https://doi.org/10.7250/CONECT.2025.098

POLICY ANALYSIS OF LATVIA'S WASTE SECTOR: A SYSTEM DYNAMICS APPROACH

Ģirts BOHVALOVS[1*], Andra BLUMBERGA[2], Vivita PRIEDNIECE[3], Terēza BEZRUČKO[4], Veronika LIBEROVA[5], Anna KUBULE[6], Dagnija BLUMBERGA[7]

[1–7] *Institute of Energy Systems and Environment, Riga Technical University, Āzenes iela 12/1, Riga, LV1048, Latvia*

[*] ***Corresponding author.*** *Email address: Girts.Bohvalovs@rtu.lv*

Abstract – Latvia's waste management sector generates annually increasing waste volume, more than doubling to 2.71 Mt in 2023 from 1.26 Mt in 2004. The current national policy aims to address this challenge to reduce waste generation and landfilling by promoting circular economy principles. The long-term strategy is focused on achieving climate neutrality in 2050 with a 58 % reduction in greenhouse gas emissions compared to 2017 levels. This study performed a comprehensive analysis of European Directives, National Policy Plans, Regulations, and IPCC reports for the waste management sector. Relevant data has been systematically extracted from these documents and analysed. In this study, a System Dynamics approach has been used to capture complex interactions within the waste management sector. The System Dynamics model has been developed to assess and evaluate the current state of Latvia's waste management sector and incorporate various policies. The model has been validated on historically available data and structural analysis. Policies regarding ways to minimize waste generation, greenhouse gas emissions and their associated effects on socioeconomics have been analysed using the model. An interactive decision-making interface has been developed on top of the model to be used by stakeholders for various scenario analyses. The interface allows users to analyse Business-as-Usual (BAU), optimistic, worst-case scenario, and custom scenarios by providing own inputs and policy mix. Two stakeholder workshops have been performed where waste management experts and policymakers performed scenario assessments using the developed interface. Discussions with the stakeholders during the workshops have shown trust and support for the model, and they report that it is beneficial to incorporate the model into the national policy analysis and planning.

Keywords – Circular economy; climate change mitigation; decision making; environmental impact; eco-design; greenhouse gas emissions; sustainability

ACKNOWLEDGEMENT

This work has been funded by the Latvian Council of Science within the research project "Climate Neutrality Decision Models in Action" No. VPP-KEM-Klimatneitralitāte-2023/1-0002