

# **A just energy transition is not just a transition: Framing energy justice for a quantitative assessment**

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## **Abstract-**

Considering the justice dimension in the energy transition context has become a key requirement for tackling current ecological and social issues. Due to this endeavour's complexity, quantitative energy models are helpful tools to inform decision-makers about policies' environmental and social consequences. However, most energy models have not been designed with this dimension firmly embedded. Some crucial questions arise: What is a just energy transition? Can we operationalise it? What does a quantitative model require to study the impacts of the energy transition on vulnerable people? What has already been done in this regard? We explore the conceptual background of energy justice to contribute to answering these questions by analysing how four quantifiable dimensions &mdash; energy access, energy security, energy democracy and energy poverty &mdash; contribute to addressing justice-related challenges of energy systems. Based on it, we highlight some strategies to assess energy justice through the energy cycle for a just energy transition. Within this context, we propose operationalising a just energy transition in long-term energy planning models with energy poverty at its core for developed countries' considering 41 essential parameters. We conclude by examining which of these parameters are included in energy planning models to assess the impact of decisions on vulnerable populations. The findings show that most models struggle to encompass these four dimensions of energy justice comprehensively. We conclude suggesting some operational criteria to advance quantitative analyses of justice dimensions in future developments, noting issues of using models within energy justice debates.

**Index Terms-** Energy justice; Energy poverty; Just energy transition; Long-term energy planning; Optimisation models; Sustainability

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