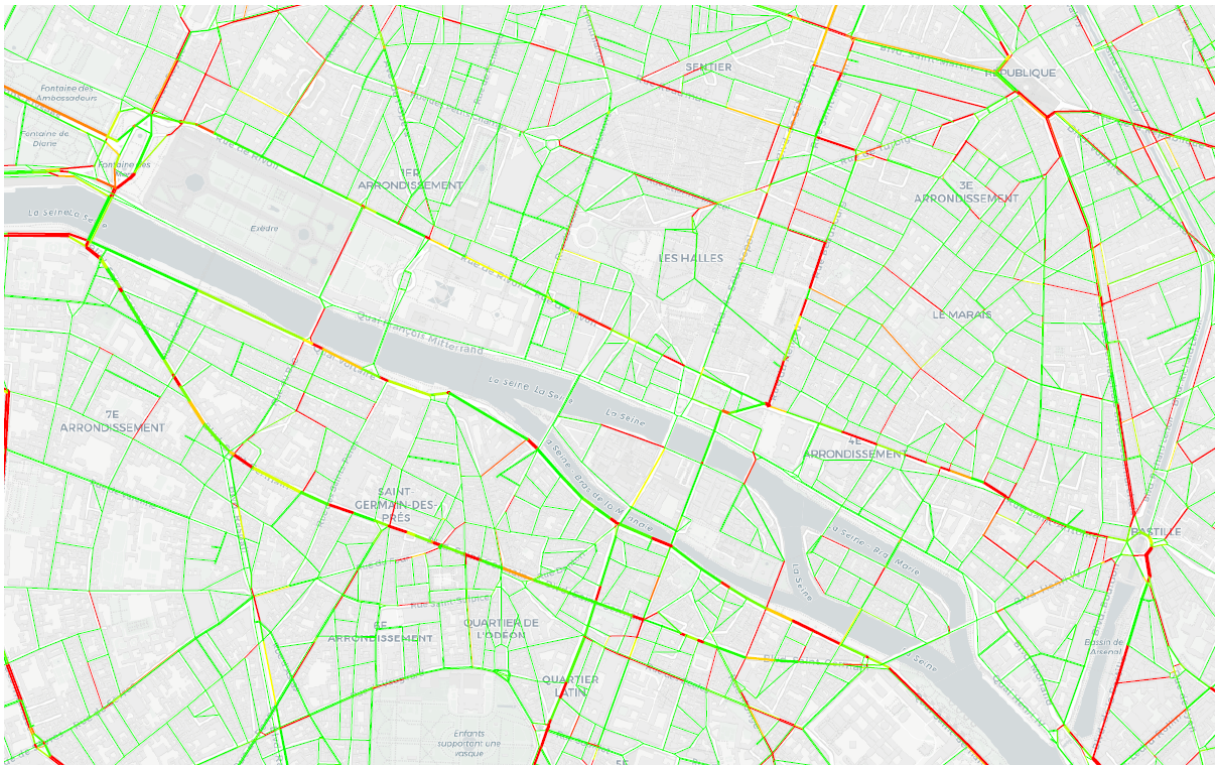


# Impact of Road Closure Policy on Neighborhood

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**ABMT Report**

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Course Report, ABMT 2018 HS

# Impact of Road Closure Policy on Neighborhood

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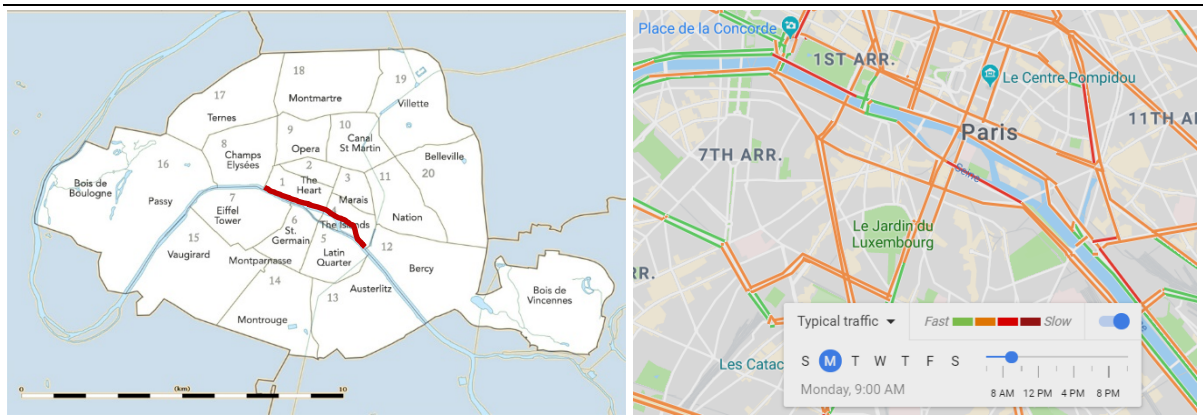
# 1 Site Description

The route to be closed is located in the center of Paris as shown in Figure 1. The roads are at the north side of the Seine River, starting at the Place de la Concorde until the Bassin de l'Arsenal, and play an important role in the city center. The policy to close these urban motorway roads aim at improving the walking and cycling quality of this area.

Figure 1 shows a typical traffic situation on a Monday morning at 9:00, by the end of the morning peak hours. It can be seen that the west section of this route has a relatively slow traveling speed and indicates a possible traffic bottleneck. What kind of impact this policy will have on the neighborhoods and people using those roads stay unknown before the policy's implementation.

In this report, we use MATSim to simulate scenarios under different settings to examine the possible influence of this policy on the nearby roads and people who frequently use those routes.

Figure 1: Site location (a) and site typical traffic situation (b)




Source: (ParisInsidersGuide, 2019), (GoogleMap, 2019)

# 2 Scenarios

## 2.1 Baseline Scenario

The baseline scenario simulates the car operation situation based on a synthetic population for the whole Île-de-France region, to provide a reference for the future evaluation of road closure policy.

### 2.2 "Link Closure" Scenario

The "Link Closure" scenario creates a modified network, where the intended closed roads are disabled for cars. Travelers thus have the option to modify their routes according to the new conditions. This scenario analyses the impact of road-closure policy assuming that, when trying to accommodate to the new traffic conditions, people would only change their car routes.

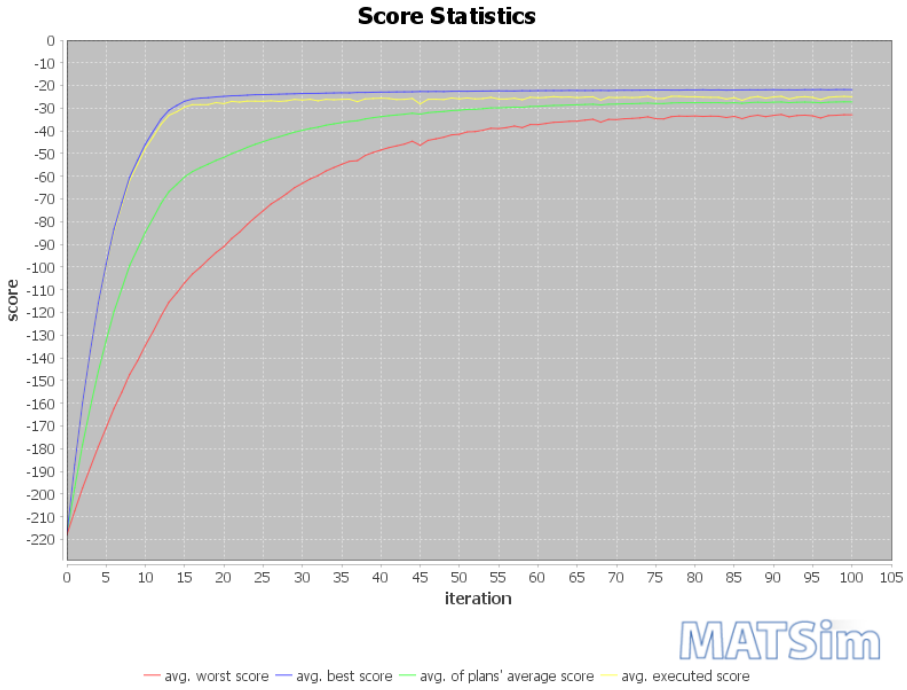
### 2.3 "Flexible Departure" Scenario

The "Flexible Departure" Scenario allows for travelers' departure time modification within 30 minutes based on "Link Closure" Scenario. It analyses the effects of the policy assuming people would not only change their routes but also their departure times.

## 3 General Settings

The three scenarios were run for 100 iterations to simulate travelers' behaviors as close as to what might happen in the reality. This was enough to reach equilibrium, as shown in Figure 2.

Figure 2: Agents score progression for the Baseline Scenario simulation

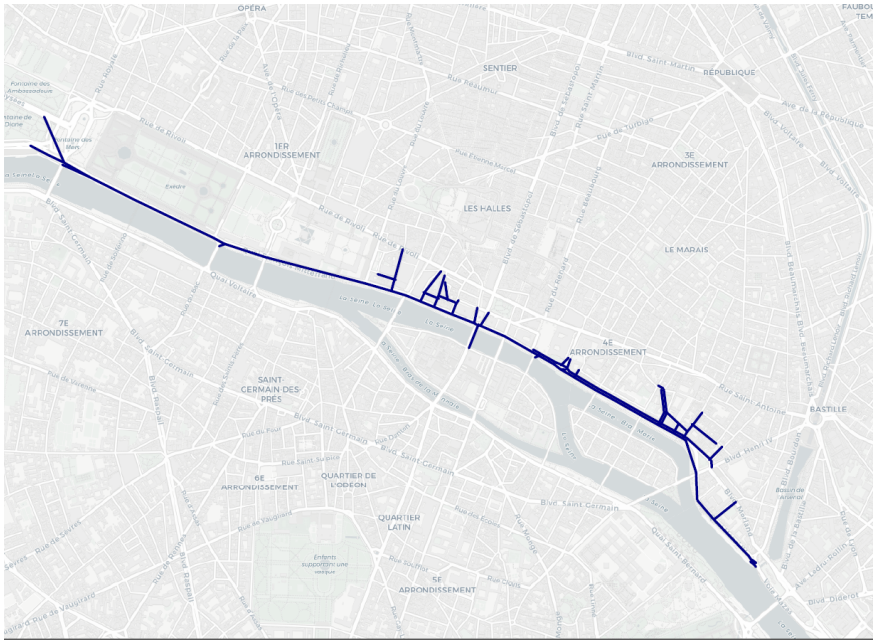



Source: the authors

To disable and close the roads, the capacity of all relevant links is set to 0. In addition, all other links that would become a dead-end road due to the closure policy are also closed. The closed links are shown in Figure 3.

Allowed departure time modification for agents is within 30 minutes which is close to people's real-life behavior.

Figure 3: Closed roads and dead-end roads




Source: the authors

# 4 Outcome Analysis

## 4.1 Travelers (Agents)

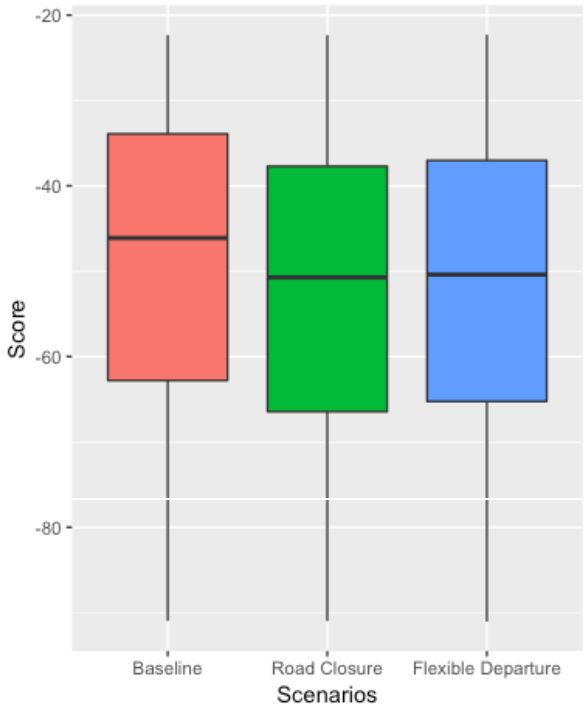
Agents that used any of the closed links in the baseline scenario had their scores analyzed to evaluate the impact of the policy on their utility measures. The scores of agents under each scenario are shown in Figure 4

Figure 4

Figure 4 (outliers removed) and Table 1 (with outliers).

In all 3 scenarios scores concentrate in the range of -70 to -30 (shown in Figure 4), while some agents' scores are lower than -400 (shown in Table 1). Compared with the Baseline Scenario, agents in both "Road Closure" and "Flexible Departure" Scenarios have lower average scores, which indicates the car drivers' utility is worsened off due to this policy. Under "Flexible Departure" Scenario, as it can be seen from Figure 4, there was a slight improvement. However, due to outliers the "Flexible Departure" Scenario has a lower average in comparison to "Road Closure", as seen in Table 1. The reason for this could possibly be attributed to the additional stochasticity coming from the time mutation strategy.

Figure 4: Travelers' score under the 3 scenarios (outliers removed to improve visualization)




Source: The authors

Table 1: Travelers' score under the 3 Scenarios (with outliers)

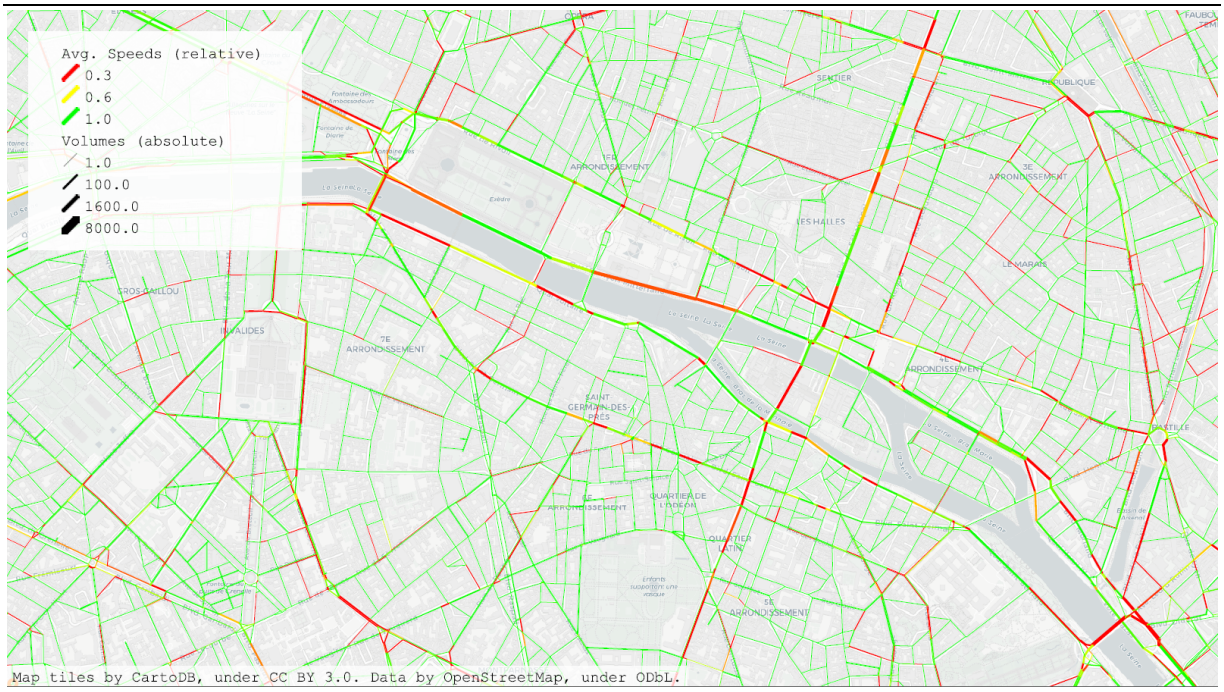
| Scenarios | Baseline | "Road Closure" | "Flexible Departure" |
|---|---|---|---|
| Highest | -2.32 | -2.58 | -0.60 |
| Average | -48.31 | -63.82 | -66.14 |
| Lowest | -559.21 | -540.14 | -562.55 |

Source: The authors

## 4.2 Roads (Links)

The volumes and speed on the roads for the Baseline scenario is shown in Figure 5. As it can be seen, the roads to be closed mostly have low speeds and high volumes.

Figure 5: Traffic volume visualization under Baseline Scenario (between 7 and 8 AM)



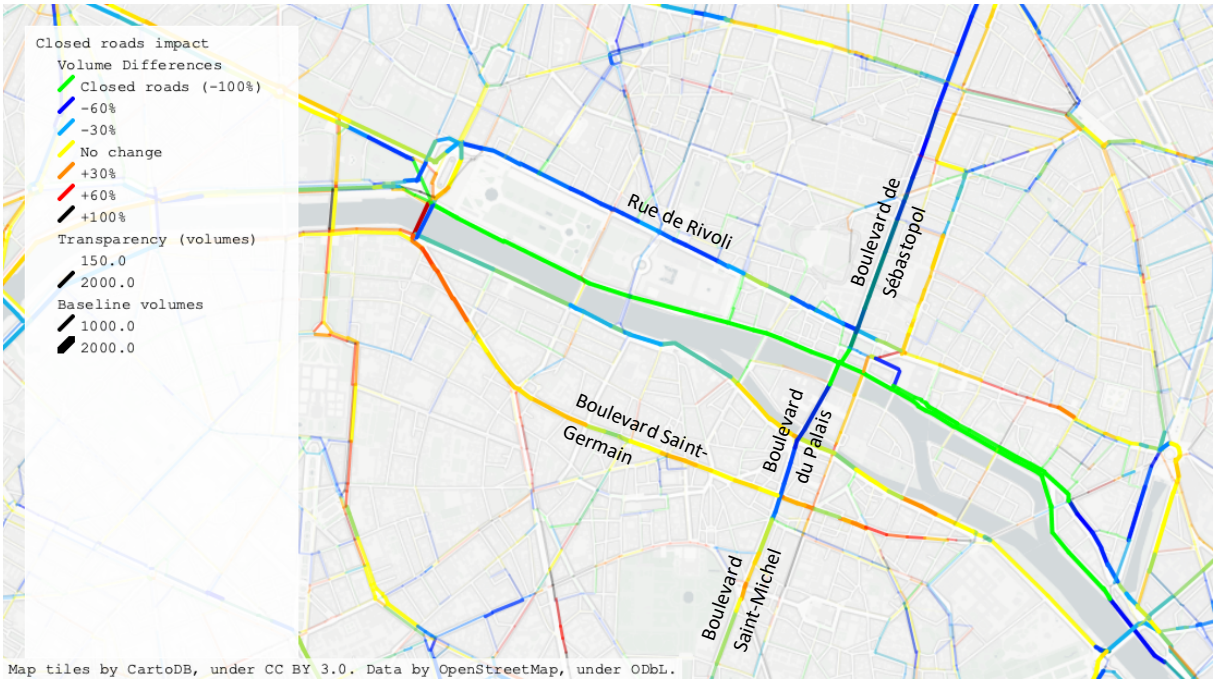

Source: The authors

The volume differences on roads between Baseline and "Road Closure" Scenarios are shown in Figure 6 and Figure 7, at the whole city level and neighborhood level respectively. The volume difference in regard to the "Flexible Departure" scenario is very similar and thus not displayed here to avoid repetition.

Figure 6: Traffic volume difference visualization under “Road Closure” Scenario


Source: The authors

Figure 7: Traffic volume difference visualization under “Road Closure” Scenario




Source: The authors

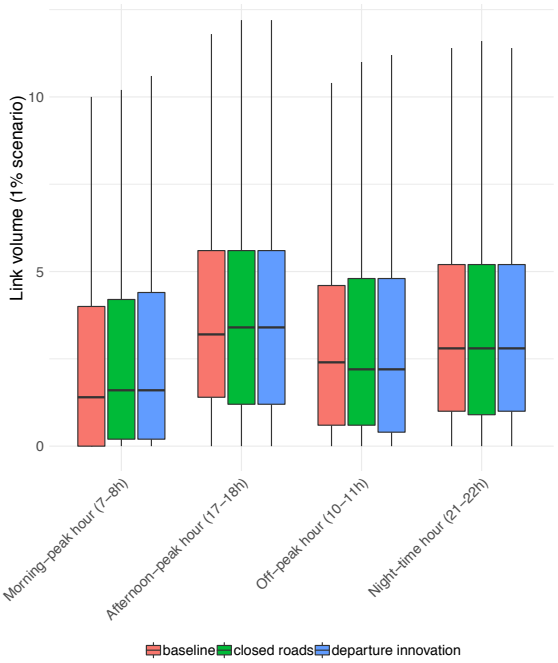
The impact of road closure policy spreads at the whole city level, with clearly the highway circles around the city being the most affected. This demonstrates the far-reaching network effects of the road closure. Interestingly, there were also some highway links in the western side of the city which actually had their volumes decreased.

At neighborhood's level, it is clear in Figure 7 that the traffic volume of Boulevard du Palais and Boulevard de Sébastopol, which vertically intersected with closed route, and Rue de Rivoli, which is parallel to the closes route, has decreased roughly between 30-60%. Initially, it can be interpreted that the implementation of the policy didn't switch the traffic to the roads nearby, and one could think that the agents might have taken other routes thus relieving the traffic situation in the neighborhood. But this is later disproved by a quantitative analysis, meaning that while the improvement happened in those three important roads, in general this was not the case.

The quantitative analysis was made of the links within a 1 km buffer area of the closed roads, in order to evaluate the policy effects on the neighboring roads. For this evaluation, the closed links were not included in the analysis, even in the case of the Baseline scenario. This was done to evaluate the impact in the other links, not in the closed ones where it is clear what happens.

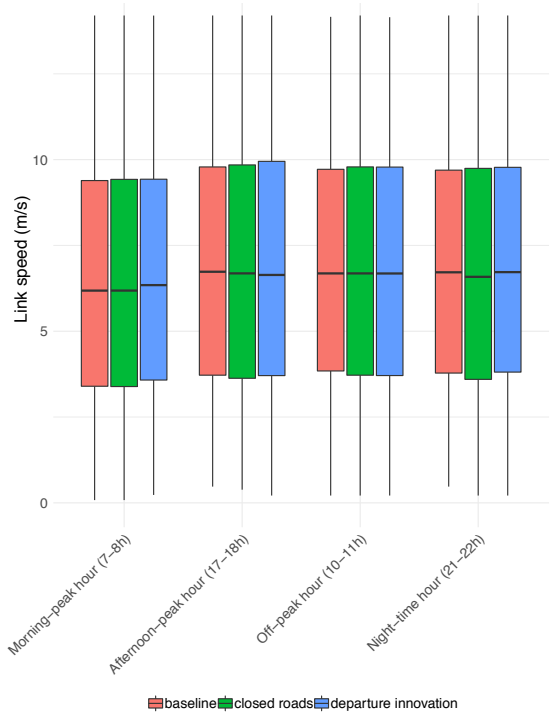
The link volumes and link speeds distributions are shown in Figure 8 and Figure 9, respectively. As it can be seen from the first plot, volumes increased, especially during the morning peak hour. This means that, particularly during the morning, the surrounding roads were negatively affected with additional traffic. The second plot shows that link speeds have slightly increased but the differences are almost insignificant to draw any conclusions.

Figure 8: Link volumes distributions




Source: The authors

Figure 9: Link speeds distributions




Source: The authors

# 5 Conclusion and Improvements

To sum up, we can draw the conclusion that implementing the policy has a negative impact on the usual traveler's utility. This is though, most likely expected by the authorities while the real goal of the policy was to increase the utility of other users of the area. So, to measure whether the global utility change is positive or negative, the improvements to the non-traveler group would have to be assessed as well.

For the neighborhood of the closed roads, the implementation of the policy increases the traffic volume on the surrounding roads, thus potentially decreasing the quality of these roads for walk and bike usage, but this effect might be compensated by the newly available roads for slow modes along the Seine.

One limitation of this project is that mode choice is not implemented. Some of the agents negatively impacted by the road closure might actually switch to other modes thus potentially relieving the penalty in their utilities.

One future improvement could be providing different mode options for travelers. How pedestrians and bicyclers would react to the policy is also of great interest and expanding the model in this direction would allow a better assessment of the demand reaction.

Other policies could also be evaluated, such as closing only one of the lanes and making its direction reversible, based on the demand of tidal flow.

# 6 References

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