Marissa K. Webber

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RESEARCH OBJECTIVE/INTERESTS

My research focuses on monitoring and modeling urban flooding to inform climate adaptation for urban transportation and stormwater infrastructure, including the responsible use of existing climate data for planning and adaptation, and the application of green infrastructure and nature-based solutions for effective adaptation in the face of deep uncertainty associated with climate change.

EDUCATION

Carnegie Mellon University, Pittsburgh, PA — August 2024
Doctor of Philosophy (Ph.D.) in Civil and Environmental Engineering (CEE)
Dissertation Title: Monitoring and Modeling Urban Stormwater Infrastructure and Nature-Based Solutions for Effective and Equitable Climate Change Adaptation
Dissertation Advisors: Constantine Samaras, Ph.D., David Rounce, Ph.D.

Carnegie Mellon University, Pittsburgh, PA — GPA: 4.00/4.00 — December 2019
Master of Science (MS) in Civil and Environmental Engineering (CEE)

Princeton University, Princeton, NJ — GPA: 3.63/4.00 — June 2018
Bachelor of Science in Engineering (BSE) in Civil and Environmental Engineering (CEE)
Minor in Sustainable Energy, Elected to Membership of Society of Sigma Xi

PUBLICATIONS AND PRESENTATIONS
Peer Reviewed Publications

- **Webber, M.K.**, Mei, L., Samaras, C. (in prep.) "Bridging the Gap: Riverine Nature-Based Solutions (NBS) for Climate Resilient Transportation Infrastructure"
- **Webber, M.K.**, Rounce D., López-Cantú, T., Samaras, C. (in prep) "Design strategies for climate resilient urban stormwater infrastructure"
- **Webber, M.K.**, Rounce, D., Tebyanian, N., Fischbach, J., Samaras, C. (in prep.) "Addressing Local Parameter Uncertainty for Climate Resilient Urban Stormwater Modeling and Decision Making"
- López-Cantú, T., **Webber, M.K.**, Samaras, C. (2022). "Incorporating uncertainty from downscaled rainfall projections into climate resilience planning in US cities" *Environmental Research: Infrastructure and Sustainability, 2(4),* https://iopscience.iop.org/article/10.1088/2634-4505/ac8a6c
- **Webber, M.K.**, & Samaras, C. (2022). A Review of Decision Making Under Deep Uncertainty Applications Using Green Infrastructure for Flood Management. *Earth's Future*, *10*(7), e2021EF002322. https://doi.org/10.1029/2021EF002322
- Miro, M.E., DeGaetano, A.T., López-Cantú, T., Samaras, C., **Webber, M.**, Grocholski, K.R. (2021) "Developing Future Projected Intensity-Duration-Frequency (IDF) Curves: A Technical Report on Data,

Methods and IDF Curves for the Chesapeake Bay Watershed and Virginia" Santa Monica, CA: RAND Corporation, 2021. https://www.rand.org/pubs/tools/TLA1365-1.html

Peer Reviewed Open Data

- **Webber, Marissa**; Samaras, Constantine (2024) "Data Collected on Hamerschlag Hall Green Roof." Carnegie Mellon University. Dataset. https://doi.org/10.1184/R1/25979656.v1
- **Webber, Marissa**; Mei, Lillian; Samaras, Constantine (2023) "Database categorizing 91 projects using nature-based solutions (NBS) in riverine environments across the US" Carnegie Mellon University. Dataset. https://doi.org/10.1184/R1/23393702.v3
- Lopez-Cantu, Tania; Samaras, Constantine; **Webber, Marissa** (2022) "Future 24-hour Depth-Duration-Frequency curves for selected U.S. cities." Carnegie Mellon University. Dataset. https://doi.org/10.1184/R1/13330805.v1
- **Webber, Marissa**; Samaras, Constantine (2021) "Data Collected for A Review of Decision Making Under Deep Uncertainty Applications using Green Infrastructure for Flood Management." Carnegie Mellon University. Dataset. https://doi.org/10.1184/R1/14981121.v3
- Lopez-Cantu, Tania; Samaras, Constantine; **Webber, Marissa** (2020) "Compilation of U.S. City Climate Adaptation Plans." Carnegie Mellon University. Online resource. https://doi.org/10.1184/R1/13125473.v2

Conference Posters and Presentations

- **Webber, M.K.**, Ozis, F. (2024). "Preparing the Next Generation of Engineers for Decision Making under Deep Uncertainty: Exploring the Pedagogical Role of the Decisions for the Decade Game" American Society for Engineering Education (ASEE) 2024 Annual Conference and Exposition, June 23-26. Oral Presentation in Environmental Engineering Division (ENVIRON) Technical Session 1.
- **Webber, M.K.**, Rounce, D., Samaras, C. (2023) "Uncertainty and Decision Making for Community Scale Urban Stormwater Modeling" AGU Fall Meeting 2023, December 11-15. Poster Presentation H33T-2042
- **Webber, M.K.**, Rounce, D., Samaras, C. (2023) "Assessing Performance of an Aging Green Roof in Pittsburgh, PA" Environmental & Water Resources Institute (EWRI) Low Impact Development (LID) Conference 2023, August 6-9. Oral Presentation in Session 4.1
- **Webber, M.K.**, Rounce, D., Samaras, C. (2022) "Synthesizing Guidelines and Lessons Learned for Implementation of Riverine Nature-Based Solutions (NBS) near to Transportation Infrastructure" AGU Fall Meeting 2022, December 12-16. Oral Presentation NH25A-01
- **Webber, M.K.**, Tebyanian, N., Rounce, D., Fischbach, J., Samaras, C. (2022) "Modeling Urban Flood Impacts and Potential Solutions at Community Scales in Pittsburgh, PA" AGU Fall Meeting 2022, December 12-16. Oral Presentation GH25A-08
- **Webber, M.K.**, Mei, L., Samaras, C. (2022) "Riverine Nature Based Solutions (NBS) for Climate Resilient Highways and Transportation Corridors" Transportation Research Board (TRB) 2022 Annual Meeting, January 9-13. Poster Presentation TRBAM-22-02144
- **Webber, M.K.**, Mei, L., Samaras, C. (2021) "Riverine Nature Based Solutions for Climate Resilient Highways and Transportation Corridors" AGU Fall Meeting 2021, December 13-17. Poster Presentation EP25B-1316
- **Webber, M.K.**, Samaras, C. (2021) "A Review of Decision Making Under Deep Uncertainty Applications Using Green Infrastructure for Flood Management" AGU Fall Meeting 2021, December 13-15. Oral Presentation GC12B-02
- López-Cantú, T., **Webber, M.**, Samaras, C. (2020) "The impact of climate information choices on city-scale resilience planning in the U.S." AGU Fall Meeting 2020, December 1-17. Oral Presentation H149-07

Other Publications and Presentations

- **Webber, M.**, Samaras, C. (2021). "Cost-Effective Method to Estimate Green Infrastructure Performance." Carnegie Mellon University Civil and Environmental Engineering Research Showcase; May 5, 2021.
- **Webber, M.**, Samaras, C. (2019). "Hamerschlag Hall Green Roof likely to become slightly less effective at reducing stormwater runoff over time." Carnegie Mellon University Civil and Environmental Engineering Summer Research Program Poster Session; July 26, 2019.
- **Webber, M.** (2018) "Seismic Chimneys: Potential for Leakage from Snøhvit's Carbon Dioxide (CO_2) Storage Formation." (Senior Thesis) Princeton University, Princeton. Advised by Celia, M. and Bandilla, K. http://arks.princeton.edu/ark:/88435/dsp01h128nh43t

Webinar Presentations, Media Interviews, Blog Posts, and Research Mentions

- Habic, E., **Webber, M.** "Insights on Using Nature-Based Solutions for Highway Resilience" in AASHTO Resilience Webinar #1 "Reducing the effects of climate change on transportation infrastructure using natural and nature-based solutions", May 9 2022.
- Guest speaker on the Future Cities Podcast "Decision Making Under Deep Uncertainty & Green Infrastructure" Episode 67, July 1 2022 https://www.stitcher.com/show/future-cities/episode/decision-making-under-deep-uncertainty-green-infrastructure-204540793

EXPERIENCE

Research Experience

Department of Earth Marine and Environmental Sciences, University of North Carolina at Chapel Hill

July 2024 – present

Postdoctoral Research Associate   Chapel Hill, NC

- Analyze North Carolina Department of Transportation (NCDOT) infrastructure exposure to flooding due to compound, rainfall, and coastal processes for recent hurricanes affecting North Carolina.
- Expand ongoing funded work to improve confidence in climate change projects by quantifying future precipitation extremes within North Carolina for resilient design.

CEE Department, Carnegie Mellon University (CMU)   Jan. 2020 – July 2024

Research Assistant   Pittsburgh, PA

- Synthesized 122 publications in the flood management literature using decision making under deep uncertainty (DMDU) approaches and referring to green infrastructure as a potential solution. Published a literature review identifying useful trends and highlighting successful practices to facilitate equitable research in these fields.
- Specified and installed a solar-powered ultrasonic sensor to measure runoff from the Hamerschlag Hall green roof on Carnegie Mellon's campus.
- Extended an existing 1-dimensional (1D) dual drainage model in Personal Computer Stormwater Management Model (PCSWMM) to capture block flows and flooding for a Pittsburgh community with a history of disinvestment. This model is calibrated and validated using data collected by local utilities. Developed a decision analysis framework to identify the set of model parameters that performs best across locations and storms and used the calibrated model to assess potential flood risks under climate change for a neighborhood in one of the largest urban watersheds in the city.
- Summarized the current state of practice in the contiguous United States (CONUS) for riverine nature-based solutions (NBS) in facilitating climate resilient transportation infrastructure.

CEE Department, Carnegie Mellon University (CMU)   Jun. – Aug. 2019
Summer Research Intern   Pittsburgh, PA

- Investigated performance of green roofs for reducing stormwater runoff in Pittsburgh. Used Geographic Information Systems (GIS) to categorize types of green infrastructure in the City of Pittsburgh. Specified, designed and installed a solar-powered weather sensing and roof monitoring package on the Hamerschlag Hall green roof on Carnegie Mellon's campus to measure atmospheric variables as well as soil moisture and temperature. Analyzed intensity, duration, and roof performance for initial precipitation event. Presented initial results as a poster.

Teaching Experience

Carnegie Mellon University, Pittsburgh PA
- Teaching Assistant Spring 2023 for 12749: Climate Change Adaptation (7-week graduate course)

Carnegie Mellon University, Pittsburgh PA
- Teaching Assistant Fall 2022 for 12401: CEE Design (14-week undergraduate course)

Carnegie Mellon University, Pittsburgh PA
- Teaching Assistant Spring 2022 for 12749: Climate Change Adaptation (7-week graduate course)

Carnegie Mellon University, Pittsburgh PA
- Teaching Assistant Fall 2020 for 12200: CEE Challenges: Design in a Changing World (14-week undergraduate course)

Carnegie Mellon University, Pittsburgh PA
- Teaching Assistant Fall 2019 for 12612/712/19712: Introduction to Sustainable Engineering (14-week graduate and undergraduate course)

Workshops and Symposia

CMU CEE Rising Stars Workshop   Sept. 2022 – Mar. 2023
Participant

- Participated in three sessions (one in-person, two remote) designed for doctoral students and postdoctoral scholars who are interested in pursuing academic teaching and research careers in Civil and Environmental Engineering. Received valuable personal feedback on mock application materials and networked with fellow students as well as faculty.

Coastal Engineering 101 – The Caribbean Context   Nov. – Dec. 2020
Participant

- Attended four modules presented by Caribbean coastal engineers and experts in the field to understand risks faced in the Caribbean, common frameworks and models for design in the region, and how to evaluate and construct coastal protection and enhancements.

Get Ready, Get SETS, GI! Symposia   Jul. – Nov. 2020
Participant

- Engaged with Early Career scholars, activists, community organizers, and practitioners to learn how to build urban resilience, while also exploring equitable and multifunctional green infrastructure implementation for the new climate normal. Networking opportunities and preparation of deliverables such as a white paper continued through 2021-22: https://get-sets.com/.

GRANTS, AWARDS, HONOURS, AND PATENTS

- Awarded Best Student Paper Award for Environmental Division at the American Society for Engineering Education (ASEE) 2024 Annual Conference and Exposition
- Completed Future Faculty Program, Eberly Center for Teaching Excellence and Educational Innovation, Carnegie Mellon University
- Awarded ASCE Freeman Fellowship 2023-2024
  - Total Award: $5,000
- Awarded the 2021 Dwight David Eisenhower Transportation Fellowship Program (DDETFP) Fellowship for research project assignment "Riverine Nature-Based Solutions for Highway Resilience"
  - Grant number: 693JJ32145222, Total Award: $41,500
- Awarded Carnegie Mellon University Civil and Environmental Engineering Outstanding Teaching Assistant Award at the 2021 Graduate Student Commencement Awards
- One of 10 finalists for the Jamaica Rhodes Scholarship in 2017

SKILLS

Application Software: *Advanced:* PCSWMM, *Intermediate:* ArcGIS, QGIS, MATLAB; *Beginner:* SWMM, OpenRefine, SolidWorks, CorelDRAW
Programming Languages: *Intermediate:* RStudio, Python
Technical Experience: *Beginner:* Rabbit Laser Cutter, Dremel3D40 3D printer

PROFESSIONAL MEMBERSHIPS

Association of Environmental Engineering and Science and Professors (AEESP): Student/Postdoctoral Researcher Member
American Society of Civil Engineers (ASCE): Student Member, Environmental and Water Resources Institute (EWRI) Member, Member of the Pittsburgh Section
American Society for Engineering Education (ASEE)
- Member of the Environmental Engineering Division
- Member of the Engineering Ethics Division
- Member of the Engineering and Public Policy Division
- Member of the Equity, Culture & Social Justice in Education Division
- Member of the Student Division

Sigma Xi: Full Member 2023-2024
Transportation Research Board (TRB)
- Friend of AEP70: Standing Committee on Environmental Analysis and Ecology
- Friend of AKD50: Standing Committee on Hydrology, Hydraulics, and Stormwater
- Friend of AKG30: Standing Committee on Geo-Environmental and Climatic Impacts on Geomaterials
- Friend of AME10: Standing Committee on Equity in Transportation
- Friend of AME20: Standing Committee on Women and Gender in Transportation
- Friend of AME40: Standing Committee on Transportation in the Developing Countries
- Friend of AMR10: Standing Committee on Critical Transportation Infrastructure Protection
- Friend of AMR50: Standing Committee on Extreme Weather and Climate Change Adaptation

PROFESSIONAL SERVICE OPPORTUNITIES AND EXTRACURRICULAR ACTIVITIES

Board Member for Environmental and Water Resources Institute (EWRI) Student Chapter at Carnegie Mellon University for AY21-22, AY22-23, and AY23-24

Student Volunteer for the inaugural Carnegie Mellon University (CMU) Civil and Environmental Engineering (CEE) Diversity Equity and Inclusion (DEI) Hackathon in Fall 2022

Graduate Student Representative to Carnegie Mellon University College of Engineering (CIT) College Council for AY20-21