BUILDING-INTEGRATED ACTIVE PHYTO-REMEDIATION FOR IMPROVING QUALITY OF URBAN LIFE AND INDOOR AIR

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Abstract

Large-scale assimilation of active phytoremediation systems within urban building systems can improve quality of life and indoor air.

Natural resources are features or phenomena that enhance the quality of human life. Human development often exploits them until their existence is so limited that these features have a diminished capacity for enhancing life. Vegetation is a life enhancing natural resource that benefits all aspects of living systems. Substantially reintroducing vegetation systems within the urban fabric to perform critical functions, potentially cleansing air and producing food, could provide a means to reduce the consumption of resources while significantly improving the quality of human life. Pressures on land for other functions, required maintenance, and cultural perceptions challenge the maximum deployment of vegetation systems into the wide variety of prospective urban applications.

Proposed methods for integrating active phytoremediation systems proposed in this study specifically relate to the improvement of indoor air quality and potential positive effects on energy consumption, health, and general quality of life. The analysis focuses in particular on existing urban and building conditions at multiple scales with regard to a case study in Washington DC, distilling sets of priorities from which to design a system for improved deployability of building-integrated phytoremediation systems. The research of previously deployed systems provides important insight into existing technologies and serves as catalysts for new systems development for building-integrated phytoremediation systems. However, the applicability of existing systems is limited to stand alone systems or building typologies that require large opaque planted walls facing an interior atrium. These systems therefore show limited ability to viably adapt to the range of existing building typologies that would benefit from phytoremediation of indoor air quality. Flexibly manufactured, modular hydroponic planting systems, that require minimal energy to induce airflow through the plant roots, have the potential to deliver fresh air to building occupants while minimizing outdoor air intake requirements and disposable filtration systems, which would reduce energy and material consumption. Such a system, with variability and interchangeability of modules and planting densities, could strengthen the urban forest through improved applicability of productive building-integrated vegetation systems.