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Editorial

Energy

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Editorial: energy and buildings in a global warming context

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The impact of climate change on our environment is never far from the news. Heatwaves across Europe, flooding in South Africa and Australia, and wildfires in the USA and the Amazon are just a few recent headlines. The greenhouse gas (GHG) emissions which are causing climate change arise due to human activity, and 75% of global GHG emissions come from the way we use energy (Ge *et al*., 2020). Across the globe the demand for energy is predominantly from transport, industry and the domestic sector, and around 70% of this global energy consumption is in the form of fossil fuels.

Global conflict also shapes our energy sector. The war in Ukraine, and efforts across Europe to move away from imports of Russian gas, have squeezed gas market prices up. Oil prices are also high. Fuel prices were already rising due to a global increase in demand as economies recovered from impacts of Covid-19 restrictions. For example, both the UK and Germany have an energy mix which is around 30% natural gas, and both countries have significant natural gas use for space heating in buildings. Price rises for wholesale gas also impact on electricity prices, and so the cost of energy is rising.

Living in cold, damp, unhealthy homes is linked to a number of physical and health impacts on building occupants. It is also linked to sickness absence from work and school, and educational attainment. Improvements in the energy performance of our homes can significantly improve quality of life.

'The buildings and buildings construction sectors combined are responsible for almost one-third of total global final energy consumption' (IEA, 2022), and so the role of energy use and buildings is a key one in the transition away from fossil fuels. To reduce the carbon dioxide emissions of energy systems and make energy bills affordable, for building owners and operators, then energy efficiency, heat networks, renewable energy technologies, smart control systems and new space heating systems are all possible solutions.

With these aspects in mind, we are delighted to present this issue of *Energy*, with a theme across our papers of energy and buildings in a global warming context.

The first paper is an assessment of the key achievements and disappointments in climate negotiations, which is timely as the preparation ramps up for the Conference of the Parties (COP) 27 in Egypt. Cohen *et al*. (2022) highlight key elements of the Glasgow Pact which arose from COP26, and evaluate whether the published national plans from member countries are sufficient to achieve the ambition of a global average temperature increase of no more than 1.5°C. This provides the global warming context for the remainder of the collection.

Li *et al*. (2022) then present an investigation of the retrofit of flat roofs, a common architectural design in 1980s China, to a pitched roof design. Their building model demonstrated more comfortable indoor temperatures are achieved with a pitched roof (compared to a flat roof) for the top floor rooms, and they also find that the gradient and form of the roof play an important role in the energy performance of the top floor.

In our third contribution, Aslan (2022) presents optimum insulation thicknesses, savings and payback periods, for external walls, ceilings and floors in 81 locations in Turkey. The results are correlated with heating degree days (and therefore location), as well as fuel type (coal or natural gas) and insulation material (rockwool, expanded polystyrene, extruded polystyrene). Given the high proportion of buildings without insulation, considerable energy savings are possible with reasonable payback periods for ceiling and wall insulation in particular.

Whilst papers two and three are about improved building form and efficiency, papers four and five are about building heating system performance. Yu *et al*. (2022) have evaluated a dual-water tank solar space heating design for application in northern China. They show that energy consumption can be reduced by 30%, and thermal comfort can be increased, through the inclusion of a thermal buffer.

Our final paper (Hay *et al*., 2022) addresses an issue for heat networks, that of axial displacement. In situ recordings of axial displacement are shown for pipes experiencing different flow temperatures. Results are seen to compare well

with modelled forecasts of steady state displacement, although the measurements provide additional evidence on transient response to temperature increase and decrease.

As a body of work, these papers highlight the need for action to combat climate change and the importance of performance of a building's form, fabric and heating system in reducing overall energy demand.

REFERENCES

Aslan A (2022) Effect of thermal insulation on building energy efficiency in Turkey. *Proceedings of the Institution of Civil Engineers – Energy* **175(3)**: 119–139, https://doi.org/10.1680/jener.21.00053.

Cohen R, Eames PC, Hammond GP, Newborough M and Norton B (2022) Briefing: The 2021 Glasgow Climate Pact: steps on the transition pathway towards a low carbon world. *Proceedings of the Institution of Civil Engineers – Energy* **175(3)**: 97–102, https://doi.org/10.1680/jener.22.00011.

Ge M, Friedrich J and Vigna L (2020) 4 Charts explain greenhouse gas emissions by countries and sectors. *World Resources Institute*, 6 February. See https://www.wri.org/insights/4-charts-explain-greenhouse-gas-emissions-countries-and-sectors (accessed 26/07/2022).

Hay S, Weidlich I, Wolf I and Villalobos FA (2022) Pipe axial displacements from a monitored pipeline connected to a district heating network. *Proceedings of the Institution of Civil Engineers – Energy* **175(3)**: 150–161, https://doi.org/10.1680/jener.21.00100.

IEA (International Energy Agency) (2022) *Buildings – A Source of Enormous Untapped Efficiency Potential*. IEA, Paris, France. See https://www.iea.org/topics/buildings (accessed 26/07/2022).

Li Y, Wang C, Yap JBH, Li H and Jiang H (2022) Energy-efficient design protocol for sustainable pitched roof modification from flat roof. *Proceedings of the Institution of Civil Engineers – Energy* **175(3)**: 103–118, https://doi.org/10.1680/jener.21.00075.

Yu Q, Cao J and Tan X (2022) Simulation and optimisation study on a solar space heating system in Baotou, China. *Proceedings of the Institution of Civil Engineers – Energy* **175(3)**: 140–149, https://doi.org/10.1680/jener.21.00098.