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Green roofs and living walls offer many environmental, social and economic benefits. Matthew Fox of Plymouth University School of Architecture reports on a study of one of his campus buildings, which proved that a living wall can improve thermal insulation by nearly a third.

Green roofs and living walls are becoming increasingly popular due to the multiple environmental, social and economic benefits they can provide, not least by increasing biodiversity in urban areas. A recent study has also confirmed their thermal insulation benefits.

Living walls − also known as green walls and vertical gardens − consist of a dedicated panel system of plants, grown vertically via soil-based or hydroponic systems. They can be situated on the side of buildings or other structures, and can be either free-standing or physically attached to the walls.

Many suppliers of living-wall systems can design bespoke interventions for a range of building scenarios at costs that vary considerably depending on the situation. The planting choices, while obviously limited to location and orientation, can be highly varied, capturing a range of colours, sizes, and other location dependent aspects.

Benefits of living walls

Along with green roofs, living walls are now often used as part of a wider strategy to, in part, provide potential solutions for the environmental and social impacts caused by urbanisation. At their simplest, they involve systems and structures designed to support the growth of vegetation on buildings, commonly aided by irrigation, drainage, and nutrient application.

The structures are associated with enhanced building thermal performance (Fox *et al*., 2021), air temperature modification, sound absorption, sequestration of carbon dioxide, storm water management, and improved air quality benefits. They also support biodiversity in urban areas, where space is limited, aiding building designers, developers and engineers in achieving net biodiversity gain.

The aesthetics and linkages to biophilic principles can also be incorporated into the design brief of new buildings or refurbishment projects. The introduction of well-thought-out strategic planting may have many positive benefits to the wellbeing of building occupants and visitors alike.

Thermal improvement

To further explore the thermal benefits of living walls on existing buildings, a team of researchers at the University of Plymouth monitored a university campus building that had received extensive renovations in 2019. One renovation was the addition of a living wall to the existing pre-1970s masonry construction.

The new system consisted of a waterproof synthetic layer, absorbent moisture layer, and porous outer phytotextile layer that was formed into pockets to hold soil and planting. The wall was populated with a range of plant species including sedges, ferns, rushes, and flowering shrubs, chosen for their suitability to survive well in the coastal environment.

Overall findings from the study led to the calculation of an in-situ U-value or thermal transmittance for the living wall intervention. It was found to be a 31.4% improvement over the original as built state of the same wall. While the study is not representative of all situations and wall types, the findings suggest that adding a living wall system to the facade of an uninsulated cavity masonry wall could be used to help lower heat losses in addition to the many other benefits.

Looking forward

In England for example, approximately 57% of all buildings were built before 1964. While regulations have changed more recently to improve the thermal performance of new constructions, it is the older existing buildings that require the most energy to heat and are a significant contributor to carbon dioxide emissions.

It is therefore essential to begin to improve the thermal performance of older existing buildings if the UK is to reach its target of net-zero emissions by 2050 and help to reduce the likelihood of fuel poverty from rising energy prices. Living walls offer a sustainable and effective solution.

Reference

Fox M, Morewood J, Murphy T, Lunt P and Goodhew S, Living wall systems for improved thermal performance of existing buildings, *Building and Environment*, 3 November 2021, DOI 10.1016/j.buildenv.2021.108491

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[fox.jpg] The retrofitted living wall at Portsmouth University reduced the existing wall's U-value by over 30%