Blockchain-Based Waste Energy Traceability for Sustainable and Digitally Transformed Supply Chains: A Case Study in the Leather Industry

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Abstract. Climate change, biodiversity loss, and industrial emissions pose significant threats to the environment, economy, and human well-being. This study investigates how blockchain technology can enhance environmental sustainability by improving the traceability of waste energy. A blockchain-based framework was developed for a real-world case study in the leather industry in Fes, Morocco, to improve transparency and accountability in waste energy tracking. Although focused on a traditional sector, the framework offers a modular and adaptable structure that can be generalized to more complex industries such as automotive and aerospace, which share similar needs for multi-stakeholder coordination, traceability of resource flows, and sustainability compliance. The study provides a replicable approach for building digitally enabled, sustainable supply chains in various industrial contexts.

Keywords: Blockchain Technology, Waste Energy, Sustainability, Traceability, Leather Industry, Supply Chain, Digital Transformation.