

Introduction

- Rapid climate and socioeconomic change is transforming Arctic human-Earth systems
- Arctic communities and economies rely on complex, intermodal transportation systems that are vulnerable to these changes
- Methods are needed to quantify impacts of climate and socioeconomic drivers on Arctic transportation systems in terms of “real-world” metrics that can be linked to other systems



Figure 1. Examples of Arctic transportation modes. Clockwise from top left: Marine shipping (Arctic Council); Airport (Greenland Airports Mittarfagarfit); Footpath (Olsen et al., 2020); Ice road (Kiani et al., 2018)

Methodology

- Systematic literature review for methods that include quantifiable climate and/or socioeconomic factors and quantitative metrics of impact on Arctic transportation modes
- Classification of methods using framework of exposure, sensitivity, and adaptive capacity

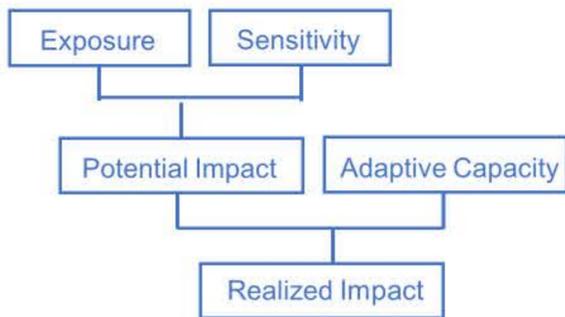


Figure 2. Framework to classify quantitative methods

Literature Search Results

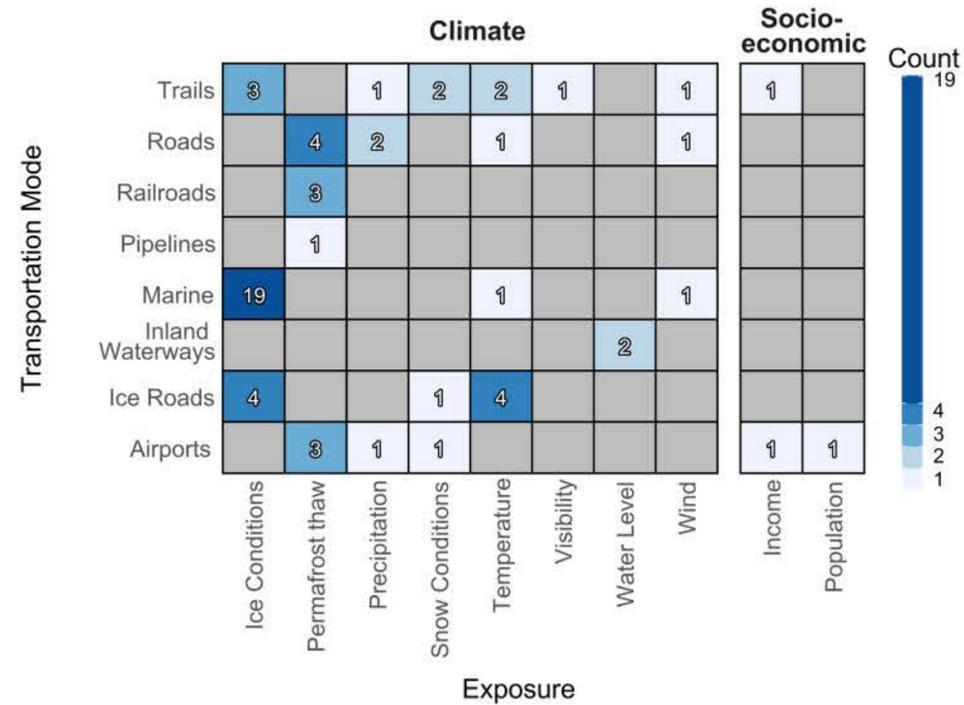


Figure 3. Summary of the number of quantitative methods identified in the literature review, categorized by mode and exposure variable.

Most quantitative methods assessed impacts of climate drivers. Few assessed socioeconomic drivers or incorporated adaptive capacity.

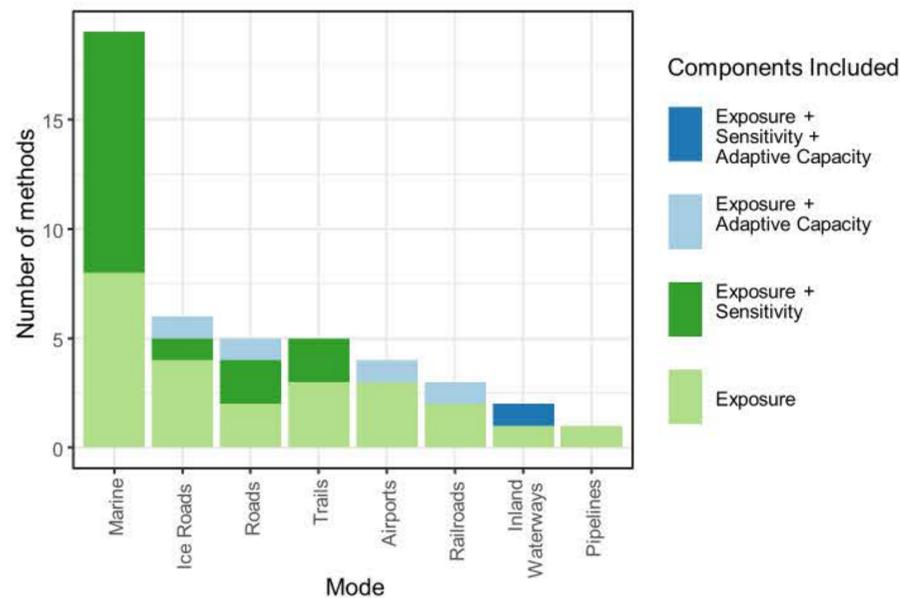
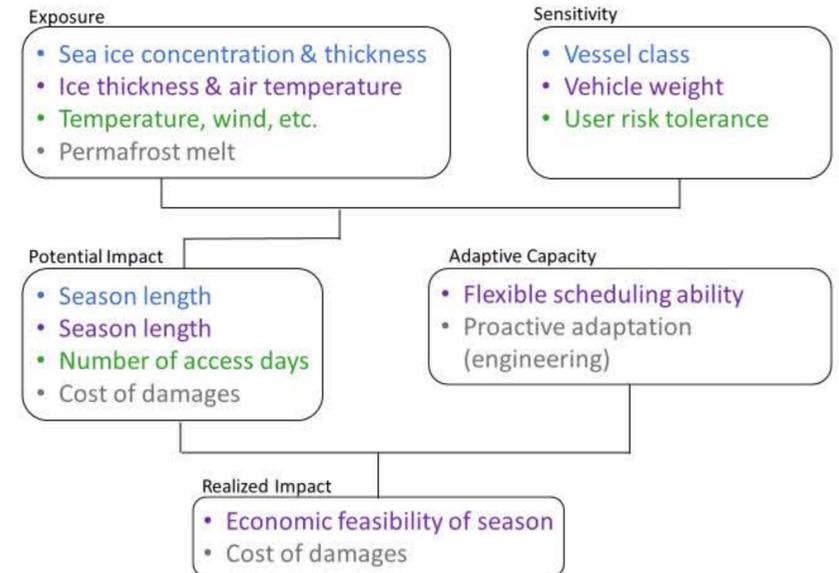


Figure 4. Summary of the number of quantitative methods identified in the literature review, categorized by mode and framework components.

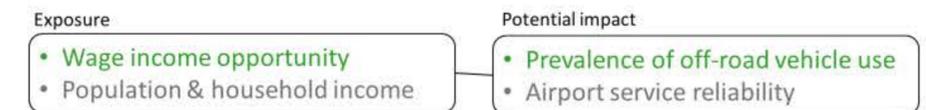
Quantitative Method Examples

- Marine transportation
- Ice roads
- Trails (motorized & non-motorized travel)
- Permanent infrastructure (e.g., roads, airports, pipelines)

Climate Drivers



Socioeconomic Drivers



Conclusions

- More methods are needed to quantify impacts of socioeconomic drivers; additionally, more methods could incorporate adaptive capacity, particularly for trails and marine shipping
- Quantitative metrics can be linked with other systems including food systems and local, regional, and global supply chains
- Local challenges and data priorities could be assessed by applying the framework to typologies of transportation options and needs, incorporating geophysical characteristics, economic activities, and remoteness

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