

# Accepted Manuscript

Living walls and their contribution to improved thermal comfort and carbon emission reduction: A review

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PII: S0360-1323(16)30189-5

DOI: [10.1016/j.buildenv.2016.05.031](https://doi.org/10.1016/j.buildenv.2016.05.031)

Reference: BAE 4505

To appear in: *Building and Environment*

Received Date: 20 February 2016

Revised Date: 9 May 2016

Accepted Date: 21 May 2016

Please cite this article as: Charoenkit S, Yiemwattana S, Living walls and their contribution to improved thermal comfort and carbon emission reduction: A review, *Building and Environment* (2016), doi: 10.1016/j.buildenv.2016.05.031.

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## **Living walls and their contribution to improved thermal comfort and carbon emission reduction: a review**

### **Abstract**

A growing number of living wall studies in the recent decade indicate the increasing interest in the environmental benefits of this greening system. Most studies focus on the energy benefits of the living walls that help to cool down the indoor spaces and reduce energy consumption and carbon emissions from the building sector. Living walls also have a carbon reducing benefit as they are able to sequester Carbon Dioxide (CO<sub>2</sub>) in plant biomass and substrate. Living walls can therefore be considered as an important measure for climate mitigation in urban environments. Literature review was conducted to demonstrate thermal performances of the living walls in four climates: tropical, desert, temperate, and Mediterranean. The comparative analysis between living walls and green roofs was also undertaken to determine CO<sub>2</sub> sequestration performance of living walls. Influencing factors affecting thermal and CO<sub>2</sub> sequestration performances of living walls are highlighted and the research gaps needed to be addressed in each factor are pointed out. It was found that plant and substrate characteristics are the major factors that have impacts on both energy and CO<sub>2</sub> performance, but these two environmental benefits of living walls are separately examined. Finally, the recommendations are presented to promote the integration of both energy and CO<sub>2</sub> aspects in the future studies of living walls.

Keywords: Living walls, Thermal performance, CO<sub>2</sub> sequestration, Climate mitigation

### Highlights:

- LW studies on thermal and CO<sub>2</sub> sequestration performance were reviewed
- The findings of 19 LW studies demonstrate the cooling effect of LWs during summer and their ability to reduce cooling/heating energy consumption in four different climates: tropical, desert, temperate, and Mediterranean

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