UNIVERSITÉ CÔTE D'AZUR | INSTITUT D'INNOVATION ET DE PARTENARIATS IMREDD

SUMO conference 2026

SUMO SIMULATION OF URBAN MOBILITY

Context & Objectives

The project aims to build a decision support method that helps planners to evaluate the environmental impact of a proposed urban development, through an integrated transport and spatial modelling framework. The project models the expected traffic flows in the study area, analyses the carbon emissions, noise pollution and time loss in traffic, in order to compare different scenarios, assess the impact of changes, and help identify an optimized configuration of the neighborhood.

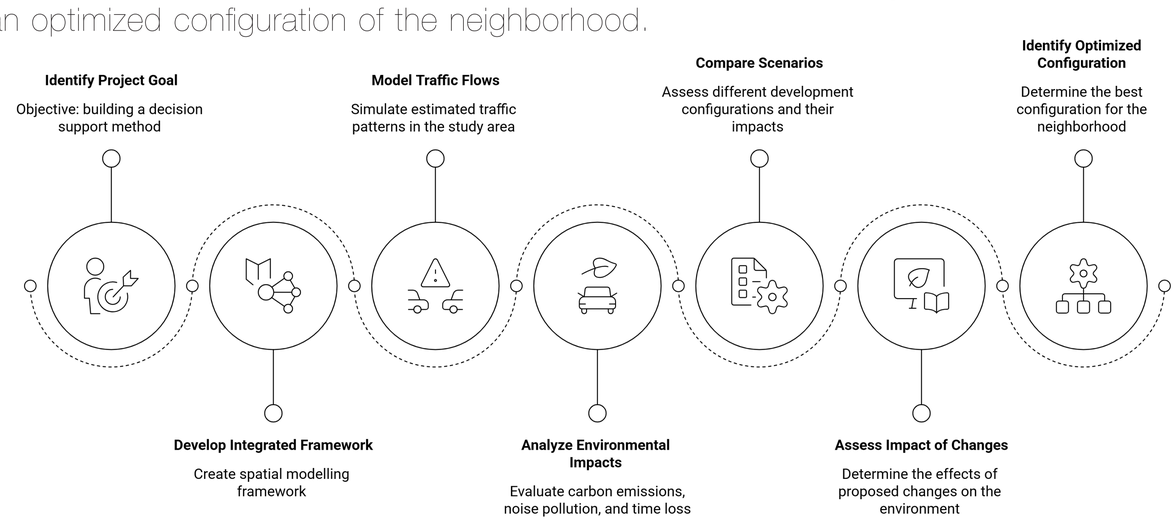

Figure 1 : General framework of the project.

Methodology

The study area is represented by its land-use composition, commercial and service program, road hierarchy and connections. A digital representation of the neighborhood and its surrounding transport network is constructed in SUMO, through node-edge topology, intersection control, road configuration (including speed, number of lanes, direction, pedestrian crossings, bike lanes, etc.). Socio-demographic assumptions and land-use parameters are used to estimate trip generation, distribution, and modal split. Travel demand is estimated based on average rates of trips identified by specialized entities such as CEREMA[1] (Center for Studies and Expertise on Risks, the Environment, Mobility, and Development), the Institute of Transport Engineering (ITE)[2], among others. The trips are allocated to the road network defining their origin and destination, incorporating vehicle flows, their density, speed and directions. The simulation is executed to obtain the results.

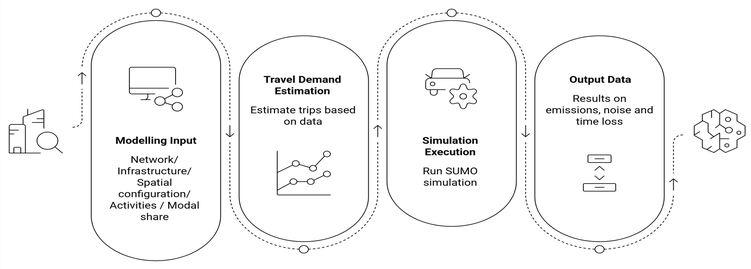

Figure2: The applied methodology of the project.

Figure 3 : Screen capture of the modeling details in SUMO.

Results

The simulation leads to outputs which include the «edge-lane emissions» output containing indicators such as CO_2, NO_x and PM_x. Noise emissions from the «edge-lane noise» output are calculated using the built-in «Harmonise» model. Finally, time lost in traffic is derived from the «edge-lane traffic» output, as well as «trip_info» for detailed information about each trip regarding time loss, waiting time and other parameters. The results are analysed and visualised through different spatial and graphical representations.

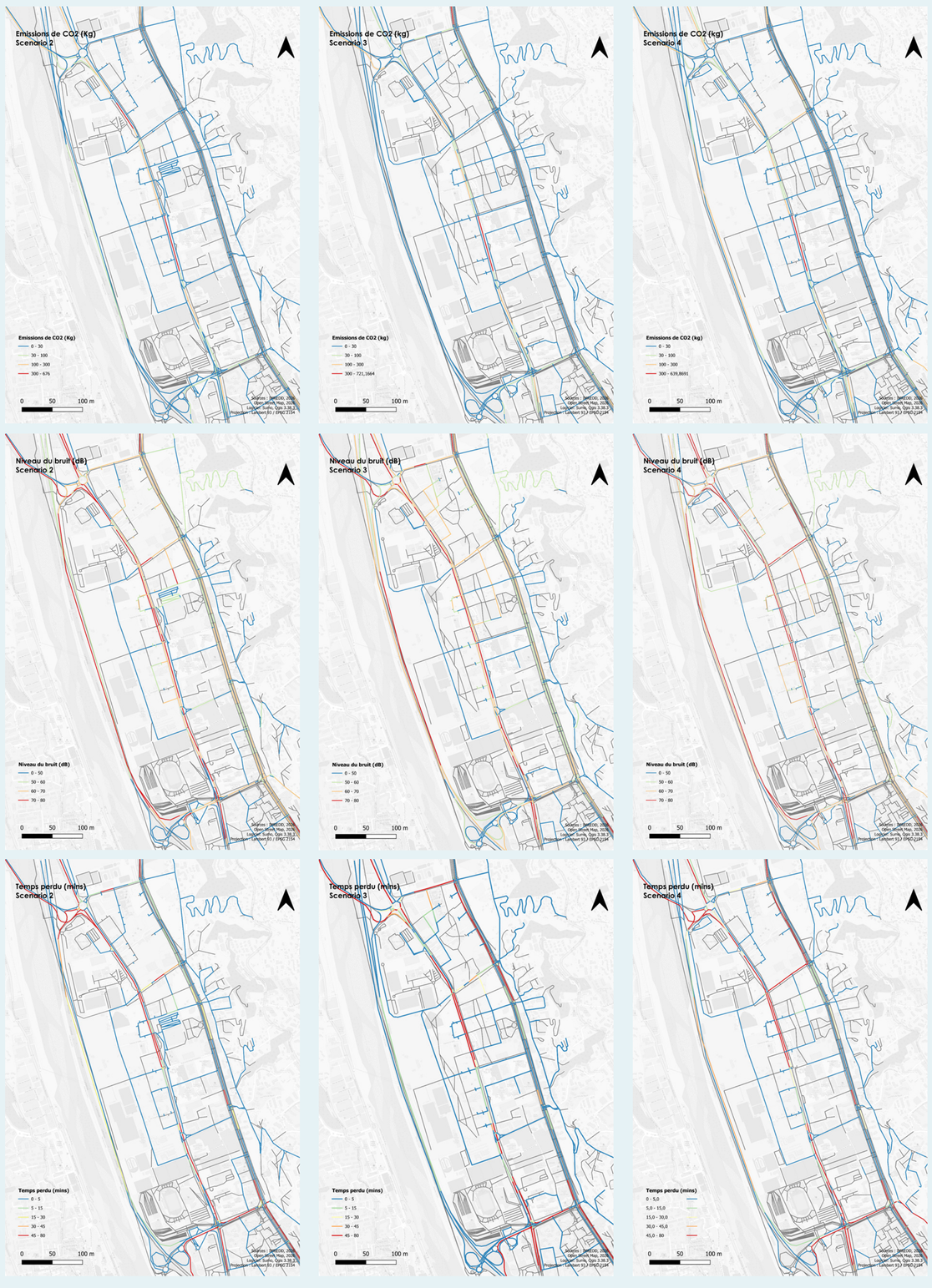

Figure 4 : Spatial analysis of the outcomes for the three indicators across the 3 scenarios.

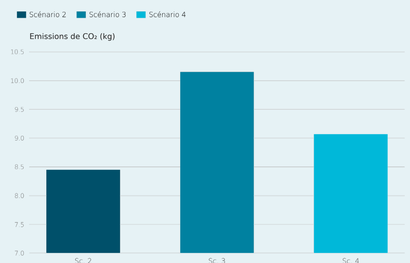

Figure 5: Comparaison of CO_2 emissions for 3 scenarios.

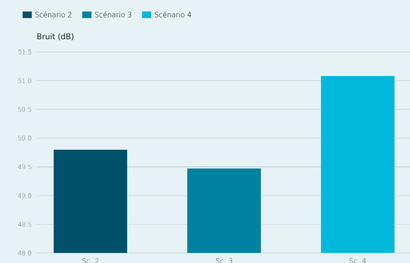

Figure 6 : Comparaison of Noise levels for 3 scenarios.

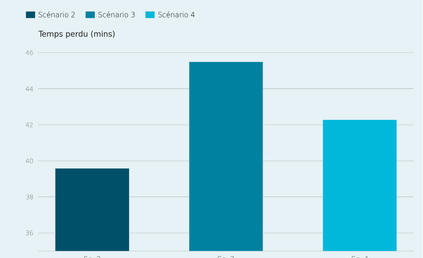

Figure 7 : Comparaison of time loss for 3 scenarios.

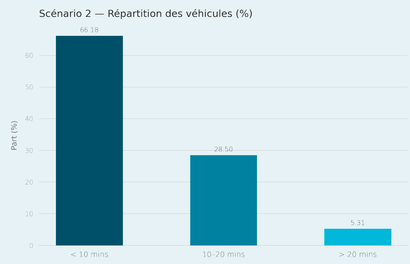

Figure 8 : Distribution of time loss - Scenario 2

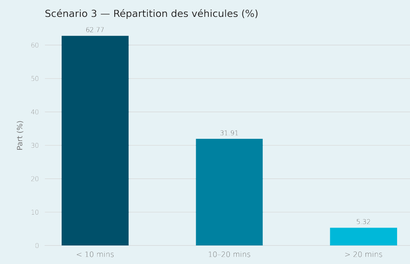

Figure 9 : Distribution of time loss - Scenario 3

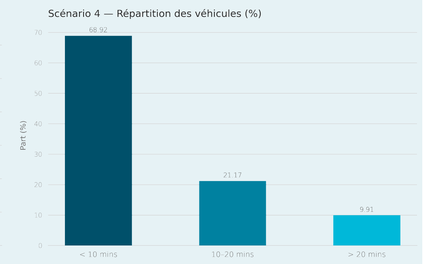

Figure 10 : Distribution of time loss - Scenario 4

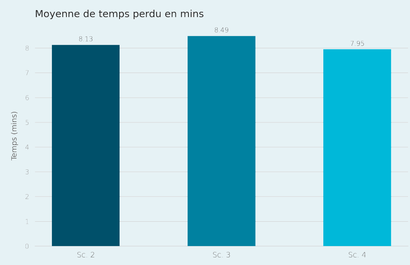

Figure 11 : Average time loss of delivery trucks for 3 scenarios

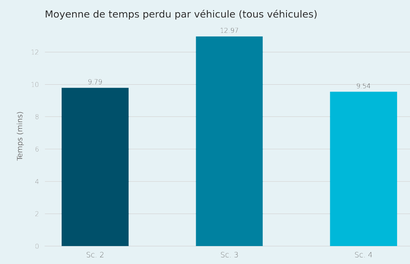

Figure 12 : Average time loss of all vehicules for 3 scenarios

The maps on the left-hand side provide a spatial visualization of the results for three key parameters - carbon emissions, noise levels, and time loss - across the three scenarios under study. Each parameter is analyzed and compared against official benchmarks to assess the significance of the findings. Specifically, noise levels are evaluated using the health and safety thresholds established by ANSES[3] (Agence nationale de sécurité sanitaire de l'alimentation, de l'environnement et du travail), while carbon emissions are benchmarked against official data from CEREMA (Centre d'études et d'expertise sur les risques, l'environnement, la mobilité et l'aménagement) and ADEME (Agence de la transition écologique)[4]. Additionally, the time loss indicator is represented on the maps as the total cumulative delay experienced by all vehicles during the simulation period. Further analysis is also conducted to determine the average time loss per vehicle, as well as the percentage of vehicules in each category of time loss.

Conclusions and limitations

This study provides a comprehensive assessment of the traffic-related environmental and mobility impacts associated with the development of the neighborhood, through microsimulation modeling using SUMO. By evaluating multiple scenarios across key indicators, the analysis offers a reliable basis for comparing development configurations and informing planning decisions. While the results are consistent with national reference values and confirm the validity of the modeling approach, they should be interpreted in light of the inherent limitations of the methodology and the assumptions underpinning the trip generation process.

References :

1. https://www.cerema.fr/fr/actualites/quantifier-localiser-aires-livraison
2. https://www.itetripgen.org/
3. Évaluation des impacts sanitaires extra-auditifs du bruit environnemental - Avis de l'Anses - Rapport d'expertise collective.
4. Https://doc.cerema.fr/Default/doc/SYRACUSE/20326/emissions-routieres-des-polluants-atmospheriques-courbes-et-facteurs-d-influence.

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