# EXPLORING NEW WAYS TO CHARGE INTERCITY MOBILITY - IMPACT ON ROAD TRAFFIC EXTERNALITIES.

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**ABSTRACT**

Around 70% of transport-related emissions in the EU (European Union) came from road transportation. A major contribution to the transport-related emission externalities comes from all the passenger car trips generated in intercity corridors. In Portugal, these trips represent 65% of the kilometers travelled and more than 55% of $CO_2$ and NOx emissions. Portugal is the second worst country withing EU, only followed by Luxembourg, in terms of the relationship between external costs of transport and the country GDP (Gross Domestic Product)., the external costs of transport account for 7.2% of the country GDP. This work intends to assess how generalized GPS-based toll systems can reduce emissions compared with a flat-electronic collection system. The model for estimating network demand and traffic assignment is PTV VISUM. Emissions are estimated using a macroscopic methodology. The variables under study are the $CO_2$ and NOx emissions, emissions-related external costs, total revenue, user costs. A trade-off will be performed to discuss the best strategy for different periods under study (peak and off-peak hours).

Previous research efforts related to GPS-based toll collection systems do not refer to the environmental impacts of the application. These research gaps are addressed in this work by proposing a methodology focused on innovative road pricing emission-based tolls (e.g. GPS-based tolls) in intercity corridors.

Simulation experiment results on a case study in Portugal comprising alternative routes of approximately 60km show that two different strategies are recommended for the peak and off-peak hours period. A GPS-based toll collection is only applicable on the Motorway for peak hours, and a GPS-based toll collection is applied in both road options off-peak hours. This strategy in a 24-hour span would allow a total decrease in emissions-related externalities (-1.4%) with only a small decrease of the total revenue without sacrificing the cost each user would pay to travel through this intercity corridor. Bearing in mind the residual emission reductions and the level on uncertainty associated with the model, these results are promising in that they suggest that it is plausible to implement a system that internalizes emission costs more directly as a function of demand, driving conditions and speed.

**KEYWORDS:** Intercity corridors, pollutant emissions, individual transportation, road pricing.

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