

TRANSPORTATION MODELING PROGRAM

In Theory...

TTI's Transportation Modeling Program uses applied mathematics to solve real-world problems.

The Clean Air Act requires the Environmental Protection Agency (EPA) to set limits on the amount of certain pollutants allowed in the air. Urban areas that exceed EPA standards are said to be in "non-attainment." The state is required to develop an implementation plan to bring the area back into compliance, or its cities face losing vital federal funding. For transportation in Texas, the primary pollutants of concern are oxides of nitrogen (NO_x), carbon monoxide (CO) and volatile organic compounds (VOCs). In addition, particulate matter (PM) is a concern for some areas.

We give those areas in nonattainment the information they need to achieve compliance with federal clean air standards. Our approach may be abstract, but our products are very real — we help our sponsors maintain their federal funding, improve their environment and create a healthier community for their citizens.



I-10 in El Paso, Texas.

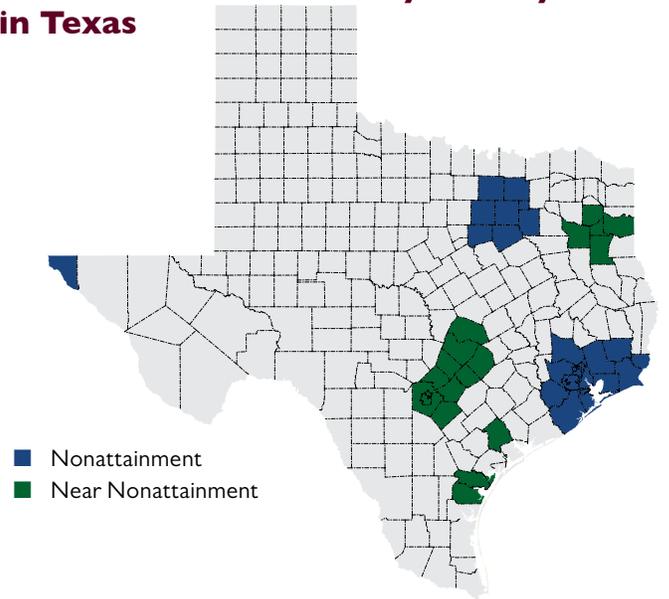
We (Can) Predict the Future

Of course, nobody can predict the future with absolute certainty. But we can model what the future will probably look like, given a set of conditions. Modeling provides a cost-effective way to estimate the impact of proposed actions under various assumptions.

The Transportation Modeling Program develops accurate, reliable methods and procedures for estimating mobile source emissions. We specialize in forecasting on-road mobile source emissions to demonstrate compliance with planning and air quality regulations.

Armed with these emissions forecasts, sponsors can show how they're meeting the goals outlined in the state implementation plan. Once an area has exceeded the standard, it must "demonstrate conformity" — the area must prove how it will achieve the standard and how future emissions will not exceed allowed levels that throw it back into nonattainment. Our work gives them exactly that information.

Nonattainment and Near Nonattainment Areas by County in Texas



The Details Matter

Researchers in the Transportation Modeling Program estimate emissions for vehicles using EPA's emissions rate program called MOBILE. Our approach enables the application of MOBILE routines at an extremely detailed level. We rely on three key activity measures for our estimates of an area's compliance:

- **Vehicle miles traveled (VMT)** – Generally speaking, the more VMT you have, the more emissions you have. VMT is estimated by year, seasonal day type (e.g., summer weekday), hour of the day and direction (peak or off-peak), for each roadway type (e.g., freeway, arterial, collector, etc.).
- **Speed** – Speed is a function of the ratio of roadway volume to capacity and is estimated for each link (roadway segment) in the transportation system.
- **Vehicle type** – Emissions rates for 28 different types of vehicles (categorized by fuel type and gross vehicle weight rating) are produced. The mix of these 28 types is estimated by roadway type and time of day.



I-10 in Houston, Texas.

MOBILE allows us to incorporate each of these three measures under various current and future conditions to predict an area's emissions. It's this information the sponsor then uses to demonstrate projected compliance with air quality standards, or develop appropriate emissions reduction strategies.

Primary Air Pollutants

- **NO_x** — the generic term for a group of highly reactive gases, all of which contain nitrogen and oxygen in varying amounts. Involved in the creation of ozone, NO_x results from fuels burning at high temperatures.
- **CO** — a colorless, odorless, poisonous gas. A product of incomplete burning of hydrocarbon-based fuels, carbon monoxide consists of a carbon atom and an oxygen atom linked together.
- **VOCs** — precursors of ground-level ozone. Since all organic compounds contain carbon, volatile organic compounds are often called hydrocarbons (HC).
- **PM** — includes dust, dirt, soot and smoke and identified by size with a different standard for each. PM₁₀ (particles ≤ 10 microns) and PM_{2.5} (particles ≤ 2.5 microns) are the sizes of interest for transportation emission purposes.



Our Reputation for Excellence

Over the years, the Transportation Modeling Program has developed a reputation for excellence through its long-standing relationships with Texas' major regulatory agencies, the Texas Department of Transportation and Texas Commission on Environmental Quality. We also frequently conduct research in the related areas of travel behavior, travel data collection methods and forecasting.

Our analyses are integral to the formal regulatory process, and as a result, a substantial portion of our work becomes part of official technical reports published by the sponsoring agencies. Our work tends to be implemented directly and immediately, rather than presented and published in journals.

Our program is the recognized authority for the development of highly efficient processes and areas of application related to air quality regulatory requirements. Consistency of analytical standards, economies of scale, and unmatched, specialized expertise make TTI's Transportation Modeling Program the finest of its kind in the nation.

The Human Equation

Our research strategy emphasizes a bottom-up approach by building peer-to-peer relationships over many years with each sponsor's professional staff, the front-line beneficiaries of our program's work.

Equally important to this strategy is the focus on required procedures and processes. These are mandated by the air quality and transportation planning regulatory process. This focus ensures continuity and stability in sponsorship while addressing the critical needs of sponsoring organizations and the State of Texas.

About TTI

The Texas A&M Transportation Institute, established in 1950, seeks solutions to the problems and challenges facing all modes of transportation. The Institute works on over 700 research projects with over 200 sponsors in the United States and abroad at all levels of government and in the private sector. TTI is recognized as one of the finest higher-education-affiliated transportation research agencies in the nation. TTI has saved the state and nation billions of dollars through strategies and products developed through its research program. TTI research has a proven impact — resulting in lives, time and resources saved.

TTI's Mission

To solve transportation problems through research, to transfer technology and to develop diverse human resources to meet the transportation challenges of tomorrow.

Contact

Dennis Perkinson

Program Manager

Transportation Modeling

Texas A&M Transportation Institute

(979) 862-4926

fax (979) 845-7548

d-perkinson@tamu.edu

<http://tti.tamu.edu>