Modeling last-mile flows: revival and evolution of the Sogaflow tool for decision support in sustainable urban logistics

Jules Pade, September 2025

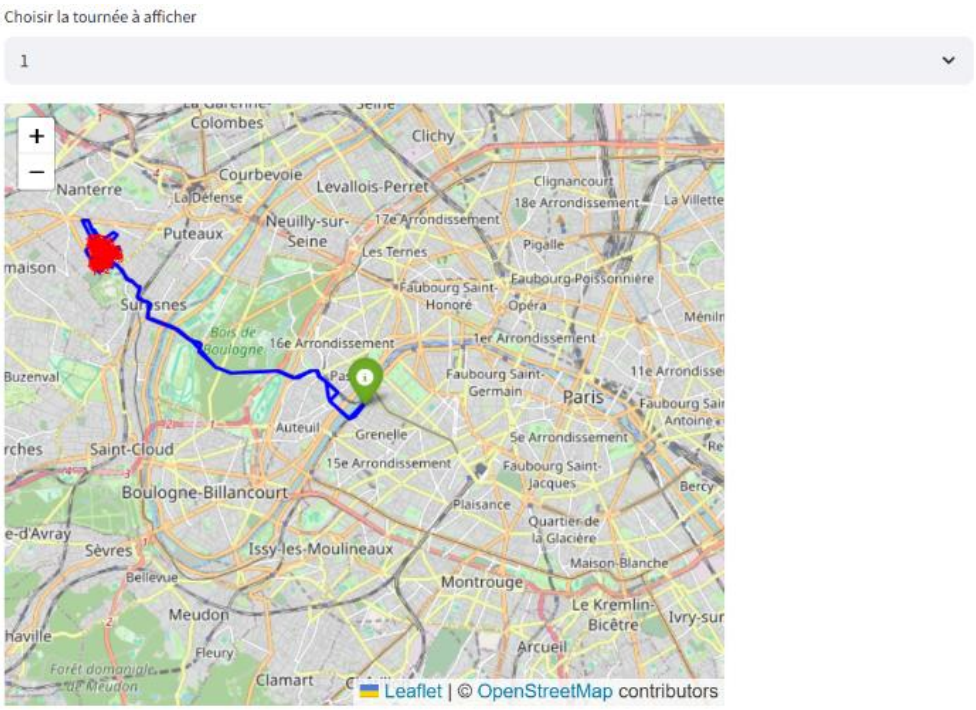
Summary of a Master's thesis in engineering from the École des Ingénieurs de la Ville de Paris (EIVP) based on an end-of-studies internship at Sogaris, a real estate company specializing in urban logistics. Supervisor: Reece Fisher. Academic tutor: Benjamin Moignot.

This master thesis presents the work carried out as part of an end-of-studies internship at Sogaris, a real estate company specializing in urban logistics. The mission focused on the reactivation and development of Sogaflow, a tool for simulating last-mile flows designed to inform decisions regarding logistics location, delivery organization, and environmental impact.

Faced with the increasing complexity of urban logistics flows, the rise of e-commerce, and the constraints of the last mile, the question is: how can these flows be modeled to aid decision-making in terms of sustainable urban logistics?

Methodology

The work was carried out in several phases. After an initial diagnosis of the existing Sogaflow project, the tool was reactivated and thoroughly restructured. The simulation engine is based on two open-source technologies: OSRM (Open Source Routing Machine) for calculating distances and travel times, and VROOM for optimizing vehicle routes. A user interface was designed to make the tool accessible to operational teams and decision-makers. New features were integrated, including multi-scenario comparison (different warehouse locations, fleet compositions, delivery organizations) and the calculation of environmental indicators (distances traveled, CO_2 emissions). A case study simulating flows from a logistics warehouse in Paris tested the tool's functionality by comparing the simulation results with data from a study bureau.



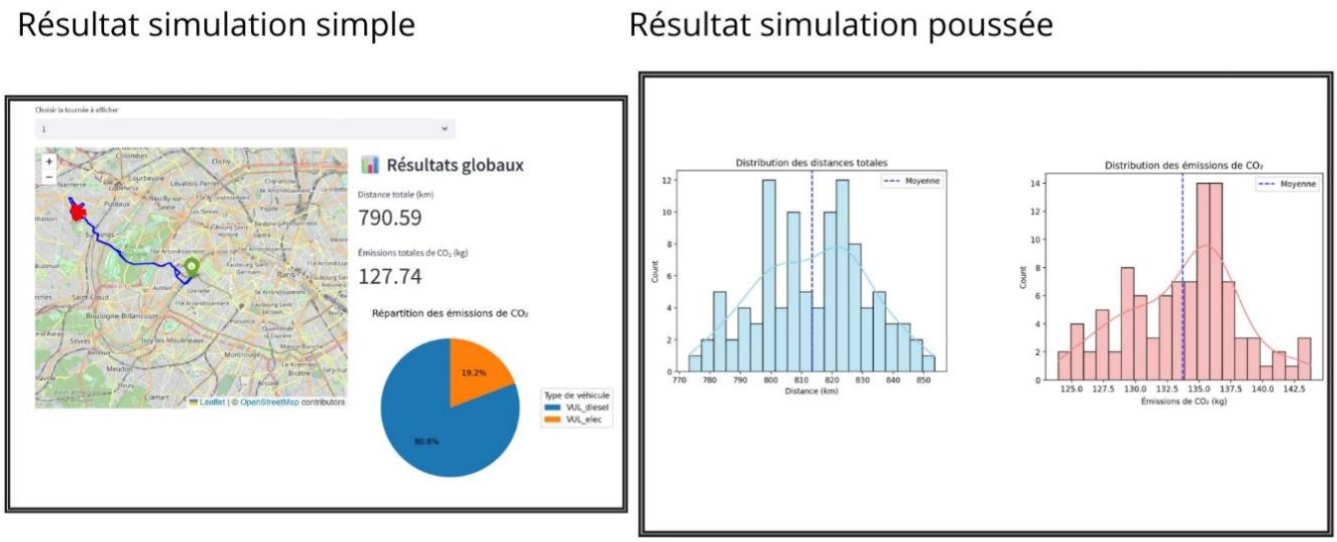
Map visualization of one delivery route. Source: Jules Pade (2025)

Main results

The comparative case study reveals differences of +33% in terms of distances traveled and +47% in terms of CO_2 emissions compared to the Jonction study data. These differences call into question the various assumptions that must be taken into account when simulating delivery scenarios. They can be explained mainly by the rigidity of the sectorization and modeling parameters of Sogaflow.

The multi-scenario comparison features allow for rapid assessment of the impact of location choices or fleet composition on logistics and environmental performance. The tool is designed to complement other existing tools: it sits between complex academic models and simple distance calculators, offering a balance between accuracy and ease of use.

Sogaflow has proven its usefulness for Sogaris' operational teams (development, asset management, real estate management) as well as for public actors involved in urban logistics planning. The tool also promotes dialogue between researchers, practitioners, and decision-makers by providing a common language based on transparent and quantified data.



Simulation results in the Sogaflow tool. Source: Jules Pade (2025)

Conclusion

This internship has transformed Sogaflow from a dormant project into a robust operational tool. Beyond the technical aspects, this work highlights the role that simulation tools can play in logistics governance and urban planning. When data is well structured and shared, it becomes a powerful tool for dialogue and collective decision-making. Future developments include the integration of new constraints (cargo bikes, low-emission zones), the enrichment of databases, and the development of an extended version of Sogaflow capable of managing larger territories and more complex scenarios.