

Innovative Adobe Production Techniques



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Abstract:

The fact that the construction sector is responsible for nearly 40% of global energy consumption and greenhouse gas emissions, that 50% of the world's processed raw materials are used for construction, and that 5-8% of global CO₂ emissions originate from cement production, highlights the urgent need to improve the sector's environmental footprint and motivates researchers to explore more sustainable construction materials. Despite the benefits of adobe, such as being produced from abundant naturally occurring soil, having high thermal resistance, facilitating natural air circulation, improving indoor air quality by balancing humidity, having fire resistance and being economic, its use in the modern construction sector is limited due to structural deficiencies such as low compressive strength and poor water resistance. Nevertheless, research continues to enhance the potential of adobe, an important sustainable building material due to its contributions to energy efficiency and waste management. For example, studies have shown that adding certain binders to the soil during adobe production has a positive effect on some of its mechanical properties.

This study aims to contribute to the more effective use of adobe material in the modern construction sector by evaluating studies on improving the properties of the material and innovative production techniques such as 3D printing and digital compacted earth systems through example projects.

Keywords: adobe, sustainability, 3D printing, digital compacted earth systems, waste management