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USE OF SOLAR ENERGY TO INCREASE THE SUSTAINABILITY OF SHARED MICROMOBILITY

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Abstract – This study continues the examination of potential ways to decrease greenhouse gas (GHG) emissions in the urban transportation sector by using shared scooters in Riga. Despite claims by shared scooter operators that these vehicles are environmentally friendly, shared e-scooters contribute an additional 239.9 tonnes of CO_2 in Riga. While energy is not the largest source of CO_2 emissions for shared scooters, it is one factor that could be improved by switching to locally produced green energy. This study revaluates the CO_2 emissions from shared scooters based on an additional year of data. It also analyses the possibility of generating enough energy on-site to provide chargers with PV energy. For this purpose, the study utilizes the last seven years of solar energy data in Latvia to model the potential energy flows that can be used to charge the electric scooters. This data is then combined with information from 3 million scooter trips from the years 2021–2022 scooter seasons, analysing the trips and the energy used during scooter use. It was determined that, on average, 59.6 Wh were used per trip, with a standard deviation of 18.9 Wh. The model was tested with various levels of PV cell areas and energy storage systems to determine the minimum parameters required for the scooters to be provided with enough energy without the need for additional grid charging. The results demonstrate that it is, indeed, possible to provide enough solar energy to ensure continuous charging of the electric scooters for 98.8 % of the cases during the scooter operation period with just 0.2 m^2 of solar cells per scooter. In conclusion, while this approach does not completely offset the CO_2 emissions generated by the short scooter lifespan, it is a step towards greener urban transport. Further research will be carried out to optimize the charging locations for the evaluation of practical PV charging viability.

Keywords – E-scooter CO_2 emissions; energy flow modelling; photovoltaic (PV) charging; renewable energy in transport; shared scooters

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