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Greenery for a university campus: does it affect indoor environmental quality and user well-being?

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Abstract

In an indoor environment, greenery plays an important role for the quality of space as well as for the users' psychological well-being, comfort and health. The purpose of this study is to evaluate the feasibility of installing an indoor green wall at a university campus (Politecnico di Torino, Italy), taking into account users' perception and preferences. The paper builds on a questionnaire based survey developed in order to assess: the relationship between vertical greening systems and users' sense of well-being and comfort; the best indoor location for a green wall and its influence on the environmental quality. The paper presents the questionnaire survey results and analyses the strengths and weaknesses of vertical greenery in respondents' opinion.

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1. Introduction

1.1. Overview on environmental and psychological benefits of greenery

The technologies related to the use of building integrated vegetation, such as vertical greening systems, are able to

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provide different beneficial effects both from environmental and psychological point of view.

These solutions, also named green walls or vertical gardens, have a positive impact on indoor environmental conditions: they contribute to the acoustic comfort, reducing reverberation of sound and increasing absorption at low/middle frequencies [1]; adsorb indoor pollutants, such as Volatile Organic Compounds, thus improving the air quality [2], improve the thermohygrometric conditions thanks to the evapotranspiration of the plants [3].

Moreover, the integration of greenery in indoor environments has an important role for the psychological well-being. People generally perceive areas with vegetation and natural elements more positively than those without [4, 5] and these considerations can also be transferred to the building integrated vegetation. Contact with nature has therapeutic effects [6], evokes positive emotions [7], promotes recovery and restoration from stress [8, 9], affects social cohesion [10]. Particularly with regard to workplace, greenery improves users' satisfaction, enthusiasm and concentration, it increases the ability to generate creative ideas, and it reduces frustration and absenteeism as well [11, 12].

1.2. Purpose of the research

The purpose of the research is to assess the feasibility of installing an indoor green wall in one of the architecture university campus of the Politecnico di Torino, Italy, taking into account users' perception and preferences. The research is related to an enquiry that the Politecnico di Torino is carrying out on the quality of its university spaces, in collaboration with the Department of Architecture & Design and Growing Green srl, an academic spin-off engaged in designing, manufacturing and monitoring modular Living Wall Systems (LWSs). LWSs are vertical greening technologies in which plants grow directly on the vertical surface [13, 14].

The research is composed by the following phases:

- Phase_1: detailed analysis of the social, environmental and economical benefits and costs of a living wall in order to determine the overall feasibility;
- Phase_2: identification of the size, layout and location of the living wall if the feasibility is proved.

This paper reports a part of the outcomes related to the Phase_1, in particular those related to a survey addressed to the campus population. The survey adopts a methodological approach based on previous literature studies and it is structured as a questionnaire [15, 16, 17].

The questionnaire was developed in order to assess:

- the level of knowledge in relation to green wall technologies and especially the perceived benefits and limits of such technologies;
- the relationship between vertical greening systems and users' sense of well-being and comfort;
- the best indoor location for a living wall and its influence on environmental quality.

2. Methodology

2.1. Site and population

The Lingotto university campus (Politecnico di Torino) was selected as a potential location for a living wall installation due to the following reasons: a Master of Science in architecture is taught there; a great number of students attend it daily.

The research targeted those students who visit the Lingotto at least once a month. The population consisted of students of MSc degree programme in Architecture Construction and City and the MSc in Architecture for Sustainable Design. The sample was formed by 136 participants.

2.2. Structure of questionnaire

The questionnaire was organized as shown in table 1 and it is based both on single-response and rating-scale items.

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