

Doutorado (DO)

ELECTRIC VERSUS ETHANOL-BASED VEHICLES: A NEW SYSTEM DYNAMIC MODEL OF BRAZIL'S CASE

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ABSTRACT

Modelling has become one of the key means to provide directions for policymakers towards a more sustainable transportation system. However, discrepancies in results are emerging questioning the reliability of estimates promoting the wide-scale adoption of green technologies, creating confusions and debates amongst policymakers. More holistic models that include well-to-wheel (WTW) system dynamic modelling with an embedded temporality perspective and built-in sensitivity tests for a wide range of assumptions can improve the robustness of model predictions and enhance their relevance for policy. Fleet-based Well-to-wheel Model for Policy Support (FWEMPS) tool offers these features. The application of our model suggests that technologies assumed to be environmentally friendly might not be such in certain life cycle context, and reaffirms that how we model things really matters. Amongst other things we find that the benefits of green technologies depend in important ways on the specific context of a country and that using endpoint life-cycle assessments weighs the results in favour of electrification for most countries. Importantly, we find that for Brazil, ethanol dominates under a wide variety of extreme scenarios, and depending on the assumption of land use change expansion, there may be negative well-to-tank emission by an increase of biofuel production. Results also highlight ambiguities, which provide relevant insight for policymakers for future sustainability transitions.

Key words: electric vehicles, ethanol-based vehicles, emissions, LCA.

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