



Purpose/Utility of Research

Transportation plays an important role in modern society, but its impact on air quality can have significant adverse effects on public health. Busy roadways and large emission sources, respectively, may impact local air quality within several hundred meters of the source. Reduced-form air quality modeling is a useful tool for examining what-if scenarios of changes in emission volume, such as those due to changes in traffic counts, fleet mix, or speed, or changes in port emissions due to equipment or vehicles. The goal of C-LINE is to characterize the effects of traffic emissions on air quality in nearby communities and examine various scenarios of air quality impacts

Connection to SHC Portfolio

- This model builds on the work initiated under SHC Theme 4 in the Transportation sector task. The model has applications for a number of Theme 2 activities as well, including Children's Health and Environmental Justice, where concerns on exposures from nearby transportation sources has major public health implications.
- This work also builds on foundational research on traffic emissions and pollutant transport and dispersion conducted under the ACE program (NMP program area).
- The model may also be integrated with other SHC tools (e.g. EnviroAtlas) in the future.

Highlights

- Developed Community **LINE** Source Model (C-LINE) Community as a reduced form modeling tool to assess air quality impacts from roadway traffic that requires limited technical expertise (beta version users have included EPA Region 4 [Paul Wagner] and AO/OP/OSC [Lori Zeller] who could provide more information).
- C-LINE is a web-based model whose front-end predicts concentrations of multiple air pollutants due to traffic emissions near roadways
- C-LINE functionality has been expanded to model emissions from port-related activities (e.g. ships, trucks, cranes, etc.) – developed the Community modeling system for near-**PORT** (C-PORT) assessments

Application & Translation

- An initial, ARC-GIS version of C-LINE has been applied to a portion of Detroit, Michigan as a part of the Near-road Exposures and Effects of Urban Air Pollutants Study (NEXUS, ACE Task 180).
- The next, web-based version of the model was used in Charleston, SC as a part of a collaborative research project between EPA ORD and Region 4 to examine the impacts of the port expansion on air quality. As freight volume increases in Region 4 ports, communities near the port and along goods movement corridors may experience increased local-scale air pollution due to increased traffic. The C-LINE/C-PORT tool would allow to identify potentially at-risk populations located near emission sources, and the effects that change in traffic and other port-related activities may have on them.
- More recently, C-LINE was used by our partners in Newport News, Virginia. The Southeast Newport News Community contains commercial port operations, highways, and multiple industrial facilities, as well as hazardous air emissions, brownfields, and compromised water quality and an increased prevalence of chronic diseases and negative health effects. The C-LINE model ability to quickly (run time < 5 min) compare different roadway pollution scenarios supports community-based applications and help to identify areas for further research.

Intended End users

C-LINE is a modeling and visualization system that access inputs, performs calculations, visualizes results, provides options to manipulate input variables, and performs basic data analysis. It is intended to inform the community user of local air quality due to mobile-sources in their region of interest using a simplified modeling approach. The model is intended to be used by local government, city planners and community groups. C-LINE accesses publicly available traffic and meteorological datasets, and is optimized for use on community-sized areas (100-1,000 km²). The user is not required to provide input data, but can provide their own if desired.

Lessons Learned

- This research has highlighted the need for easy to use models that can accurately assess impacts of traffic and other transportation facilities on nearby air quality.
- The model has also provided a framework for integrating new modeling algorithms developed through research and development of the R-LINE model on pollutant transport and dispersion from roadways.

