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Green Public Procurement Strategies of Vending Machine Systems at the Polytechnic University of Milan

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Abstract

Globally, the food sector is responsible for a third of the greenhouse gas emissions (Crippa et al., 2021). Within this broader agri-food system, the automated retail sector, specifically the vending machine industry, represents a key but often disregarded element of energy consumption, material waste, and logistical complexity.
The adoption of Green Public Procurement (GPP) has emerged as a key instrument for integrating sustainability criteria into public procurement processes. In Italy, the transition to a low-carbon economy is enforced by the mandatory adoption of Minimum Environmental Criteria (CAM). In its role as a contracting authority, the Polytechnic University of Milan is legally bound to incorporate these requirements into its procurement procedures for selecting the economic operator. The primary objective of this work is to establish the most relevant criteria to include in a call for tenders for vending machine service, as defined at the European (European Commission, Joint Research Centre, 2019) and Italian (Ministero dell'ambiente e della Sicurezza Energetica, 2025) levels. This objective was achieved by examining a recent tender call for the selection of a supplier for vending machine systems. Firstly, an attributional life cycle assessment (ALCA) was conducted from cradle to grave for the entire vending machine system on the Bovisa campus in Milan. Secondly, different scenarios were considered, simulating the inclusion of the EU-defined GPP criteria, applying a consequential LCA (CLCA) approach, and considering only the changes such criteria would produce. In this way, the criteria that yield the greatest environmental benefit can be identified. Three categories of machines were evaluated: those designated solely for preparing beverages, those intended for preparing both snacks and beverages, and those specifically designed for preparing coffee.
From the LCA results, for each building and model, it was found that energy consumption in "idle mode" had the greatest environmental impact (65% to 95%), while the role of product management was limited.

Keywords: Green Public Procurement, Vending Machines, Life Cycle Assessment

ACCEPTED

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