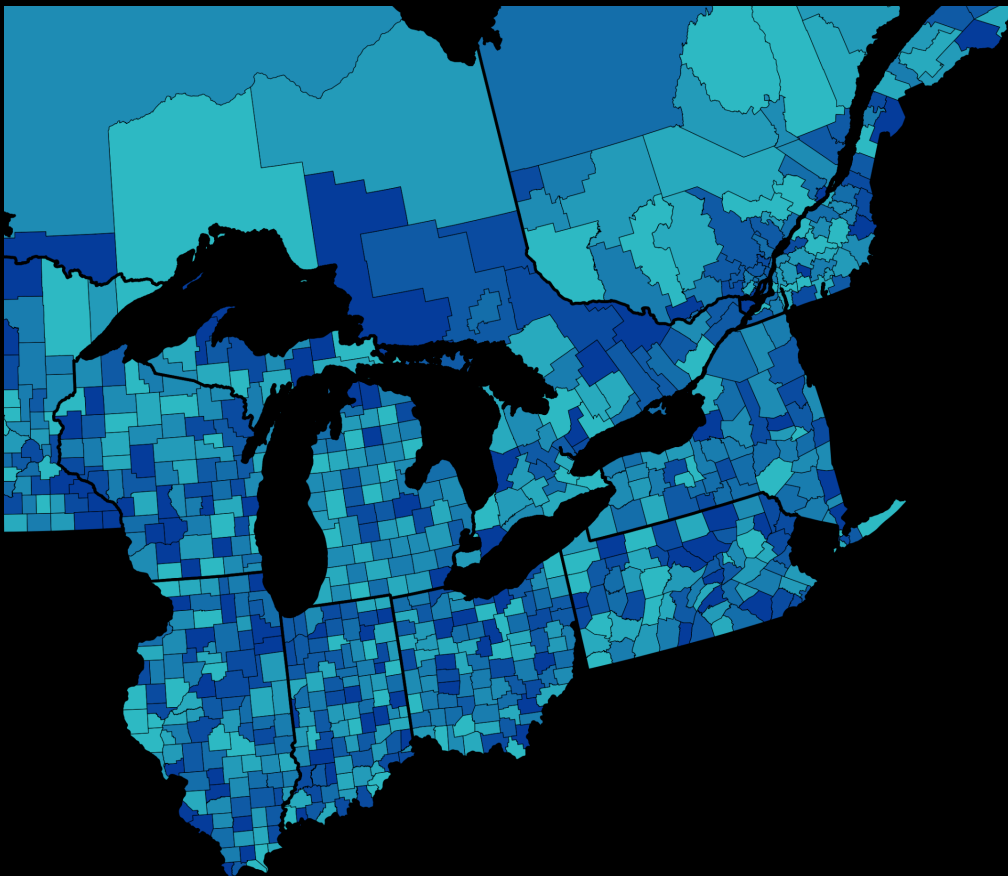


EXECUTIVE SUMMARY

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**Resilience and connectivity in
Quebec's railway network: A graph-
theoretical analysis**

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Resilience and Connectivity in Quebec's Railway Network: A Graph-Theoretical Analysis

Executive Summary

Quebec's transportation system is the backbone of our province's economy. It's how businesses get their products to market, how people travel for work and leisure, and how communities stay connected. Think about the food on our tables, the goods in our stores, and our ability to visit family and friends – it all depends on a well-functioning transportation network.

However, this critical system faces a number of growing challenges that threaten its reliability. Climate change is bringing more extreme weather events, like floods and ice storms, which can disrupt roads, railways, and ports. We are also seeing labor shortages, making it difficult to maintain and operate transportation services. And global or political events can create instability that affects supply chains and trade. These challenges raise serious concerns about whether our transportation network can continue to meet our needs in the years to come.

This study takes a detailed look at Quebec's transportation network to understand its strengths and weaknesses. The current state of our research focusses particularly on the railway system, which plays a vital role in moving large volumes of goods over long distances. By using advanced analytical techniques, we have created a model of the network that allows us to identify potential vulnerabilities and assess how well the system can handle disruptions.

Our analysis shows that the railway network is heavily concentrated in the southern part of the province, especially along the St. Lawrence River between Montreal and Quebec City. This area is the heart of the network, handling a large share of freight and passenger traffic. In contrast, the railway network is less developed and less connected in the northern regions of Quebec. This means that some communities may be more vulnerable to disruptions. We also found that, overall, the network isn't as efficient or well-connected as it could be. This suggests that there are potential bottlenecks and that disruptions in one area could have ripple effects throughout the system.

The results of this study provide valuable information for decision-makers and planners who are responsible for maintaining and improving Quebec's transportation infrastructure. By understanding the network's vulnerabilities, they can make better decisions about where to invest resources and how to prepare for potential disruptions. For example, it's clear that it's important to focus on strengthening and improving key transportation routes and hubs, particularly in the southern part of the province. This will help to ensure that goods and people can continue to move smoothly and reliably, even when challenges arise.

Looking ahead, we plan to continue this research and build on these findings. Future work should expand the analysis to include other modes of transportation, such as roads and ports, to provide a more complete picture of the overall transportation system. It should also delve deeper into the economic impacts of transportation disruptions, so that we can better understand the costs of inaction.