Master of Science

Sustainable Management and Technology

HEC – University of Lausanne
IMD Lausanne
École polytechnique fédérale de Lausanne

WORKING DRAFT

Decentralizing Carbon Accountability

A Platform for User-Centric Blockchain Emissions Estimation and Offset

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MASTER THESIS

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Executive summary

The advent of blockchain technology has raised concerns about its high energy use and carbon emissions. This is partly due to the current dominance of proof-of-work-driven Bitcoin, which was the first network to gain widespread adoption and media coverage. However, different consensus mechanisms and design choices result in varying environmental footprints across blockchains. While the recent release of the first industry blockchain ESG benchmark enables standardized comparisons between chains at an aggregate level, a granular methodology for user-level emissions accounting is lacking.

This thesis introduces an attribution model designed to map the carbon footprint of blockchain at a user-responsibility level. Key factors such as asset balance, transactions signed and gas spent are used as proxies for user responsibility in overall chain emissions. Furthermore, a proof-of-concept tool (GreenBlocks) is built to showcase the attribution model, allowing users to estimate and offset their emissions through carbon credits. Based on the Ledger Live platform, this platform interacts seamlessly with leading blockchains and links with on-chain carbon market partners to retire offsets with maximal transparency.

Greenblocks provides transparent and personalized insights into blockchain emissions for end-users. By linking usage to quantified environmental impact, it promotes awareness and enables offsets as a means for users to take responsibility for their use of the technology. Moreover, it demonstrates the potential for on-chain data to be used as a basis for granular emissions estimation beyond high-level address metrics. Thus, this thesis proposes a bottom-up, user-focused approach to align blockchain adoption with environmental sustainability by pioneering user-level footprint attribution.

TODO:

- Add section on further opportunities blockchain/sustainability
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