Challenges of Truck Size and Weight

What Will Airports Be Like in 2040 and 2070?

Post-Hurricane Supply Chain Resilience

Hawai‘i Interstate High-Tech Revamp

January–February 2021

NUMBER 331

The National Academies of
SCIENCES • ENGINEERING • MEDICINE

TRANSPORTATION RESEARCH BOARD
The National Academy of Sciences was established in 1863 by an Act of Congress, signed by President Lincoln, as a private, nongovernmental institution to advise the nation on issues related to science and technology. Members are elected by their peers for outstanding contributions to research. Dr. Marcia McNutt is president.

The National Academy of Engineering was established in 1964 under the charter of the National Academy of Sciences to bring the practices of engineering to advising the nation. Members are elected by their peers for extraordinary contributions to engineering. Dr. John L. Anderson is president.

The National Academy of Medicine (formerly the Institute of Medicine) was established in 1970 under the charter of the National Academy of Sciences to advise the nation on medical and health issues. Members are elected by their peers for distinguished contributions to medicine and health. Dr. Victor J. Dzau is president.

The three Academies work together as the National Academies of Sciences, Engineering, and Medicine to provide independent, objective analysis and advice to the nation and conduct other activities to solve complex problems and inform public policy decisions. The National Academies also encourage education and research, recognize outstanding contributions to knowledge, and increase public understanding in matters of science, engineering, and medicine.

Learn more about the National Academies of Sciences, Engineering, and Medicine at www.nationalacademies.org.

The Transportation Research Board is one of seven major programs of the National Academies of Sciences, Engineering, and Medicine. The mission of the Transportation Research Board is to provide leadership in transportation improvements and innovation through trusted, timely, impartial, and evidence-based information exchange, research, and advice regarding all modes of transportation. The Board’s varied activities annually engage about 8,000 engineers, scientists, and other transportation researchers and practitioners from the public and private sectors and academia, all of whom contribute their expertise in the public interest. The program is supported by state departments of transportation, federal agencies including the component administrations of the U.S. Department of Transportation, and other organizations and individuals interested in the development of transportation.

Learn more about the Transportation Research Board at www.TRB.org.

TRANSPORTATION RESEARCH BOARD 2021 EXECUTIVE COMMITTEE*

OFFICERS
Chair: Susan A. Shaheed, Professor, Civil and Environmental Engineering, and Co-Director, Transportation Sustainability Research Center, University of California, Berkeley
Vice Chair: Nathaniel P. Ford, Sr., Chief Executive Officer, Jacksonville Transportation Authority, Jacksonville, FL
Executive Director: Neil J. Pedersen, Transportation Research Board

MEMBERS
Michael F. Ableson, CEO, Arrival Automotive–North America, Birmingham, MI
Marie Therese Dominguez, Commissioner, New York State Department of Transportation, Albany
Ginger Evans, CEO, Reach Airports, LLC, Arlington, VA
Michael F. Goodchild, Professor Emeritus, Department of Geography, University of California, Santa Barbara
Diane Gutierrez-Sacetti, Commissioner, New Jersey Department of Transportation, Trenton
Susan Hanson, Distinguished University Professor Emerita, Graduate School of Geography, Clark University, Worcester, MA
Stephen W. Hargarten, Professor, Emergency Medicine, Medical College of Wisconsin, Milwaukee
Chris T. Hendrickson, Hamerschlag University Professor of Engineering Emeritus, Carnegie Mellon University, Pittsburgh, PA
S. Jack Hu, UGA Foundation Distinguished Professor of Engineering, Senior Vice President for Academic Affairs and Provost, University of Georgia, Athens
Randell Iwasaki, Leader, State and Local Transportation for Amazon Web Services, Walnut Creek, CA
Ashby Johnson, Executive Director, Capital Area Metropolitan Planning Organization (CAMPO), Austin, TX
William Kruger, Vice President, UPS Freight for Fleet Maintenance and Engineering, Richmond, VA
Julie Lorenz, Secretary, Kansas Department of Transportation, Topeka
Michael P. McClean, Vice President – Strategic Planning, Norfolk Southern Corporation, Norfolk, VA
Melinda McGrath, Executive Director, Mississippi Department of Transportation, Jackson
Patrick K. McKenna, Director, Missouri Department of Transportation, Jefferson City
Brian W. Ness, Director, Idaho Transportation Department, Boise
Craig E. Philip, Research Professor and Director, VECOR, Department of Civil and Environmental Engineering, Vanderbilt University, Nashville, TN
Leslie S. Richards, General Manager, Southeastern Pennsylvania Transportation Authority (SEPTA), Philadelphia
James M. Tien, Distinguished Professor and Dean Emeritus, College of Engineering, University of Miami, Coral Gables, Fl
Shawn Wilson, Secretary, Louisiana Department of Transportation and Development, Baton Rouge

EX OFFICIO MEMBERS
Michael R. Berube, Acting Deputy Assistant Secretary for Sustainable Transportation, U.S. Department of Energy, Washington, D.C.
Carlos M. Braceras, Executive Director, Utah Department of Transportation, Salt Lake City
Richard Corey, Executive Officer, California Air Resources Board, Sacramento
LeRoy Gishi, Chief, Division of Transportation, Bureau of Indian Affairs, U.S. Department of the Interior, Germantown, MD
Martin R. Grabowski, McDevitt Distinguished Chair in Information Systems, Le Moyne College, Syracuse, NY, and Senior Research Scientist, Rensselaer Polytechnic Institute, Troy, NY
John T. Gray II, Senior Vice President, Policy and Economics, Association of American Railroads, Washington, D.C.
Eletheria Kontou, Assistant Professor, University of Illinois, Urbana-Champaign, Urbana, and Chair, TRB Young Members Committee, Chicago
Stephanie Pollack, Acting Administrator, Federal Highway Administration, U.S. Department of Transportation, Washington, D.C.
Craig A. Rutland, U.S. Air Force Pavement Engineer, U.S. Air Force Civil Engineer Center, Tyndall Air Force Base, FL
Karl L. Schultz (Admiral, U.S. Coast Guard), Commandant, U.S. Coast Guard, Washington, D.C.
Karl Simon, Director, Transportation and Climate Division, U.S. Environmental Protection Agency, Washington, D.C.
Pau L. Skoutelas, President and CEO, American Public Transportation Association, Washington, D.C.
Katherine F. Turnbull, Executive Associate Director and Regents Fellow Research Scientist, Texas A&M Transportation Institute, College Station (voting)
Jim Tymon, Executive Director, American Association of State Highway and Transportation Officials, Washington, D.C.

* Membership as of February 2021.
Way of the Future: Airports at the Horizon of 2040 and 2070
Gael Le Bris
By 2040 and 2070, U.S. and worldwide population increases will create interrelated megaregions and improved living conditions in emerging and developing countries that result in a demand for more air travel. The author describes how airports will change to meet these challenges.

Advancing Aerial Mobility: A National Blueprint
Dwayne Day
Electric and hybrid aircraft—aka advanced aerial mobility—used for urban, suburban, and rural operations have increased globally. The author shares how transformative technologies such as runway-independent, short-range, and highly automated aircraft will change the way goods—and people—are moved and will affect industries across the economy.

Strengthening Post-Hurricane Supply Chain Resilience: Observations from Hurricanes Harvey, Irma, and Maria
Laurie Geller, James G. Featherstone, and Steven Stichter
Charged with analyzing how Hurricanes Harvey, Irma, and Maria affected the supply chain network, a special National Academies of Sciences, Engineering, and Medicine committee identified key lessons from South Texas, South Florida, Puerto Rico, and the U.S. Virgin Islands. The authors report on those lessons and the committee’s recommendations.

Evaluating Cost Effectiveness of Climate Adaptation Measures
Laurel McGinley
Ever-increasing—and often severe—weather events present state departments of transportation (DOTs) with potentially serious and costly infrastructure issues. Aging infrastructure and limited budgets add to the challenge. The author looks at the Federal Highway Administration’s framework to help state DOTs manage pressing priorities.

Data Dive into Transportation Research Record Articles: Authors, Coauthorships, and Research Trends
Subasish Das
An increase in transportation research has resulted in a publications upsurge. But as transportation research becomes more complex and cross-cutting, transportation professionals face critical challenges when predicting future issues. Applying text mining and topic modeling techniques, the author analyzes 28,987 articles from the Transportation Research Record to identify publication trends.

Truck Size and Weight Research Challenges
Daniel Haake
The author examines the decades-long challenges of measuring the impacts against the benefits of truck size and weight limit policies.

Innovative Technologies and Precast Pavement Allow Rapid Replacement Along Hawai’i Interstate H-1
Mark B. Snyder
After years of temporary patches, the busiest stretch of Hawai’i’s Interstate H-1 needed long-term repair. The Hawai’i Department of Transportation found a solution in design–build contracting and the use of innovative technologies such as precast concrete pavement, 3-D surface modeling, and ground-penetrating radar. The author chronicles the project from concept to completion.

Trucks on I-84 in Oregon sit in stopped traffic, caused by bad weather and crashes on the highway. State crash databases often do not include data on individual truck weight; improved data can help states evaluate truck size and weight regulations, observes author Daniel Haake in this issue of TR News. (Photo: Oregon DOT)
Social Isolation and Loneliness in Older Adults: Opportunities for the Health Care System

Dan Blazer, Tracy Lustig, and Megan Kearny

Factors that influence social isolation and loneliness in older adults include housing displacement, access to broadband communication, gentrification, consequences of natural disasters, and lack of transportation. The authors look at this phenomenon and explore possible solutions.

Innovations in the Food System: Exploring the Future of Food

Melissa Maitin-Shepard

In August 2019, the National Academies’ Food Forum convened a public workshop to discuss innovations for modern food systems and how they could be designed to optimize environmental, health, social, and economic outcomes. The author highlights parts of the proceedings that looked at transportation as related to the food system.