massDOT
Massachusetts Department of Transportation

Transportation Research Quarterly

Providing highlights of MassDOT's transportation research activities and other helpful information **2023 Q2**

Sustainability and Research

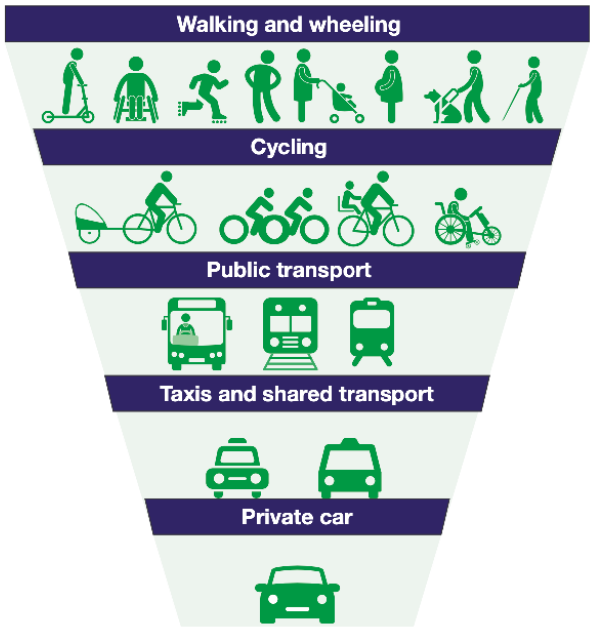
"Our biggest challenge in this new century is to take an idea that seems abstract – sustainable development – and turn it into a reality for all the world's people."

Kofi Annan, former Secretary General of the United Nations

Sustainability in Transportation

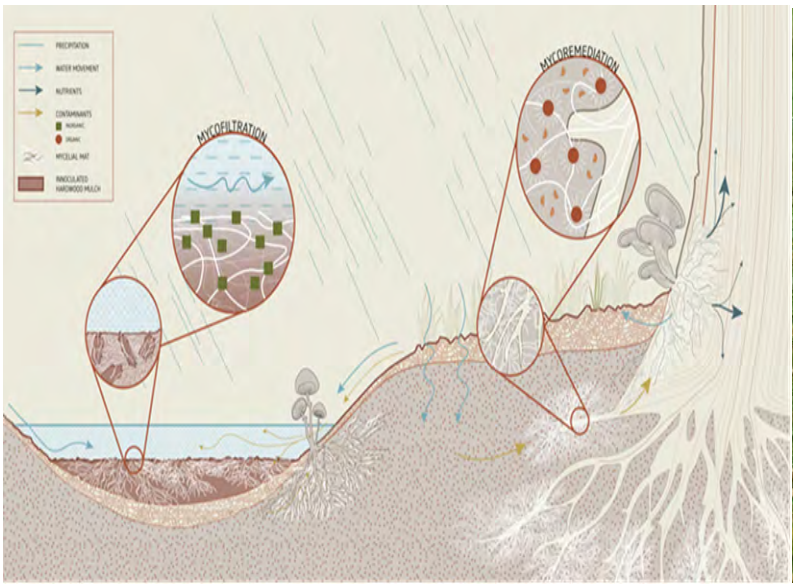
The UN Secretary-General's High-Level Advisory Group on Sustainable Transport defines sustainable transport as "the provision of services and infrastructure for the mobility of people and goods—advancing economic and social development to benefit today's and future generations—in a manner that is safe, affordable, accessible, efficient, and resilient, while minimizing carbon and other emissions and environmental impacts."

INSIDE THIS ISSUE



MassDOT is currently funding a study looking at developing a cost metric for sustainable transportation networks. Sustainable transportation is the capacity to support the mobility needs of a society in a manner that is the least damageable to the environment and does not impair the mobility needs of future generations. Sustainable transport includes public transportation and BRT. Additionally cycling, walking and, wheeling offer alternative and healthier modes of transportation contributing to sustainable transportation. Developing sustainable transportation requires linkages between environmental protection, economic efficiency and social progress to be emphasized.

Research Project Highlight



Using Mycofiltration Treatment for Stormwater Management

Mycofiltration is a newly developing stormwater management technology that utilizes mycelium or fungal webs as biological filters within organic matter and soil substrates. MassDOT has legal, financial, and ecological obligations to mitigate pollution from stormwater runoff entering waterbodies. Transportation construction and also retrofit projects are also regulated to manage stormwater and improve water quality. MassDOT has constructed green and gray infrastructure installations to mitigate stormwater pollution from entering waterbodies however, MassDOT is exploring new ways.

This project investigated the feasibility of mycofiltration through synthesizing of existing literature and case studies on mycofiltration, and interviews conducted with subject matter experts. Two types of fungi, saprophytic and mycorrhizal, were found to be most suited for and commonly used in mycofiltration systems. Saprophytic fungi are decomposers often found on dead wood and are the fungi most cultivated by people. Mycorrhizal fungi form mutualistic relationships with 80-95% of all terrestrial plants on earth; they provide water and nutrients to plant roots in exchange for carbohydrates. These fungi readily grow on materials employed in existing MassDOT Stormwater Control Measures, respectively cellulose material (woodchips or straw substrate), or within soil media and on plant roots.

The results of this research showed that mycofiltration holds the potential for reducing some of the contaminants like nitrogen, phosphorus, Total Suspended Solids (TSS), and biological contaminants (such as fecal coliform like E. coli). in treated stormwater. However while the results of Mycofiltration are promising there is a lack of field, lab, and replicable studies and existing studies suffer from lack of data points. Due to the new and developing nature of mycofiltration and the existing knowledge gaps of the technology, particularly for the Massachusetts climate, MassDOT will not be able to immediately implement mycofiltration as an SCM for stormwater management and water quality improvement. Field experiments are being planned to evaluate mycelial nativeness and whether bioaugmentation with commercial spores should be done or locally occurring spieces should be used.

New Research Project Highlight

Cross-Modal Impact Assessment of Sustainable Transportation

Environmentally friendly, equitable, and cost effective are the three pillars of sustainable and effective development defined by FHWA. To date very little clear methodology exists for modeling a holistic impact assessment that addresses these three pillars for state agencies to make major operational and capital investments into our multi-modal transportation system. It is essential to have a methodology for defining and comparing the sustainability and cost of different transportation system investments that accounts for the total – direct and indirect – cost of supporting different modes of travel. This metric must also account for incorporating different modes of transportation.

This project will develop a cost metric (in the unit of dollars) that estimates the total government cost of transportation projects – including direct costs (e.g., capital investments) and indirect costs (e.g., public health impacts from pollutants or climate impacts generated by a particular mode of travel). This metric will allow public transportation agencies to make decisions that account for the immediate and long-term impacts of transportation investments, allowing for more judicious use of government funds and improving social, economic, and environmental equity and sustainability outcomes.

A holistic impact assessment of cross-modal transportation infrastructure would benefit MassDOT/MBTA from both a communication and policy perspective. First, the project will provide maps which allow for easy communication to the public and focus on impacts that are most important to end users and operating agencies. Moreover, the cost metric will allow for cross modal comparison which allows users and decision makers to evaluate all their transit options and can be used as a tool to select future investments.

This project provides a framework for evaluating investments with an equity lens. This is especially salient given the passing of the infrastructure bill which provides resources for transportation investments and requires these investments be made with equity considered.

A Look at Who We are – Team Highlights

Each MassDOT research project team is comprised of a Project Champion(s), a Principal Investigator(s) and a Project Manager. The Project Champion serves as the MassDOT technical representative, the Principal Investigator conducts research investigation and produces deliverables per project scope and schedule, and the Project Manager takes charge of the overall project administrative management and coordination. Highlighted below are the key members of "Using Mycofiltration Treatment for Stormwater Management" project team.

Project Champion – Robbin Bergfors

Robbin Bergfors has been a landscape architect with MassDOT's Landscape Design Section since 2009. Previously from Massachusetts Department of Conservation and Recreation and New York City Parks, she brings diverse experience in ecological restoration, urban design, parks and shared-use paths.

Project Champion – Hung Pham

Hung Pham is an experienced Environmental Analyst with a demonstrated history of working in the environmental compliance review, biological research, and pharmaceutical industry. He is skilled in ESRI's ArcGIS, Cell Culture, Adobe Photoshop, and Life Sciences. Hung is a strong community and social services professional and has a Masters of Science degree that is focused on Environmental Studies with a specialization in Environmental Engineering Sciences from University of Massachusetts at Lowell.

Principle Investigator – Kate Kennan, Offshoots Inc.

Kate Kennan is a registered Landscape Architect with degrees from Cornell University and Harvard's Graduate School of Design, She founded Kennen Landscape Architecture in 2004 and Offshoots, Inc in 2012 to create practices focused on productive planting and ecological planning. Kate's current research and teaching concentrates on planting design and applied phytotechnologies that utilize plants to clean up contaminated sites. Kate has been honored with numerous awards for her recent and ongoing projects.

Supporting Partner – Goode Landscape Studio

Goode Landscape Studio (GOODE) is a multi-disciplinary studio offering professional design services in landscape architecture, master planning, climate resilience, public art, wayfinding, and design research. The studio is led by Courtney Goode, who is a licensed landscape architect with over ten years of experience and is committed to creating engaging, sustainable, and equitable environments. GOODE provided graphic design support for the project.

Academic Peer Review – Steven Hendel

Dr. Steven Handel studies the potential to restore native plant communities, adding sustainable ecological services, biodiversity, and amenities to the landscape. He has explored pollination, seed dispersal, population growth, ecological genetics, and most recently, problems of urban and heavily degraded lands. He serves on the faculty at Harvard and Rutgers Universities. Previously, he was a biology professor and director of the Marsh Botanic Garden at Yale University. He was also Director of the Center for Urban Restoration Ecology,

Events & Announcements

massDOT Transportation Innovation CONFERENCE

May 2-3, 2023 • DCU Center, Worcester, MA

The annual MassDOT Transportation Innovation Conference provides a forum for innovative transportation systems, management ideas, and initiatives. Each year, the conference provides an important opportunity for transportation practitioners to share knowledge, sponsor peer-to-peer learning, and collaborate on issues of mutual interest. This years conference concluded with 29 sessions in two days. Keynote speakers were Massachusetts Transportation Secretary Gina Fiandaca, Executive Director of the Transportation Research Board of the National Academies of Sciences, Engineering and Medicine Victoria Sheehan, and MassDOT Highway Administrator Jonathan Gulliver.

The FY2024 Research Problem Statement Solicitation period ends on May 15, 2023.

The Office of Transportation Planning Research Section opens problem statement submissions to all MassDOT and MBTA employees each spring. Submissions selected for research will be developed into research projects conducted by universities, laboratories, and firms across the Commonwealth and are overseen by the Research Section staff. Should the project be selected, the MassDOT/MBTA proponent will serve as the Project Champion. Working alongside the researchers and Research Section staff, they will ensure that the results of the research address the most pressing issues facing us as an agency and that the recommendations are readily implementable.

To submit a research project idea, please complete the MassDOT SPRII research problem statement submission form by May 15, 2023. Please contact Mike Flanary if you have any questions.

TRB TRANSPORTATION RESEARCH BOARD

No time to conduct a literature search yourself?
TRB Library Snap Searches can help

Snap Searches are designed for the busy professionals and researchers who would like to quickly get up to speed on complex research topics. They provide a succinct summary of current activities at TRB on a given topic. Follow the link below for the TRB snap search results for "Environment and Sustainability."

TRB Snap Search: Environment and Sustainability

massDOT Massachusetts Department of Transportation
U.S. Department of Transportation Federal Highway Administration
AASHTO
TRB TRANSPORTATION RESEARCH BOARD OF THE NATIONAL ACADEMIES
NCHRP NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

MassDOT Research Resources

In Progress MassDOT Research

	Start Date
Massachusetts Depth to Bedrock	March 2021
Massachusetts-Specific Trip Generation Rates	March 2021
Multisource Data Fusion for Traffic Incident Detection	April 2021
Accessibility to Public Health Phase I	May 2021
Revised Load Rating Procedures for Prestressed Concrete Beams	May 2021
Outdoor Information Panels to Convey Real-time Travel Information for Ridership Recovery	May 2021
Optimizing MassDOT's High Performance Asphalt Overlay Mixtures	July 2021
Using Traffic Signals to Reduce Speeding Opportunities	July 2021
Ultra High-Performance Concrete Reenforced with Multi-scale Hybrid Fibers	August 2021
Development of Improved Inspection Techniques Using LIDAR for Deteriorated Steel Beam Ends	March 2022
Smart Work Zone Safety Control and Performance Evaluation	April 2022
Tree Preservation and Planting for Complete Streets Development	April 2022
Development of a Salt Spreader Controller Program	April 2022
Post-Fire Inspection of Concrete Structure Phase III-In-Situ Experiments	April 2022
Building Information Model for Transit Infrastructure: Feasibility and Gap Analysis	May 2022
Methods to Identify Problematic Carriers	June 2022
3D Printing Applications for Bridge Element Repair	June 2022
Evaluating Safety Impacts of Two-stage Bike Boxes	August 2022
Field Study to Determine Salt Usage Efficiency on Two Pavement Types	August 2022
Implementing AASHTO Mechanistic-Empirical Pavement Design Guide Phase III	November 2022
LIMMS Development Planning	March 2023
Accessible Bus Stop Design in the Presence of Bike Lanes	March 2023
Cross-Modal Assessment of Sustainable Transportation Networks	March 2023
A Pavement Marking Inventory and Retroreflectivity Condition Assessment Method Phase II	March 2023

Recently Completed MassDOT Research

	Completion Date
Discover the Root Causes for Truck Rollover at Highway Ramps *	March 2023
Using Mycofiltration Treatment for Stormwater Management	March 2023
Construction and Material Best Practices for Concrete Sidewalk Phase II – Hot Placement	March 2023
Safety Impacts of Yellow Flashing Permissive Left-Turn Indications – Approach Analysis	March 2023
Post-Fire Damage Inspection of Concrete Structures (Phase II) – Experimental Phase	February 2023
Implementing AASHTO Mechanist-Empirical Pavement Design Guide Phase II	September 2022
Understanding the Asset Management Systems Utilized by Municipalities in Massachusetts	September 2022
Use of UAS for Surface Transportation Emergency Response	July 2022
A Pavement Marking Inventory and Retroreflectivity Assessment Method Using Mobile LiDAR Phase I	June 2022

Additional Resources

Transportation Research and Information Database (TRID) is a comprehensive bibliographic database containing more than 1.3 million records of transportation research.

Research in Progress (RiP) Database contains information on more than 12,000 current or recently completed federally-funded transportation research projects.

AASHTO Publications include the most accepted technical guides, specifications, and manuals of the industry.

Contact Us

Email Research & Technology Transfer Section

Email Research Section Manager Hongyan (Lily) Oliver

Email Research Project Manager

Mike Flanary
Nicholas Zavolas
Patrick McMahon
Anil Gurcan
Austin Sanders

* Accessible project document will be posted on the MassDOT Research website in the coming month.