Title:

Evaluation of the sustainability of vertical gardens

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Aim: In order to reduce the environmental challenges caused by rapidly increasing urbanization and climate change nowadays it has been proposed to give more place for nature in humans living spaces. Considering the restricted available spaces in the city centers, the vertical gardens seem to be a potential solution by reducing the required space for growing plants. Although vertical gardens may have some benefits for today’s modern life, considering the used materials and maintaining difficulties it seems that they are not sustainable as they seem. This study aims to provide a better perspective about the sustainability of vertical gardens by discussing the advantages and disadvantages for researchers and decision-makers in the area of urban planning and landscape architecture.

Methods: In this research, we reviewed the literature on vertical gardens and sustainability and analyzed it systematically to extract the parameters which affect the carbon footprint of applications from early design to maintaining process. The findings will be collected in a selection pool and classified in terms of their role, importance, and requirements for sustainability. The classified parameters will be rated as required and optional with points to guide decision-makers to evaluate a vertical garden design proposal or existing application.

Results: The gathered information indicated that different aspects of vertical gardens can be categorized under seven topics: (1) site context, (2) plant species and design, (3) water and fertilizer usage, (4) implementation system and process, (5) applied technologies and energy efficiency, (6) material selection, and (7) user’s utility and maintenance. For each topic, measurable principles and criteria were identified in tables that can be scored regarding their performance in order to identify necessary requirements for reaching sustainability. The obtained approach can be used for evaluating the sustainability of vertical gardens.

Conclusion: In this century, that resource management issue become more important than ever and the self-sustaining systems are a necessity not an optional approach. In this context, self-sustaining vertical gardens, several aspects need to be considered in the design, implementation, and utilization of these green systems as mentioned in this study. Also, it is tried to assign fair and general scores to each criterion to provide a guideline for evaluating the sustainability of any vertical garden to improving their positive outcomes and reducing unwanted and undesired ones. This research aims to present a guideline for the designers, contractors, researchers, and companies that will help them to evaluate the vertical gardens since early design to post-construction. This research will enable to improve the understanding of resource management parameters which lead vertical gardens, green roofs and facades to leverage the quality in every phase.

**Keywords**: Vertical Gardens, Sustainability, Urban Development

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