THE UNIVERSITY OF VERMONT
COLLEGE OF ENGINEERING &
MATHEMATICAL SCIENCES

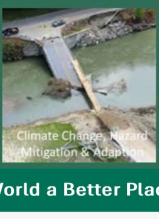
THE UNIVERSITY OF VERMONT
CIVIL & ENVIRONMENTAL
ENGINEERING

Fall 2023
Newsletter

Healthy Environment Healthy Societies

Sustainability & Energy

Infrastructure Systems



Environmental & Public Health

Empowering Students to Make the World a Better Place

A Note from the Acting Chair,

Season's Greetings. As we close 2023 at the University of Vermont, we are grateful for the many successes of our students, faculty and staff we were fortunate to enjoy. We welcomed three new faculty and started a search for a tenure track faculty in environmental engineering. We welcomed many new graduate students including six PhD students on fellowships. I am serving as the acting chair while our chair Mandar Dewoolkar is enjoying his much-deserved sabbatical this fall.

This newsletter provides a glimpse into the many exciting recent achievements in the Department of Civil and Environmental Engineering at UVM. I hope you will enjoy reading about the contributions of our department to Vermont and beyond.

On behalf of the department, I wish you the best in coming year.

Warm regards,

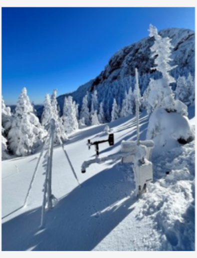
Greg Rowangould
Acting Chair, Department of Civil & Environmental Engineering
Director, UVM Transportation Research Center

Welcoming Drs Panagiotis Oikonomou, John Sangster, and Lampros Svolos

CEE was fortunate to start three new faculty in 2023. **Panagiotis (Takis) Oikonomou** is a Research Assistant Professor with expertise in water resources management. His research is focused on extreme hydroclimatic hazards, climate change impacts on coupled natural and human systems, and hydroinformatics. **John Sangster** is a Senior Lecturer with expertise in computer-aided drawing and design, and transportation engineering. **Lampros Svolos** is an Assistant Professor of engineering mechanics and structural engineering. His research entails development of predictive computational models and efficient numerical techniques that assist engineers in modeling material failure mechanisms, designing composite structures with desired properties, and preventing rapid collapses of structures. We are super excited to have these three new faculty members on board and looking forward to the search we have underway for a tenure track faculty position in environmental engineering.

Water Innovation for the Future Initiative News

New $500K EPA Grant



CEE faculty Prof. **Arne Bomblies**, together with **Josh Benes** in the Vice President for Research Office, has been awarded a $500K grant from the Environmental Protection Agency's National Environmental Information Exchange program. The award allows major advances in mountain weather and snow observation data management, which builds on ongoing snow hydrology research at UVM CEE under the "Water Innovation for the Future" theme.

Bomblies and collaborators in CEMS, CAS and the Spatial Analysis Lab have been conducting research which seeks to understand the impacts of climate change impacts on northeastern snowpack and improve modeling capabilities. The effort involves detailed snow and weather monitoring using a transect of ground stations and drone-based snowpack measurements. In the northeastern United States, the Mount Washington Observatory and New York Mesonet currently operate mountain observatories with related infrastructure and aims. The new grant allows improved collaboration, data integration, and combined data accessibility with a state-of-the-art database for improved collaborative research on northeastern snow. Moreover, the grant will fund a public-facing data portal that allows snow enthusiasts and others interested in weather to access real-time information from the observation network that spans the northeast region from the Adirondacks in New York, across the Green Mountains of Vermont, to the White Mountains in New Hampshire, and interpretive information about climate. The award was made possible by the skilled efforts of Josh Benes in OVPR in bringing an interdisciplinary team of project participants together.

Charting a Path to Flood Recovery in Vermont

Two CEE faculty-led research teams were awarded Rapid Flood Research Grants to evaluate the effects of the July 2023 flood event on Vermont's waterways, infrastructure, and communities. Prof. **Kristen Underwood** is leading a team that is evaluating the channel and floodplain impacts of the loss of the Clark Sawmill Dam. **Sarah Grajdura**, a Postdoctoral Researcher in CEE, and Prof. **Dana Rowangould** are evaluating mobility, housing, and infrastructure recovery and resilience. Funds were awarded from the Gund Institute for Environment and the UVM Office of Research.

Read more here.

Transportation Research Center (TRC) News

TRC recognized by AASHTO for High Value Research on Pedestrian Safety

Research on the safety of pedestrian crossing treatments in Vermont's rural communities by the TRC's **James Sullivan**, **Dana Rowangould**, and **Parsa Pezeshknejad** was recently chosen as one of 16 High Value Research projects by the American Association of State Highway and Transportation Officials (AASHTO) Research Activities Committee. Read more about the project here.

TRC Students and Faculty Present their Research at the 2nd Annual Chittenden County Congestion Management Association (CATMA) Transportation Summit at the UVM

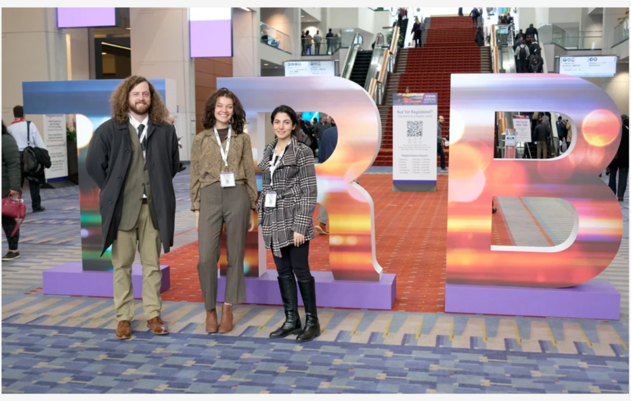
Faculty, undergraduate and graduate students presented their latest Vermont policy-focused research to regional and state transportation professionals, policy makers, and agency staff at the second annual CATMA summit which was held at the UVM Davis Center. The summit which the TRC helps sponsor provides a unique opportunity for students and faculty to connect with local decision makers on campus. Learn more about the research presented by the TRC at the summit this year here.

Three TRC Graduate Students Receive Fellowships from FHWA

This semester **Clare Nelson** (MS student in CEE), **Meg Fay** (MS student in CEE), and **Parker King** (PhD candidate in CEE) received grants from the Federal Highway Administration's Dwight D Eisenhower Transportation Fellowship Program to support their thesis and dissertation research and attend the 2024 Annual Meeting of the Transportation Research Board in Washington DC in January. The fellowships will support Clare's research on measuring the impacts of land-use and vehicle travel and GHG emissions in Vermont, Meg's research on forecasting the health impacts of exposure to air pollution from vehicle traffic along the nation's highway network and strategies address environmental justice concerns and improve public health, and Parker's research on the effectiveness and efficiency of Vermont's electric vehicle purchase incentive programs.

For more information on the fellowship see here.

TRC Presentations and Activities at the 2024 Annual Meeting of the Transportation Research Board



Faculty, staff and students affiliated with the University of Vermont Transportation Research Center will be participating in 23 presentations and activities at the 103rd Annual Meeting of the Transportation Research Board in Washington, DC this January. Learn more about the research we will be presenting at this year's meeting here.

Learn More about Current TRC Research Projects

Visit the TRC current research project's site to learn more about each of our ongoing research projects focused on increasing the sustainability of travel and transportation infrastructure in Vermont and across the country.

You can also find reports from many of our past research projects here.

Our Students and their Successes

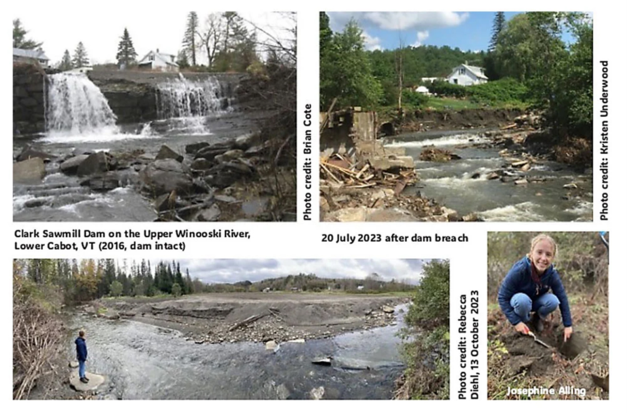
Our students help local utility reenergize and revitalize central Vermont community of Moscow

Our senior capstone design students have been working on multiple projects at the Stowe Electric Department headquarters site in Moscow, Vermont since the fall of 2021. The projects focus on restoring a historic mill building, dam, and powerhouse and integrating the site pedestrian and vehicle access with the local Moscow village traffic patterns. Our CEE collaboration with Stowe Electric has led to the Rubenstein School of Environment and Natural Resources, and the Historic Preservation Program also engaging with the utility for student projects. The photograph shows our student team presenting at the annual Vermont Society of Engineers meeting in April 2023 on optimizing their site design for shared parking and access with the adjacent general store development.

Read more here.

CEE student assists Vermont community impacted by July 2023 flooding

Environmental Engineering senior, **Josephine Alling**, is conducting research this Fall to help the Cabot community understand impacts of a dam breach that occurred during the July 2023 flooding with Profs. **Kristen Underwood** (CEE) and **Rebecca Diehl** (Geography & Geosciences). The Clark Sawmill Dam in Lower Cabot gave way catastrophically during flooding on the upper Winooski River, releasing large volumes of sediment and debris to downstream reaches and leaving high eroding streambanks where the upstream impoundment once stood. Josephine and technician Ken Johnston surveyed high water marks to quantify the extents of floodwater inundation. Relying on post-flood drone imagery and lidar collected by UVM's Spatial Analysis Lab, she is mapping extents of erosion and deposition in the channel and floodplain.



Clark Sawmill Dam on the Upper Winooski River, Lower Cabot, VT (2016, dam intact)

Photo credit: Brian Cote

20 July 2023 after dam breach

Photo credit: Kristen Underwood

Photo credit: Rebecca Diehl, 13 October 2023

Research results are being shared with Cabot to inform flood recovery efforts. Additional project partners include Friends of the Winooski River, SLR Corporation, Vermont Fish & Wildlife, US Fish & Wildlife Service, and VT Rivers Program. Josephine is also minoring in Geospatial Technologies, and plans to continue in the Accelerated Master's Program next year.   This undergraduate research experience is supported in part by a 2023 Vermont Flood Event Rapid Response Grant Award from the UVM Office of the Vice President for Research and the Gund Institute for Environment.

Graduate students receive prestigious Gund-Barrett PhD fellowships

The department was very fortunate to award fellowships to six exceptional CEE doctoral students – **Brittany Antonczak**, **Parker King**, **Harrison Meyers**, **Joy Ojodunwene Onuh**, **Lucinda Toppen**, and **Ryan van der Heijden**. Three fellowships were supported by a generous gift from Barrett Foundation through a partnership with the Gund Institute for Environment and our college to help support research that promotes environmental stewardship. Three additional fellowships were awarded through Prof. **Luic Garcia's** grant from the Department of Education Graduate Assistance in Areas of National Need (GAANN) program to train teacher-scholars capable of designing next generation sustainable and equitable civil infrastructure systems that are climate resilient. We expect to award additional six PhD fellowships from these two programs in the upcoming fall.

Prestigious Undergraduate Research Internships Program from the Barrett Foundation

Richard
Barrett
Foundation

Richard and Elaine Barrett are long-time donors to the College of Engineering and Mathematical Sciences through the family's Barrett Foundation. Richard '66 Mechanical Engineering has always been grateful for his undergraduate internship experience, and therefore has supported a generous summer research internship program, among other substantial donations, for our undergraduate engineering students to pursue research that promotes environmental stewardship. As many as 10 students have been supported per year through this program for over 15 years. This summer, nine engineering students including six CEE students – **Zai Gluck**, **Emily Hall**, **Charlotte Perveiler**, **Cooper Petrie**, **Perry Wilson**, and **Lauren Waters**, received the Barrett Internships. Their research spanned from mapping hydrology of Canyon de Chelly in support of archeological site preservation to using remote sensing for estimating evapotranspiration to studying urban heat island effects to developing sustainable methods for dairy waste management and anaerobic digestion of food waste. The students were not only mentored by their individual research advisors, but graduate students, other faculty, and national and state agencies. They also participated in six workshops on research methods and communicating research held by Professors **Luis Garcia**, **Donna Rizzo** and **Mandar Dewoolkar**, Barrett Foundation Director **Magdalena Paul**, and CEE doctoral students **Kate Porterfield** and **Ryan van der Heijden**. The doctoral students Kate and Ryan are also supported by the Barrett Foundation through a doctoral fellowships program in the College of Engineering and Mathematical Sciences and the Gund Institute for Environment.

Read more here.

Faculty Recognition

CEE faculty continue to be exceptional teacher-scholars and mentors. **Kristen Underwood** received our College's *Excellence in Research Award*. **Matt Scarborough** was recognized by the graduate student senate as an exceptional graduate advisor for a second year in a row! **Courtney Giles** and **Priyantha Wijesinghe**, who also serve as the Co-Directors of Curricular Enrichment for our College received accolades for their commitment to student success. Courtney was selected for the 2023-24 HERS Leadership Institute as one of the two participants from UVM. The HERS Leadership Institute has become an important part of professional development for women-identified leaders at UVM. Priyantha received 2022-23 President's Distinguished Senior Lecturer Award.

Courtney Giles, **Priyantha Wijesinghe**, **Varuni Seneviratne**, and **Larry Medsker** were awarded a grant from the National Science Foundation through the Improving Undergraduate STEM Education (IUSE) program for the project titled: "*Learning Map Framework to Align Learning Outcomes and Assessments in Undergraduate STEM Course Sequences*".

The project focuses on student retention of prerequisite knowledge as a means of ensuring success in STEM course sequences and longer-term outcomes such as persistence in degree and time to graduation. The research team will work with faculty in Civil & Environmental Engineering, Mechanical Engineering, and Physics at UVM to apply the ADDIE model (Analysis, Design, Development, Implementation, Evaluation) and visual learning map process to their course design. The approach will be used to identify key physics concepts and skills that students must master in order to succeed in the physics-statics-dynamics course sequence, and to coordinate related learning outcomes, instructional approaches, and assessments across this sequence. The team plans to extend the study by examining the efficacy of the approach in other contexts, such as course sequences relying on calculus and programming.

Featured Alumni

Kaitlyn Keenan received her B.S. from UVM CEE. Since graduation, she has worked for Vermont-based PC Construction. Throughout her career, she has worked on a range of projects from large wastewater treatment plants and food manufacturing to underground utilities and university laboratory buildings. Kaitlyn earned her M.S. in Engineering Management on the way. Her project management focus brought her to projects in Maryland, Virginia, Vermont, and New Hampshire, where she most recently managed the construction of the Firestone Medical Research Building for UVM's Larner College of Medicine. She currently supports the company's operations team by providing training, guidance, and analysis related to cost control. She also leads the company's internal Leadership Development Program. She is an advocate for women in the construction industry and is involved with multiple company initiatives focused on building inclusivity. She is also a board member for the Vermont affiliate of Hugh O'Brian Youth Leadership and serves on our department's Board of Advisors.

Bijay KC received his PhD with Prof. **Ehsan Ghazanfari** on enhanced deep geothermal systems. Upon graduation, Bijay became a postdoctoral research associate at Los Alamos National Laboratory working on experimental geomechanics relevant to enhanced geothermal systems, geologic carbon storage, underground hydrogen storage, injection induced seismicity in the reservoir and geotechnical engineering. Bijay and Ehsan's work in collaboration with the University of Utah and LANL titled "Evaluation of Sintered Bauxite Proppant for Binary Enhanced Geothermal Systems" just got accepted to be published in Geomechanics and Geophysics for Geo-Energy and Geo-Resources.

Zoi Dokou received her PhD with Prof. **George Pinder**. She is now an assistant professor in water resources engineering at California State University – Sacramento. Zoi teaches courses in hydraulics and water resources, and her research includes groundwater recharge enhancement using various managed aquifer recharge (MAR) techniques, stormwater capture and management, storm-induced salinization assessment and recovery in sub-tropical islands, and PFAS transport in the subsurface. We were thrilled to know that Zoi was recently honored with an Outstanding ASCE Faculty Award by the ASCE Sacramento Section.

Visit the CEE Website

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