Transportation Carbon Accounting Module (TCAM)
A cooperative project between the University of Alaska – Fairbanks (UAF) and the Michigan Tech Research Institute (MTRI)

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Carbon emissions represent a transportation impact that has not been traditionally included in cost equations. However, accounting for them is increasingly relevant with recent national policy initiatives to enact cap-and-trade and related legislation. The ability to dynamically account for carbon emissions from freight transportation based on mode, distance, and cargo will help to prepare and inform logistics industries, including mining. Additionally, emissions tracking will enable logistics companies to better serve environmentally-minded clients who are interested in minimizing emissions as a factor in transmodal shipping scenarios.

TCAM for the Mineral Occurrence Revenue Estimation and Visualization (MOREV) Tool

MTRI has developed multimodal carbon modeling tools for several of its current research projects. In cooperation with the University of Alaska – Fairbanks (UAF), one of these projects involves modeling commodity revenue and cost of mine operations for the proposed Alaska-Canada Rail Link (ACRL) and other transportation projects in Alaska.

Route: Rail from Delta Junction to Port MacKenzie
Distance: 616 km
Total CO2 equivalent emissions: 784327
Segment cost: $63765209

Google Earth visualization of a freight route calculated by MTRI's MOREV tool with route color and height representing carbon emissions for a particular leg as calculated by TCAM.

A significant portion of mining costs goes into the transportation of commodities from the mines to mills, smelters, or other processing facilities. Because of this, understanding the costs and characteristics of transporting mine commodities for all major transportation modes is essential.

Mainland transportation options for bulk hauling of these commodities include truck, rail, and barge. In addition, understanding of ocean-going-vessel logistics is necessary since commodities are frequently shipped overseas as raw material for industries in China and other rapidly developing countries.

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Subsequently, MTRI has researched and developed carbon emissions calculation software for each of three modes of transportation (truck, rail, water) with varying complexity based on vehicle capacity, size, fuel usage and type, commodity, and distance traveled (among others). This module is incorporated into MTRI's MOREV tool with the additional option for users to input a carbon offset price per ton of carbon dioxide, thus informing both environmental and economic impacts.

Above: TCAM's GUI interface for carbon emissions for the logistics industry.

Right: TCAM's mode-specific carbon emissions calculators

TCAM for the Logistics Industry

MTRI has demonstrated to logistics companies a carbon accounting module to integrate with existing logistics software as a potential factor for clients in shipping prioritization.

For this project, we developed an additional carbon emissions model for airfreight using the best scientific data available. Thus, MTRI currently has working carbon dioxide emissions accounting modules for all four major modes of transportation (road, rail, water, air) and is currently extending our tools to calculate emissions from modal transition nodes → e.g. the emissions from cranes operating at ports to load/unload cargo vessels.

Collaborators:
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