

UTC Spotlight

University Transportation Centers Program

Texas A&M University



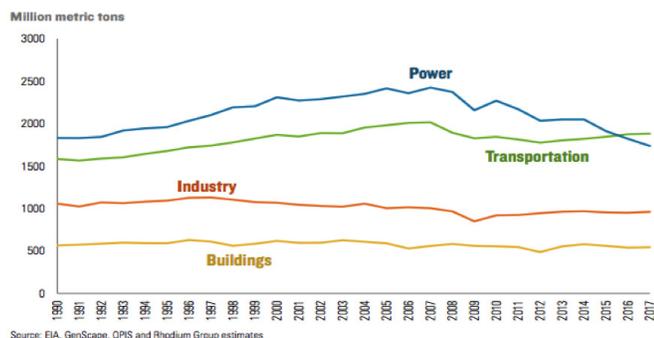
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TTI Researchers Develop Curriculum for Transportation Emissions and Health

Researchers in the Texas A&M Transportation Institute's (TTI's) Center for Advancing Research in Transportation Emissions, Energy, and Health (CARTEEH) have developed a cross-disciplinary course titled [Traffic-Related Air Pollution: Emissions, Human Exposures, and Health](#). A Tier-1 University Transportation Center program, CARTEEH is funded by the U.S. Department of Transportation's Office of the Assistant Secretary for Research and Technology (OST-R) and focuses on the intersection of transportation and health, including the growing impact of transportation emissions (see figure 1) on human health. TTI leads the CARTEEH consortium, which consists of four partner universities: Johns Hopkins University, Georgia Institute of Technology, University of Texas at El Paso, and the University of California, Riverside.

Figure 1: Energy-Related Carbon Dioxide (CO₂) Emissions in the United States by Sector



Transportation emissions have become the largest source of CO₂ emissions in the United States for the third year running.

Source: EIA, GenScope, OPIS and Rhodium Group estimates (slide #11 from lecture #3: Other Transportation-Related Emissions and Air Pollution)

Transportation and health have historically been viewed as two distinct fields of education, research, and practice. Students, researchers, and practitioners in each field are typically taught their respective subject matter without touching on the other. There is a growing need, however, for cross-disciplinary training at the intersection of transportation

and health. To deal with the complexities of how transportation impacts public health, we need new curricula that recognizes this relationship.

Led by TTI Associate Research Scientist Haneen Khreis, Traffic-Related Air Pollution: Emissions, Human Exposures, and Health provides the basis for a graduate-level course offered by CARTEEH consortium member institutions or other universities. The course's content is targeted at students and practitioners in the fields of transportation, environmental health, and planning and policy-making. However, the course's lectures are designed to be modular and can be mixed to complement existing courses, as well as to be implemented as smaller courses targeted to audiences studying specific topics or with specific pre-existing backgrounds.

Numerous models, measurement techniques, and datasets underlie the curriculum to demonstrate the relationship between traffic activity and human health, through exposure to air pollution (see figure 2). The course equips participants to understand, assess, and quantify road traffic, vehicle emissions, traffic-related air pollution (TRAP), human exposures, biological mechanisms, associated health effects, and population-based impacts including their distribution

Figure 2: The Full Chain: Linking TRAP to Health Impacts



This image shows the full chain linking traffic activity to human health, through the air pollution pathway, while noting technologies and disruptors as upstream factors that impact the full chain.

Source: Center for Advancing Research in Transportation Emissions, Energy, and Health

based on socioeconomic and demographic factors, and their societal costs.

The course also explores the impacts of environmental regulation and real-world policy-making and practice, with numerous case studies from around the world. Additionally, emerging technologies and disruptors in the transportation sector are addressed, such as automated, connected and electric vehicles, and their impacts on air pollution and human health.

While cross-disciplinary education is the first step in linking transportation and health, planning for implementation is equally important. The course concludes with an introduction to policy and provides methods and tools to generate policy options and assess policy feasibility and effectiveness to mitigate the adverse health effects from TRAP.

Learning Tracks

Developers separated the course into three high-level, separate tracks to help tailor the information to participants' existing knowledge in their respective fields while focusing on potential application in the classroom and beyond.

The health track is targeted at urban planners, transportation planners, and engineers unfamiliar with public health issues. The transportation track is aimed at environmental epidemiologists and public health students and practitioners with a limited knowledge of transportation concepts. The third track (planning and policy) targets practitioners and policy-makers, providing a more holistic overview of health and transportation and focusing on the link between science and policy as seen in real-world case studies. This track is also applicable to health and transportation students and researchers since it equips them with the knowledge needed for policy option generation and policy assessment.

Delivery Methods

The project's development and delivery are separated into two phases. In Phase 1, over 30 iterations were needed to develop the outline and key topics of the course (see figure 3), which include 60 lecture titles. In Phase II, which is currently ongoing, researchers are developing the content and slide decks for each of the proposed lectures.

Figure 3: Six Course Themes Graphic



The six major themes of the curriculum.

Source: 01-16-TTI Development of CARTEEH Curriculum for Transportation Emissions and Health.docx

Thirty-five of the 60 lectures are completed and available online at the [CARTEEH website](#). A set of slides and either a book chapter or set of notes (including a reading list) provide supplemental materials for participants wishing to study the subject matter in more depth. When implemented in the classroom, recommended in-class activities include instructor and peer discussions, problem-solving exercises, and laboratory or hands-on software activities. The lectures can also be used beyond the classroom for continuing education and customized training for transportation and public health agencies personnel.

CARTEEH researchers Khreis, Ziestman, and Ramani edited the book [Traffic-Related Air Pollution](#) while developing the curriculum, so it may serve as a useful reference.

About This Project



The intersection of transportation and health is an emerging field that is gaining global attention. As communities deal with adverse health impacts of transportation, it is imperative to equip students and practitioners with a cross-disciplinary repertoire of knowledge capable of addressing multifaceted challenges. CARTEEH's [Traffic-Related Air Pollution: Emissions, Human Exposures, and Health](#) project is a unique effort that developed a cross-disciplinary curriculum with input from national and international experts from both the transportation and health fields. The curriculum is open access and available online for anyone to use.

This newsletter highlights some recent accomplishments and products from one University Transportation Center. The views presented are those of the authors and not necessarily the views of the Office of the Assistant Secretary for Research and Technology or the U.S. Department of Transportation.

