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EMERGY SYNTHESIS FOR VALUING THE ECOSYSTEM SERVICES OF GREEN WALLS AND OTHER VEGETATED BUILDING ENVELOPE TECHNOLOGIES

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ABSTRACT Increased environmental awareness and demand for green space are driving the need to find ecological solutions to environmental problems in urban areas. Covering the roofs and walls (i.e., envelope) of buildings with vegetation is a promising eco-solution that helps moderates temperature, creates habitat, attenuates noise and impedes stormwater runoff. Living building envelopes incorporate vines rooted in the soil to cover the vertical, horizontal and angled surfaces. The thermal and hydrological ecosystem services were valued using the energy-based environmental accounting methodology of emergy (with an ‘m’). Results suggest that buildings located in Maryland (US) can be cooled considerably during the summer by covering the southern wall, which reduces electricity consumption because of lowered demand for air conditioning. Emergy valuation determined that the embodied energy of the annual electricity savings was greater than the embodied energy of the capital investment amortized annually. The service of stormwater mitigation by green building envelopes was valued based on its ability to reduce peak storm flow. Valuation of the ecosystem services of green, living technologies by the emergy evaluation method provides useful sustainability information for urban building policy and engineering design.

Keywords: Green walls, roofs, valuation, energy, emergy, ecosystem services