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Building Resilient Supply Chains for Renewable Energy Access in Conflict-Affected Regions: A Sustainability Framework for Sub-Saharan Africa

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Abstract

Access to sustainable energy remains a critical challenge in conflict-affected regions of Sub-Saharan Africa, where infrastructure is fragile and humanitarian needs are acute. While global attention increasingly shifts toward renewable energy, the supply chains that deliver solar panels, wind turbines, and clean cooking solutions often break down in the face of insecurity, poor logistics, and lack of local capacity. This study proposes a sustainability-focused framework for building resilient renewable energy supply chains that can operate effectively in complex and volatile environments. Using a mixed-methods approach including field data from humanitarian logistics operations, stakeholder interviews, and policy analysis the research identifies key bottlenecks in last-mile delivery of energy solutions and evaluates successful case studies from Mali, Tchad, and the Democratic Republic of Congo. It presents a model that integrates local manufacturing, gender-inclusive workforce development, and decentralized storage with real-time digital monitoring. Findings reveal that adaptive supply chain design coupled with community engagement and coordinated donor action can significantly improve the availability and maintenance of clean energy infrastructure in conflict zones. The study contributes to ongoing discourse on energy justice, resilience, and the humanitarian-development nexus, offering actionable recommendations for governments, NGOs, and private sector actors seeking to advance Sustainable Development Goal 7 in fragile contexts.

Keywords: Renewable Energy, Humanitarian Logistics, Conflict Zones, Sustainable Supply Chains, Sub-Saharan Africa, SDG 7