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Alternative Material Strategies for Post-Disaster Temporary Housing

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ABSTRACT

Post-disaster shelter needs are commonly addressed through rapidly deployable container-based temporary housing units. Although these systems provide immediate emergency accommodation, they often exhibit poor thermal performance, high embodied energy, short service life, and significant challenges related to material reuse, recycling, and construction waste generation. In many post-disaster contexts, temporary shelters remain in use far longer than initially intended, increasing the importance of their environmental and operational performance. This study investigates the potential of improving the sustainability performance of post-disaster temporary housing units through alternative building envelope materials. The standard container housing model widely used in Türkiye after earthquakes was selected as the base-case for the study. A parametric three-dimensional model was developed using Grasshopper within the Rhinoceros 3D environment, while thermal performance analyses were conducted using the Ladybug and Honeybee plugins.

Within the scope of the research, selected low-embodied energy materials—sourced from academic literature, construction manuals, and existing buildings—including bio-based, soil-based, and mycelium-based alternatives such as hempcrete, compressed straw panels, rammed earth, and mycelium composites, were comparatively evaluated according to their thermal and environmental properties. The study evaluates the integration of alternative envelope materials into existing modular shelter systems. The effects of these material adaptations on thermal performance and sustainability-related parameters were analysed through building simulation processes. This research aims to contribute to the development of more sustainable and adaptable post-disaster temporary housing strategies by evaluating material-based improvement approaches for existing shelter systems. The findings are expected to support future research on environmentally responsive and resource-conscious temporary housing design within post-disaster recovery processes

Furthermore, through the assessment of energy conservation and comprehensive environmental impacts, this research establishes a framework for developing post-disaster temporary housing units. The integration of these materials facilitates the provision of healthier, thermally comfortable, and ecologically responsible long-term housing solutions for disaster-affected communities throughout the recovery phase**.**

KEY WORDS:
Post-Disaster, Temporary Housing, Energy Simulation, Thermal Performance, Alternative Materials