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PACHAMARS: APPLYING MARTIAN HABITAT TECHNOLOGIES TO COMBAT EXTREME COLD IN ANDEAN COMMUNITIES FOR SUSTAINABLE DEVELOPMENT

Abstract

The Pachamars initiative presents a novel approach to addressing the socioeconomic and environmental challenges posed by extreme cold in high-altitude Andean regions. By adapting technologies originally developed for extraterrestrial habitats—such as advanced thermal insulation, renewable energy integration, and controlled-environment agriculture—Pachamars aims to create sustainable, energy-efficient homes that improve living conditions and food security in vulnerable communities. This study outlines the theoretical framework and technical innovations behind Pachamars, emphasizing its adaptability to terrestrial applications. Preliminary results highlight the project's potential to reduce dependence on traditional heating fuels, lower household energy costs, and mitigate respiratory health issues associated with indoor air pollution. Moreover, the initiative includes local training programs to ensure community autonomy in managing and replicating the technologies. By bridging space technology and rural resilience, Pachamars serves as a scalable model for sustainable development in resource-limited environments, with implications for global application in regions facing similar climatic and economic challenges.