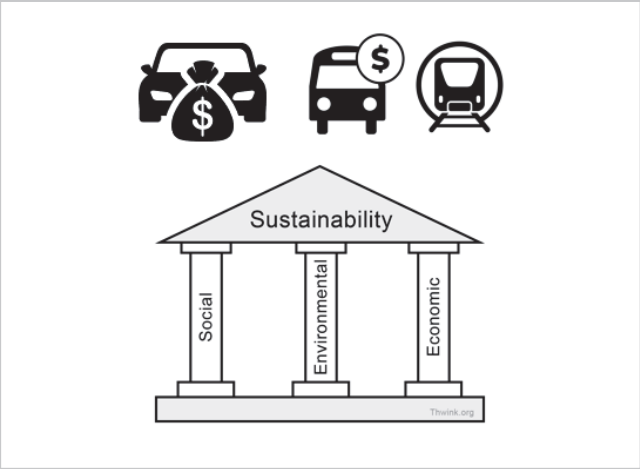
Research Summary

Cross-Modal Impact Assessment for Sustainable Transportation Networks

Research Need

State agencies must make major operational and capital investments into our multi-modal transportation system with wide-ranging impacts. To date, little clear methodology exists for modeling a holistic, state-specific impact assessment that addresses the three pillars of sustainable development as defined by the federal highway administration (FHWA). How do we assess the sustainability of each mode for more informed decisions?



Goals/Objectives

This project developed a cost metric (in the unit of dollars) that estimates the total government cost of transportation projects including direct costs (e.g., capital investments) and indirect costs (e.g., public health impacts from pollutants or climate impacts generated by a particular mode of travel).The main objectives of this project was to:

1. Develop a cost metric to estimate the total government cost of transportation projects as a function of economic, environmental, and social costs, as it pertains to travel from point A to point B and across different modes of transportation.
2. Document the repeatable methodology for cross-modal sustainability assessment with clear system boundaries.
3. Create a visual summary of the metric that can be easily shared and understood without the need for in-depth technical knowledge.

Methodology

The research team completed the project using a multi-step methodology. First,the team conducted a comprehensive literature review and engaged stakeholders through workshops to gather insights on important sustainability components. Stakeholder input was crucial in selecting practical and relevant metrics for MassDOT and MBTA. The chosen metrics were quantifiable, mode-agnostic, and based on existing data covering economic, environmental, and social aspects, such as agency costs, emissions, and health impacts. Next, the metrics were converted into monetary values for ease of application in policy and decision making. This allowed the impacts to be compared in terms of cost. Finally, the metrics were applied in three case studies across Massachusetts, analyzing trips of varying distances (1 to 60 miles) across transportation modes.

Key Findings

The case studies showed that transit and bicycling are the most sustainable modes, especially for shorter trips, due to lower agency costs, reduced emissions, and health benefits. While cars offer faster travel, they carry higher social costs, including safety risks and health impacts. A sensitivity analysis revealed that factors like increased transit ridership significantly influence the cost metric Key takeaways include promoting active transportation and improving transit reliability.

Use of Findings

MassDOT and MBTA will leverage the project's findings by incorporating the cross-modal sustainability assessment methodology into their transportation planning and investment decisions. This methodology provides a holistic comparison of different transportation modes by converting economic, environmental, and social impacts into monetary values, making decision-making more straightforward. Its flexibility allows for customization through stakeholder weightings, ensuring it meets specific regional needs and priorities. The ultimate goal is to integrate this assessment into regular planning processes, leading to more sustainable and cost-effective transportation systems across Massachusetts.

Project Information

This project was completed as part of the Massachusetts Department of Transportation (MassDOT) Research Program with funding from Federal Highway Administration (FHWA) State Planning and Research (SPR) funds.

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Project Start Date:
March, 2023
Project Completion Date:
June, 2024
MassDOT Research Project Number:

Key Words:
Cross-modal, sustainability metrics,

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Massachusetts Department of Transportation