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Designing Green Walls:

An early-design framework to estimate the cooling impact of indirect green walls on buildings in different climates

PROBLEM

The 2015 Milan Expo, Paris Smart City 2050, and the NYC Million Trees Initiative are just a few examples that highlight the important role of urban green infrastructure within cities. While the scope of these examples varies from urban farming to sustainability, each project represents a clear trend towards a deeper integration of vegetation within the built environment.

Green walls are a component of urban green infrastructure. They are vertical vegetative surfaces made up of clinging and climbing vines. In contrast to trees, vines can cover larger surfaces in a relatively short amount of time because they grow on external support structures, and consequently, they can be a robust solution to unique building scale design conditions.

There is limited reseach on the impacts of green walls on building energy performance. These particular studies aim to define the performance of green walls on a short temporal scale. This scale of resolution is both time- and labor-intensive. As a result, these investigations remain only within the academic domain.

GUIDING QUESTIONS

This project investigates possible frameworks that could allow designers to quickly and simply assess the efficacy of the cooling performance of green walls during the early design phase of a project in various climates.

What is the appropriate precision level for an early-design decision-making framework to address variables such as climate conditions, biophysical plant traits, green wall design, and building façade thermal properties?

What are the appropriate practical methods to evaluate the cooling from the shading and transpiration of a green wall?

PROJECT DESCRIPTION

The goal of this research is to develop a framework to conduct back-of-the-envelope estimates that measure the ability of green walls to reduce the energy consumption of buildings during summer months. To do so, the scale of the temporal resolution must be adjusted to address appropriate levels of precision. In addition, the method must be sufficiently quick and simple to allow designers to evaluate the performance of green walls for a particular building typology within in a specific climate from an early stage of the design phase.

IMPACT

This study aims to close the gap between research and practice by developing a document that provides designers with fundamental knowledge of variables impacting the performance of a green wall, a verified early-design framework to allow designers to quickly assess the efficacy of a green wall for a particular climate, and a matrix that test the limits of green walls as passive solutions for various construction systems.

Provide a comprehensive list of design variables impacting performance of green walls

Provide a green wall cooling performance matrix that accounts for various climates and design options

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