

MODELLING USER-PAY AND POLLUTER-PAY PRINCIPLES-BASED STATE INTERVENTIONS FOR SUSTAINABLE TRANSPORTATION SYSTEMS

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Summary: Abstract This paper presents a model framework demonstrating how the User-Pay (UsP) and Polluter-Pay (PoP) principles inform state interventions in sustainable transportation systems. While the concept of sustainable transportation has been extensively explored (Banister, 2008; Kraus & Proff, 2021), inherent contradictions remain. Notably, full-cost pricing under UsP may disproportionately affect lower-income groups, exacerbating social inequalities.

We hypothesize that existing methodologies for assessing the expected outcomes of state interventions in transportation systems – such as legislative restrictions, taxation, and subsidies – evaluate these measures individually rather than as an integrated policy framework, are not fully aligned with the objectives of sustainable transportation.

The aim of this study is to develop a principled model that illustrates the interactions among different combinations of UsP- and PoP-based state interventions within the context of achieving sustainable transportation goals. The specific objectives are:

To analyze the effects of various combinations of state interventions on sustainability objectives, incorporating environmental, economic, and social dimensions.

To further enhance the transport model developed by Riga Technical university (RTU), which currently focuses primarily on investment-based interventions.

This study explores the complexity of sustainable transportation using an Analytic Network Process (ANP)-based RTU transport model, describing interactions across four interconnected sub-systems: infrastructure, equipment, traffic, and user behaviour. Using a systematic review of EU transportation policies, we generalized existing UsP- and PoP-based state interventions and examined their mutual contradictions and complementarities when applied directly to transport users and owners or indirectly to infrastructure, fuel, and equipment. A structured framework is developed to enable a comprehensive analysis of these interactions, assessing their strength and impact.

The findings suggest that various combinations of UsP- and PoP-based state interventions can either reinforce or undermine each other in achieving sustainability goals. These insights contribute to a more comprehensive assessment of transport policy development and provide a foundation for more advanced modelling of state intervention effects.

The study highlights the importance of designing complementary UsP- and PoP- based state interventions to maximize policy efficiency and minimize unintended consequences. Further research should explore dynamic feedback mechanisms and stakeholder perspectives to enhance the model's applicability in policy-making.

References

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