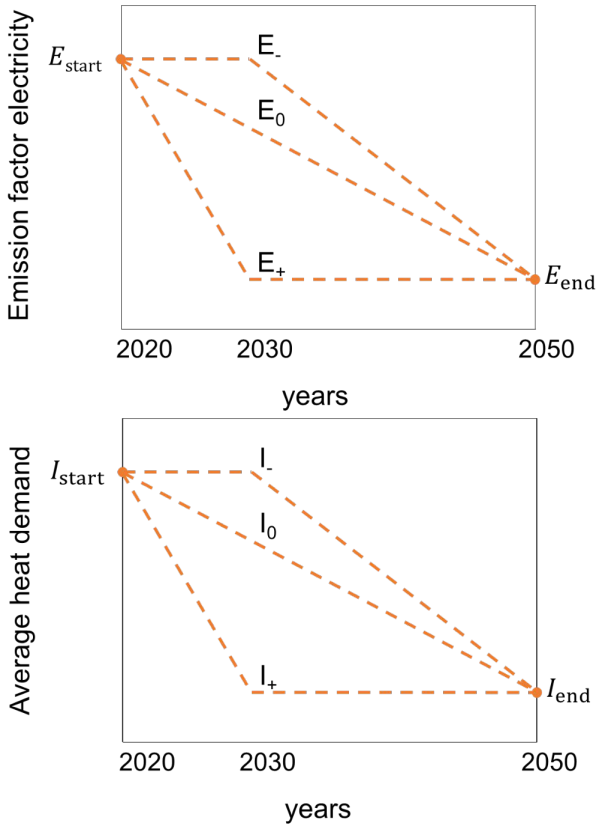

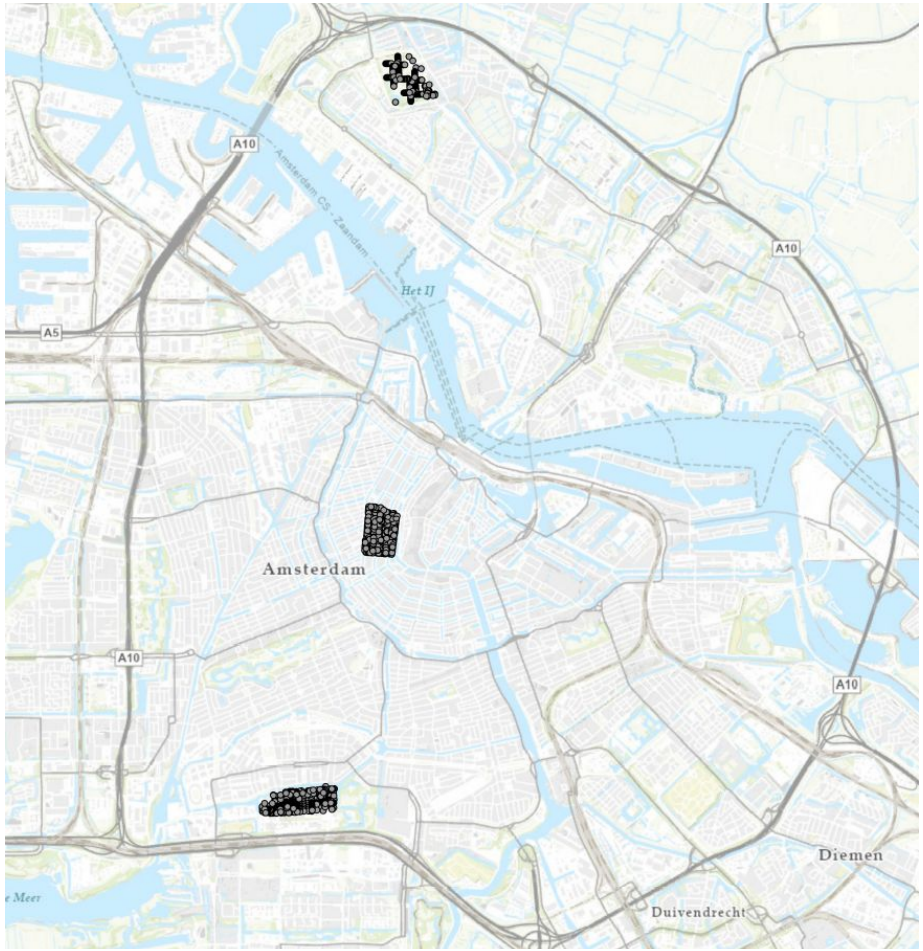

Optimization model for committed emissions

Energy justice and commoning practices

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Published paper on water use:
https://iopscience.iop.org/article/10.1088/1748-9326/abede7/pdf

Policy brief:
https://www.verdus.nl/project/enlarge/