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Decarbonising future heating systems: trade-offs between water use and CO₂ emissions

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Sustainable energy systems can only be achieved when reducing both carbon emissions and water use for energy generation. Water-energy nexus studies are therefore crucial for supporting environmental policy oriented towards the mobilisation of resources in an optimally integrated way. Decarbonizing heating infrastructures is an important part of achieving low-carbon energy systems because they globally account for 50% of the final energy consumption and 40% of the carbon dioxide (CO₂) emissions. In our study, we quantitatively assess the changing water usage of the energy sector due to the integration of low carbon heating infrastructures. Multiple future energy mix scenarios were assessed by building a multi-scale energy and water use model that quantifies the direct and virtual water footprint of space heating and hot water use in households, services and industry. In this presentation we show an analysis on the water use of heating pathways towards the year 2050 for the Netherlands and its capital, the city of Amsterdam. Additionally, we present preliminary results from our research about the trade-offs between carbon emission reductions, insulation measures and energy reliability in neighbourhoods in Amsterdam.