Understanding Factors Affecting Degradation of Forest Gravel Roads in Eastern Canada

Gowri Bagavalli Nagendrappa[1], Osvaldo Valeria[1] and François Girard[2]

[1] Institut de Recherche sur les Forêts, Université du Québec en Abitibi-Témiscamingue, *Gowri.BagavalliNagendrappa@uqat.ca*

[2] Département de Géographie, Université de Montréal

Introduction:

- Forestry companies rely on gravel roads for timber transportation

- Typically built to minimum standards.

- Undergo continuous degradation processes, impacting their overall performance.

Aim: Understand and identifying factors influencing the degradation process of forest gravel roads in eastern Canada.

Objectives:

1. Determining the behavior of the bearing capacity (California bearing ratio- CBR) index according to different gravel road categories in a longitudinal gradient of three regions in eastern Canada.

2. Identifying the main drivers influencing the degradation process of forest graveled roads.

Why this study?

- Though scientific papers talk about problems with gravel roads, there haven't been many studies on this issue in Canada.

- The focus is on understanding the processes and factors influencing degradation for improved infrastructure management.

Study area:
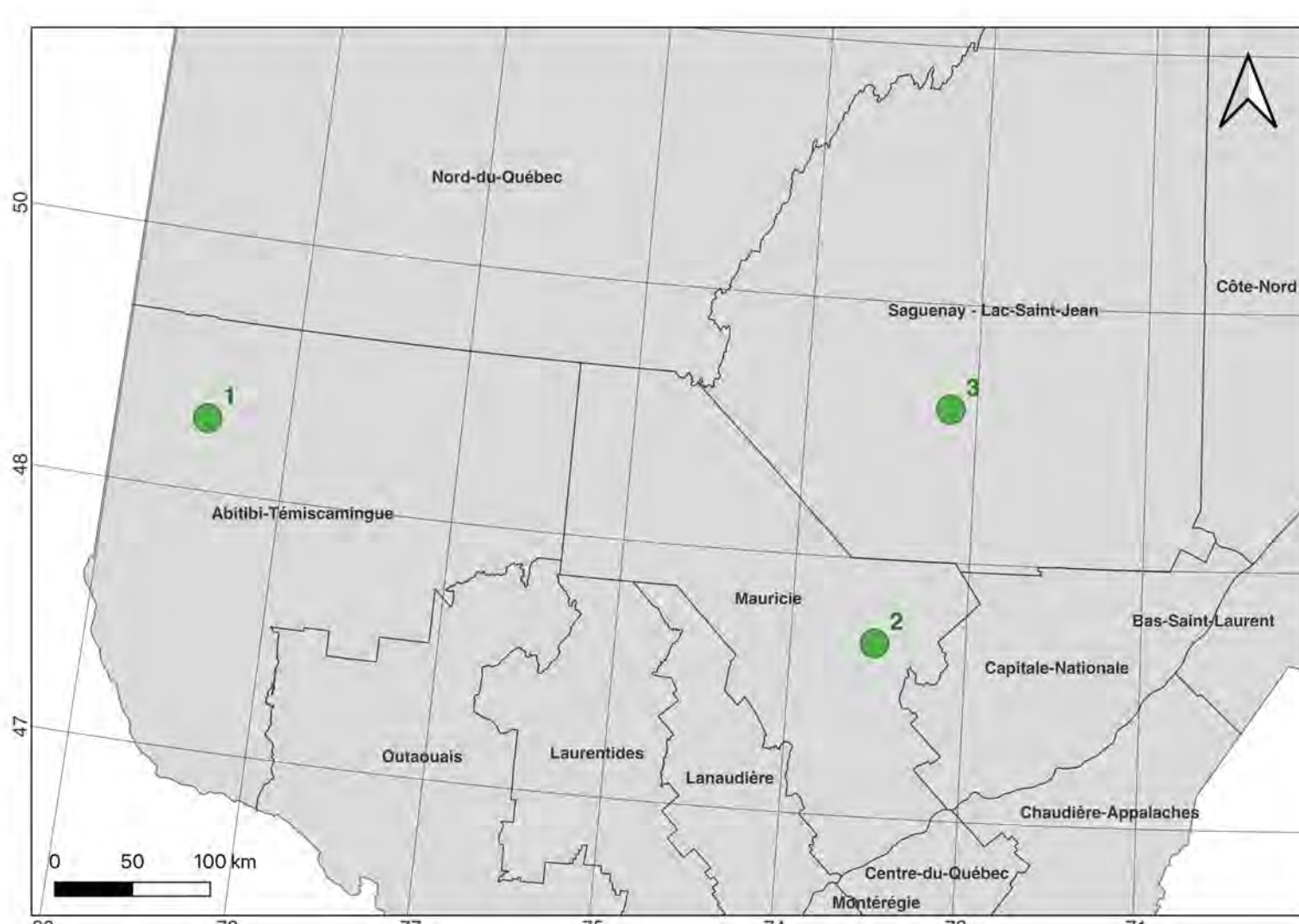
Location of the three respective study areas (1, 2 and 3) in the province of Quebec in eastern Canada.

Methodology:

- Determining CBR for different road categories based on :

  Width:
  1. narrow
  2. medium
  3. wide

  Time since last maintenance:
  1. Recent
  2. old

  Slope:
  1. $\leq 4\%$
  2. $>4\%$

- Modelling
Degradation ~ Soil moisture * Vegetation composition * traffic intensity * road construction aggregates * soil deposit * terrain elevation 40

Expected results:

- Trends of bearing capacity in different forest road categories & relative importance of factors affecting degradation of forest gravel road
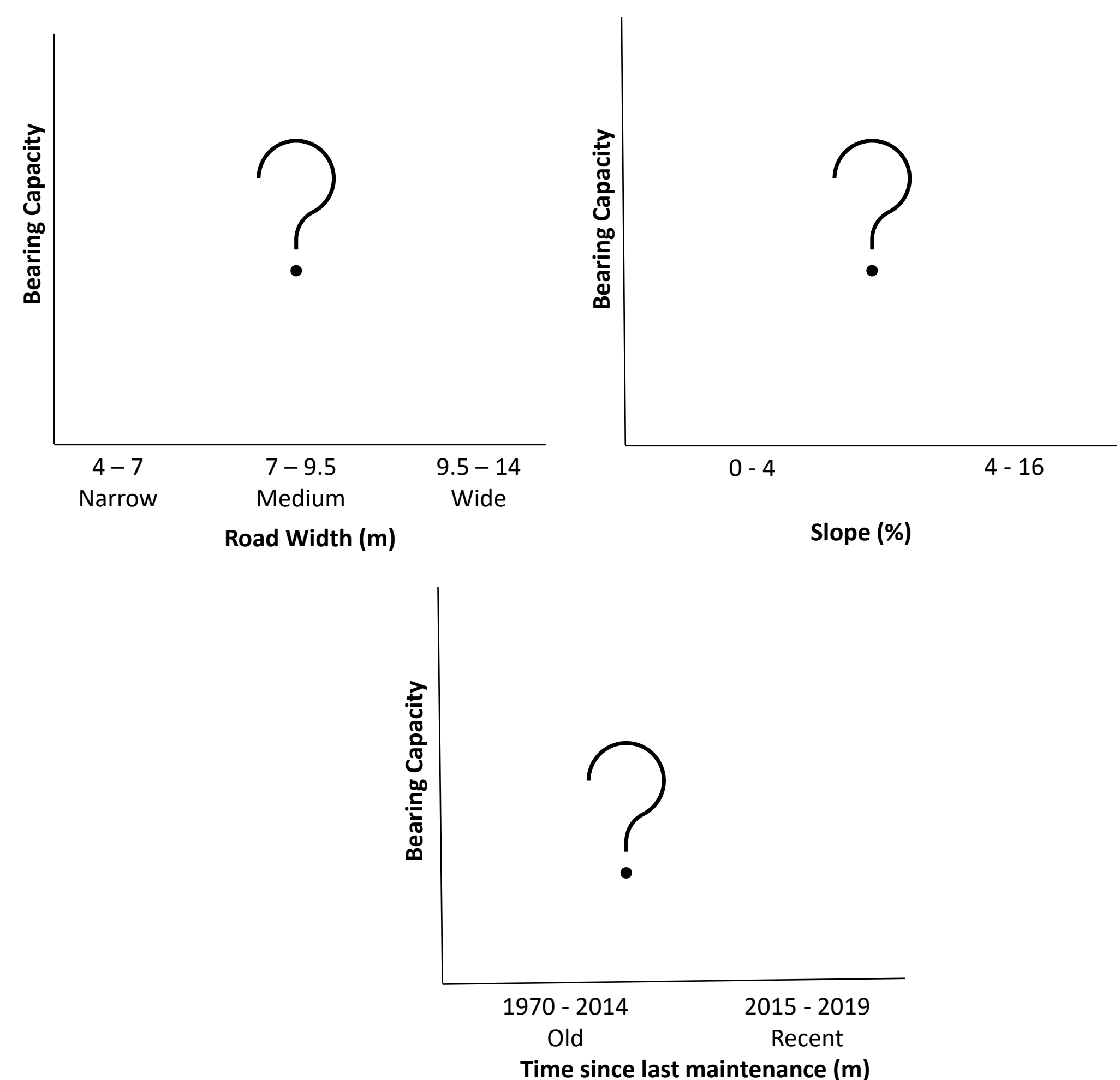
Conclusion:

- Tackles practical challenges of forest road degradation.
- Helps in decision-making processes.
- Guides practices related to forest road construction and maintenance.
- Improvement of transportation infrastructure in Eastern Canada.

1. Based on width categories,
2. narrow (4 to <7 m)
3. medium (7 to <9.5 m)
4. wide (9.5 to 14 m) [range 4 to 14m],

- Determining trends in bearing capacity in different road categories
    1. Based on slope (4% vs. >4%) (range 0 to 16%),
    2. Based on last maintenance, e.g., recent (2015–2023) vs. old (1970–2014) (range 0 to 46 years).
- modelling the factors contributing to the degradation of gravel forest roads, such as soil moisture, vegetation composition, traffic intensity, road construction aggregates, soil deposit and terrain elevation
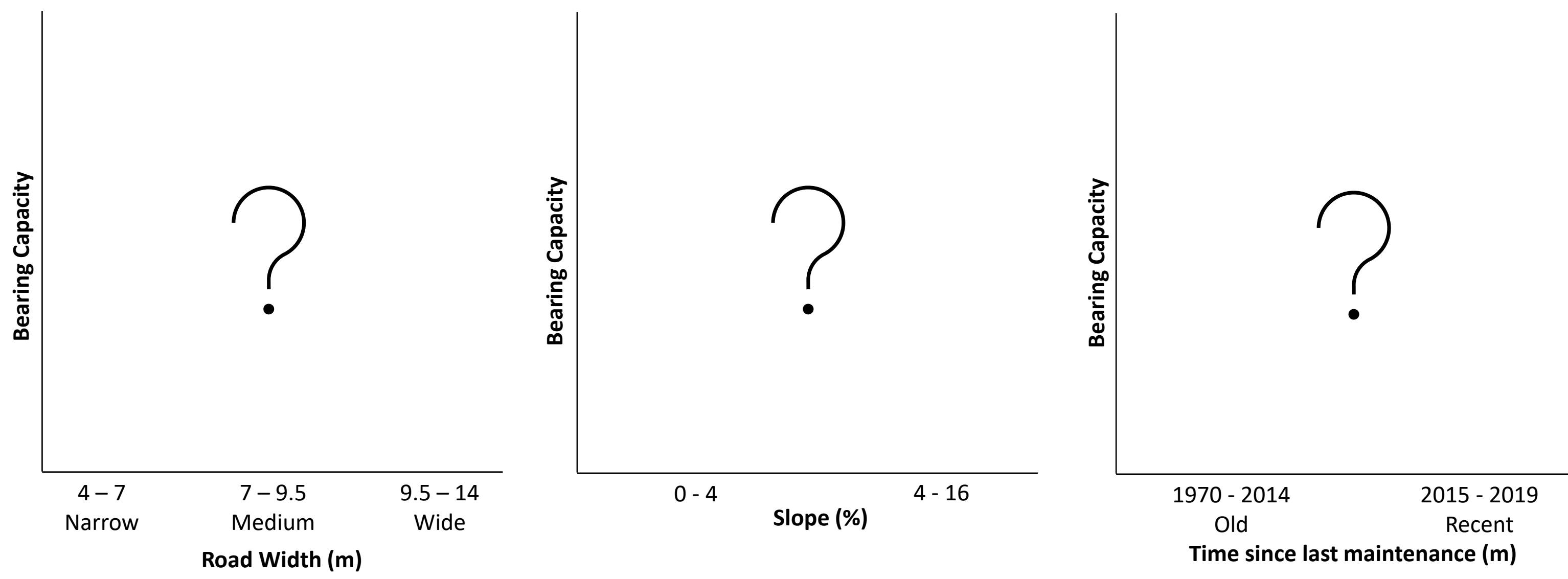
    1. Based on width categories,
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    4. wide (9.5 to 14 m) [range 4 to 14m],

Conclusion:
In summary, this research addresses practical challenges linked to forest road degradation, yielding tangible benefits for economic growth, environmental sustainability, and optimized resource utilization. The findings are poised to inform decisions, guide industry practices, and contribute to the improvement of transportation infrastructure in Eastern Canada.

Conclusion:
- This research tackles practical challenges of forest road degradation.
- It brings tangible benefits in terms of economic growth, environmental sustainability, and optimized resource utilization.
- The findings inform decision-making processes.
- It guides industry practices related to forest road construction and maintenance.
- Overall, the research contributes to the improvement of transportation infrastructure in Eastern Canada.

Three plots, each with y-axis labeled "Bearing Capacity" and a question mark above a single data point.

Plot 1 x-axis:
4 – 7 Narrow   7 – 9.5 Medium   9.5 – 14 Wide
Road Width (m)

Plot 2 x-axis:
0 - 4   4 - 16
Slope (%)

Plot 3 x-axis:
1970 - 2014 Old   2015 - 2019 Recent
Time since last maintenance (m)

Degradation ~ Soil moisture * Vegetation composition * traffic intensity * road construction aggregates * soil deposit * terrain elevation