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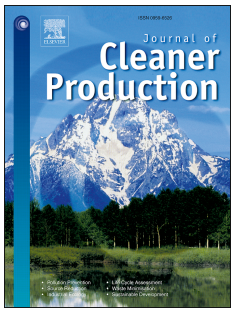

A dual narrative-modelling approach for evaluating socio-technical transitions in electricity sectors

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A dual narrative-modelling approach for evaluating socio-technical transitions in electricity sectors

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Abstract: The sustainability transition of electricity sectors is a matter of competition between multiple emerging renewable systems and dominant, established conventional systems. These transitions are multi-dimensional and are featured with non-linear and causal interactions between social, technical, economic and political components. Understanding the dynamic of transitions, i.e. how transitions unfold, can inform effective policy interventions. This paper aims to present a narrative-modelling approach to improve the understanding and description of transition dynamics in electricity sectors. The central ideas of the paper are: (1) the use of qualitative transition narratives helps to capture the co-evolving nature of society and technology which are simplified in modelling approaches; (2) narratives, with concepts from the sustainability transitions field, also guide the development of a model structure; and (3) computational models, in return, reproduce the complexity of transition dynamics, i.e. feedback loops, non-linearity, and time delays—the features which are impracticable to analyse with transition narratives alone. We use the historical transition of India's electricity sector to demonstrate the implementation of our proposed approach. First, an overview of the transition narratives is presented and the model structure, developed based on the narratives, is explained. Then, it is argued how the coupling of the narratives and model improves our understating of the positive impacts as well as the side-effects of stable feed-in tariffs and accelerated depreciation on the penetration levels of wind and solar electricity.

Keywords: System dynamics, Sustainability transitions, Renewable energy, Policy, India.

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