Evaluation of the Low Emission Zone according to the evolution of car-ownership: the *Métropole du Grand Paris* case study

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Among the strategies for reducing the use of private cars, coercive measures such as urban tolls and low emission zones (LEZ) are more and more investigated by the city planners[1]. Since 2019, the *Métropole du Grand Paris* (MGP) established a LEZ system according to some vehicle pollution criteria from diesel, essence, gas, and electric (*Crit'Air*) (APUR (2021)). The provisional timetable for application is: 2019 (*Crit'Air 5*), 2021 (*Crit'Air 4*), 2023 (*Crit'Air 3*), 2024 (*Crit'Air 2*), and 2030 (*Crit'Air 1*). Applying this new measure involves the replacement of a large proportion of the vehicles in circulation within the perimeter of the LEZ by the end of the calendar (99% of cars in total).

Although the consequences of such a measure on improving air quality and protecting the environment remain undeniable, it has dramatically disrupted the mobility behaviors of populations. These behaviors can take several forms depending on household income, the main ones being: i) replacement of the car fleet by vehicles of appropriate criteria or use of a compliant household vehicle, ii) modal shift towards public transport and cycling, and iii) changing routes to circumvent the perimeters of the LEZ. It should be noted here that some people may refuse to comply with this measure and continue to use non-compliant vehicles. Regarding these possibilities, it is essential to have a decision support tool to evaluate different scenarios of LEZ applications to allow its adoption by the populations.

This work aims to investigate the impacts of the LEZ for the MGP according to the evolution of car fleet using the *Eqasim* simulation framework, which is a version of *MATSim* (Horni et al. (2016)) using a Discrete Mode Choice module (Hörl et al. (2019)). It is based on a previous work that performed an open *MATSim* calibrated simulation at the scale of the *Ile de France region* (Hörl and Balać (2021)). The simulation approach is based on two steps: i) generation of an evolutive vehicle fleet following the LEZ timetable and allocation to households based on specific criteria and ii) driving restriction of non-compliant vehicles in *Eqasim* by modeling new vehicle type and routing constraints by adapting the road network. The emissions estimate is based on the *MATSim* emissions module using the HBEFA factors.

Regarding expected results, we will carry out about ten simulation scenarios by considering the years of application of the LEZ and the situations with or without its implementation. We will conduct analyses on the changes in mobility behavior (modal shift, change of routes, non-compliance with the measure) at the scale of the MGP. Then, we will evaluate the emissions in the area of application of the LEZ and the surrounding municipalities.

References

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[1]https://urbanaccessregulations.eu, accessed May 8th, 2023