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Assessment of Energy, Global, and CO_2 Emission Efficiencies of Sand Production from Construction and Demolition Materials

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Abstract

At the same time in which the market of building construction generates gross domestic product (GDP) and collaborates with social-economical growth, it generates large load on environment due to materials and energy use as well as the waste generated. Among others, the building construction waste (BCW) deserves special attention because it corresponds to about 50% of total solid waste generated in the Earth. Specifically for the São Paulo city, Brazil, the BCW corresponds to about 66% in mass of total solid waste generated within the city, which demands high economic and energetic cost for its transport to landfills. In an attempt to overcome the resources wasteful, the use of BCW as raw material in producing sand for building construction could be considered as a good alternative, because usually sand corresponds up to 50% of total recycled BCW in mass. On the other hand, recycling BCW to produce sand also demands resources as materials, energy and labor to transport the BCW until recycling plant and in all other related processes as separation, size reduction, classification, and sand transport until final user. This work aims to assess the energetic-environmental performance of BCW recycling process in producing sand for building construction in São Paulo city. For this, energy analysis, emergy accounting (with an "m"), and global warming potential (GWP) are the methodologies used. Results indicate that energy efficiency (0.12 MJ/kg sand), global efficiency (3.09E10 seJ/kg sand) and the GWP (0.016 $kgCO_{2\text{-eq.}}$/kg sand) of recycled sand from BCW have better performance when compared to referenced values of sand produced traditionally from natural extraction. It is recognized the need of higher amount and diversity of referenced values for comparison, but these preliminary results indicate that recycling sand from BCW suggests, a priori, a good alternative in comparison with sand obtained from natural extraction.

Keywords: *Embodied energy; Emergy accounting; Global warming; Recycled sand.*