

## Modeling the impact of dynamic tolling in large-scale regional networks: A case study for Delaware Valley Regional Planning Commission (DVRPC)

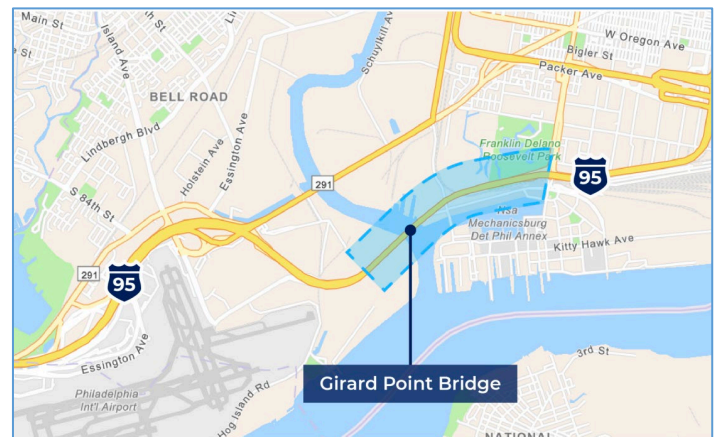
**Purpose:** To develop a large-scale multi-class network modeling and simulation framework, particularly for DVRPC, that holistically models the behaviors of private cars, ride-hailing cars, and freight trucks. The purpose is also to develop, evaluate, and deploy, tolling strategies, such as locations and pricing, among tolling revenue, system mobility and social equity.

**Approach:** The team began by identifying various data sources for network flow modeling in regional networks. This was followed by establishing a model for the Philadelphia Metropolitan Region to provide estimated day-to-day origin-destination demand among all Traffic Analysis Zones that vary by time of day. The team then modeled tolling plans for Center City Bridge scenarios at various locations and at various rates for both cars and trucks. Travel time, travel delay, vehicle-mile-traveled and emissions for each of those vehicle classes, at the system-level and community-level were estimated. An estimate of the social equity in terms of accessibility, reliability and travel time/cost change among various pair of main origin/destination points was then derived.

### Key Findings:

- ✓ Assuming no O-D demand change induced by tolling at a small rate with the introduction of tolling, travel time, fuel consumption, and emissions are increased. The relative changes in large regional network in these metrics indicate substantial impacts on fuel consumption and emissions.
- ✓ It was found that the introduction of a toll on Girard Point Bridge indeed induced travelers to take detours and thus reduce its traffic flows in its vicinity.
- ✓ Additionally, the introduction of a toll on the bridge can significantly reduce the traffic on the bridge leading towards downtown area, but meanwhile it may increase travel time and emissions for the whole region and also results in a significant traffic flow increase on neighboring bridges due to traffic detours.

**Conclusion:** Tolling can generate considerable revenue for the public agencies to fund infrastructure in general. However, decisions on bridge tolling need to consider the trade off between social costs among different communities and the resultant funding for infrastructure.



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### Project Record:

<https://ppms.cit.cmu.edu/projects/detail/357>

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