Chapter 10
Green Walls as an Environmental Strategy:
A Case Study in Brasília

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ABSTRACT

Vegetation is an excellent strategy to tackle global warming and climate change. In this context, the green wall is a kind of green infrastructure that is used as a bioclimatic strategy. Also, it can be used as an approach to insert green areas in an urban context, contributing to urban areas to become more sustainable. This chapter aims to evaluate the thermal performance of green walls using three different native climbing vegetation from the Cerrado biome. Thus, the authors used a computational tool named ENVI-met (v.3) as a method to analyze and evaluate which plants would bring the best performance in terms of improving thermal comfort. The database the authors obtained from the simulations will serve as a comparison of the thermal performance between walls without vegetation cover, as well as clarify the morphological and physiological characteristics that influence its thermal performance. The results demonstrate that Arrabidaea pulchra species enabled green walls with lower temperatures and higher air humidity rate in most situations.

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INTRODUCTION

Mitigating actions to tackle global warming and climate change are urgent. The plans to combat the consequences of global warming and climate change have two distinct scales, global and local, and each one has its specific measures and efficiency. The built environment can promote a better condition of comfort for all occupants. Before, we need to understand the thermal comfort better and promote a more comfortable condition in our cities.

Thermal comfort is an individual perception which implies a neutral sense to the body within a particular environment (Lin, 2009), not being necessary to cool down or heat up the air temperature, humidity, or wind speed. In its norm 55, the American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE, 2010) asserts that thermal comfort is a "condition of mind that expresses satisfaction with the thermal environment and is assessed by subjective evaluation" (p. 3). In this sense, thermal energy exchange results in the thermic conditions in the environment (Costa, 1974).

Surface materials influence thermic conditions in urban areas substantially. For example, we can observe this process in the urban heat island (UHI) phenomenon, first described by the meteorologist Luck Howard in 1833, who measured the weather variation in London (Howard, 1833). Heat is absorbed by the urban surfaces with heat capacity (Taleghani, 2018) and released to the environment, raising the air temperature.

Urban areas can also contribute to extreme heat events (EHE) and increase mortality and morbidity in urban population (Gabriel & Enddlicher, 2011), as seen in Paris, France (2003) (Dhainaut, Claessens & Riou, 2003), Melbourne, Australia (2009) (Department of Human Services, 2009) and Moscow, Russia (2010) (Revich, 2011). Replacing artificial surface materials is one strategy to reduce UHI and EHE (Norton et al, 2014).

For this study, the authors analyzed exchanges in thermal energy among the natural environment, the built environment, and anthropogenic activities. Costa (1974) argues that these exchanges are influenced by several processes, such as human activity, clothes, and climatic conditions, or the intrinsic characteristics of the materials. Indeed, surface materials have a direct impact on thermal comfort in cities.

In this sense, it is possible to control thermal energy exchanges in the built environment by choosing and incorporates adequate materials that would favor or decrease such exchanges. This observation enables cities with less energy consumption, more thermal comfort and consequently more secure. Also, it is possible to make achieve those goals as we make the cities more morphologically similar to natural environments. All this contributes to more sustainable cities. In