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Title: Enhancing the causal understanding of rebound effects: a catalogue of mechanisms and a formalisation procedure

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Highlights

- The systemic view on rebound effects (RE) makes explicit the reactions from well-intended sustainability measures
- Causal Loop Diagrams (CLD) help explain RE mechanisms
- A catalogue of mechanisms represents the state-of-the-art of RE categorisations
- The fundamental structures of RE mechanisms are uncovered

Abstract

Rebound Effects (RE) hinder achieving the intended effects of sustainability actions. Despite the wide recognition of RE, the limited understanding of the causal structures sustaining RE hampers the ability to anticipate, prevent, or tackle them. This paper, by drawing on systems thinking, describes various structures leading to RE, based on qualitative System Dynamics (SD) modelling using Causal Loop Diagrams (CLD). More specifically, to demonstrate the use of CLDs for RE, 30 RE mechanisms were modelled and organised in a comprehensive catalogue of mechanisms. Two generic RE mechanisms are derived from the catalogue, depicting RE as either (1) reinforcing loops acting

against quick fixes to enhance local resource consumption or (2) balancing reactions in the opposite direction of attempts to control local resource consumption leading to escalation behaviour. Eight research implications consolidate how the results of this research sustain a systemic view on RE, the natural evolutionary step required to understand and manage its occurrence.

Keywords: Rebound effects, Systems thinking, System dynamics, Sustainability transitions, Unintended consequences