Lauren Cook, Ph.D, EIT

Curriculum Vitae

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https://scholar.google.com/cooklaur
orcid.org/0000-0001-7790-1294
https://www.linkedin.com/in/lauren-cook

MAIN RESEARCH AREAS

Blue-green stormwater infrastructure; Climate resilience; Urban sustainability; Performance based design; Multifunctionality

EDUCATION

2014 - 2018 **Doctor of Philosophy**
ADVISOR: CONSTANTINE SAMARAS
Civil & Environmental Engineering
Carnegie Mellon University

2011 - 2012 **Master of Industrial Engineering**
Energy and Economics Program
Institute Français du Petrole (IFP School)

2006 - 2010 **Bachelor of Science**
Civil & Environmental Eng., Water Resources
University of Maryland

EMPLOYMENT HISTORY

CURRENT, SINCE APRIL 2021 (DUEBENDORF, SWITZERLAND)
Dept of Urban Water Management
Swiss Federal Instit. of Aquatic Science & Tech. (Eawag)
Group Leader

JAN 2019–MAR 2021 (DUEBENDORF, SWITZERLAND)
Dept of Urban Water Management, Eawag
Post-doctoral Fellow

Transdisciplinary collaboration with ETH Zürich and industry specialists to gain expertise for experimental design on solar panels, green roof vegetation, energy balance modelling.

AUG 2014–DEC 2018 (PITTSBURGH, USA)
Dept of Civil & Environmental Eng., Carnegie Mellon Univ.
Doctoral Researcher

Interdisciplinary collaboration and visiting researcher at the National Center for Atmospheric Science (NCAR) and with the RAND corporation.

AUG 2012–AUG 2014 (NEWARK, DE, USA)
Air Liquide Industrial Gases, Research & Development
Research Associate

Oral and written communication results of supply chain optimization model to a non-expert and international audience

MAY 2010–AUG 2010 (COLLEGE PARK, MD, USA)
Dept of Civil & Environmental Eng., Univ. of Maryland
Water Resources Research Assistant

Supervisor: Professor Emeritus Richard McCuen

APPROVED RESEARCH PROJECTS

2021 **SNF Project Funding, 583'864 CHF**
BETTER: Blending design and dEcision-making for mulTi-funcTional bluE-green infRastructure
Primary Investigator

2021 **Blue-Green Biodiversity (BGB), 520,000 CHF**
Joint Eawag-WSL Funding Initiative
Blue-Green Stormwater Infrastructure Meets Biodiversity in the City [Benefit]
Primary Investigator

2019 **Eawag Postdoctoral Fellowship, 2-year funding**
Quantifying the co-benefits of distributed stormwater and energy infrastructure
Post-doctoral researcher

2015 **U.S. NSF, 4-year Ph.D funding**
Humans, Disasters, & Built Env.
Characterizing 21st Century Extremes for Eng. and Evaluating Robust Infrastructure Designs
PhD student

FELLOWSHIPS & AWARDS

2018 **Postdoctoral Fellowship Recipient**
Swiss Fed. Instit. Aquatic Science & Tech. (Eawag)

2018 **3rd Place Student Presentation**
Universities Council on Water Resources Conference

2016 **Best Student Poster Award**
8th Annual Sustainability Conference, Pittsburgh

2016 **Outstanding Teaching Assistant Award**
Carnegie Mellon Civil & Environ. Eng.

2016 - 2017 **John and Claire Bertucci Fellowship**
Carnegie Mellon Civil & Environ. Eng.

2014 **Carnegie Mellon Deans Fellowship**
Carnegie Mellon Civil & Environ. Eng

2012 - 2013 **Tuck Foundation Scholarship**
Institute Français du Petrole (IFP School)

PUBLICATIONS AT A GLANCE

Peer-reviewed : 9; citations: 143; h-index: 7

Cavadini and **Cook** (2021) *Applied Energy* doi:10.1016/j.apenergy.2021.117082

Cook and Larsen (2020) *Building and Environment* doi:10.1016/j.buildenv.2020.107489

Cook et al (2020) *Climatic Change* doi:10.1007/s10584-019-02649-6

TEACHING ACTIVITIES

Student Supervision

Student	Degree	Project Title	Duration
Giovan Battista Cavadini	PhD ETH Zurich	Hydrological, thermal and ecological performance of blue-green infrastructure in Switzerland	2022 -2026
Mayra Rodriguez	PhD U. Exeter	Spatial interactions between green infrastructure, shallow groundwater, and combined sewers systems influence urban drainage system resilience	2021
Killian Perrelet	PhD U. Zurich	Using eDNA to reveal the dynamics of aquatic and terrestrial communities in the urban environment	2020 - 2025
Bettina Maurer	MSc Thesis ETH Zurich	Decision analysis of green and cool roofs	2021–2022
Dawar Muktar Qureshi	MSc Thesis TU Dresden	Adequacy of urban water infrastructure under climate change	2021
Giovan Battista Cavadini	MSc Thesis ETH Zurich	Evaluating potential efficiency gains in rooftop solar panels placed on green roofs	2019–2020
Ines Malot	MSc Project ETH Zurich & Ecole de Mines de Paris	Does vegetation influence the hydrologic performance of green roofs?	2020

Teaching Assistant Experience

JAN 2018–MAY 2018 (PITTSBURGH, PA, USA)

Dept of Civil & Environmental Engineering, Carnegie Mellon University
Teaching Assistant, Climate Change Adaptation

Prof. Constantine Samaras @csamaras

JAN 2015–2017 (PITTSBURGH, PA, USA)

Dept of Civil & Environmental Engineering, Carnegie Mellon University
Teaching Assistant, Water Resource System Engineering (3 semesters)

Prof. and President Emeritus Jared Cohon link to bio

MAY 2010–DEC 2010 (COLLEGE PARK, MD, USA)

Dept of Civil & Environmental Engineering, University of Maryland
Course Assistant, Simulation & Design of Experiments

Prof. Steven Gabriel link to bio

Guest Lectures

University	Department	Course	Hours	Years
ETH Zurich	Integrated Building Systems	Indoor Environment, Resources & Safety (066-0420-00L)	6	2020–2021
Carnegie Mellon	Civil & Environmental Eng.	Intro to Civil & Enviro. Eng. (12-100)	3	2017, 2018
Carnegie Mellon	Civil & Environmental Eng.	Climate Change Adaptation (12-749)	2	2016, 2018
Carnegie Mellon	Civil & Environmental Eng.	Intro to Sustainable Eng. (12-712)	3	2016, 2017
Carnegie Mellon	Information Systems	IT & Environmental Sustainability (67-353)	1	2017
Carnegie Mellon	Civil & Environmental Eng.	Water Resource Systems Engineering (12-657)	20	2015–2017

Training, Leadership, and Outreach

2019 **Leadership in Academia Training**
Fix the Leaky Pipeline Program, ETH Zürich

2017 **Future Faculty Program Completion**
Eberly Center for Teaching Excellence, Carnegie Mellon University

2016 **Bias Busters Training**
College of Engineering, Carnegie Mellon University

2015–2016 **Co Program Organizer**
SUCCEED Summer Prog. for High School Students
Carnegie Mellon University, Pittsburgh, USA

2015 - 2016 **Scientist in the Classroom**
National Center for Science Education Pilot
Central Valley, PA, USA

SERVICE AND MEMBERSHIPS

Professional

2016–2022	**Member**, Infrastructure and Climate Network (ICNET)
2016–2022	**Member**, American Geophysical Union (AGU)
2016–2018	**Board Member**, Environmental & Water Resources Institute (EWRI) Carnegie Mellon Graduate Student Chapter
2015–2018	**Member**, American Society of Civil Engineers (ASCE)

University/Departmental

2019–2021	**Board Member** Eawag Postdoctoral Association (EPSA), Eawag
2017	**Workshop organiser** Teaching and Learning Summit, Carnegie Mellon University
2014–2016	**Civil & Env. Engineering Department Representative** Graduate Student Association, Carnegie Mellon University

Peer-Review

REVIEW FOR JOURNALS	Climatic Change; J. Infrastructure Systems; Sustainable and Resilient Infrastructure; Energy Efficiency; International J. Climatology; Frontiers in Water; Urban Water Journal; Blue-Green Systems
REVIEW FOR CONFERENCES	World Environmental and Water Resources Congress

COMPUTER SKILLS

COMPUTER LANGUAGES	Python, MATLAB, Visual Basic GAMS, LINGO, Command Line
SOFTWARE	SWMM, AutoCAD, Microstation, ArcGIS, Tableau, HECRAS, Microsoft Office, LaTeX
MODELLING EXPERTISE	Hydrologic simulation, Linear programming, Statistics & uncertainty

COMMUNICATION SKILLS

LANGUAGES	English (Native), French (Bilingual), German (Level B1), Spanish (Limited Working Proficiency), Mandarin (Basic)
CONFERENCES	20+ oral presentations at international conferences and 3 invited talks
POSTERS	7 posters at international conferences

PUBLICATIONS

Peer-Reviewed (9, citations: 143, h-index: 7)

1. Cavadini, G.B. and **L .Cook** (2021) Green and cool roof choices integrated into rooftop solar energy modelling. *Applied Energy* 296. 10.1016/j.apenergy.2021.117082
2. **Cook, L.** and T. Larsen (2020) Towards a performance-based approach for multifunctional green roofs: An interdisciplinary review. *Building and Environment* 107489. doi.org/10.1016/j.buildenv.2020.107489
3. **Cook, L.**, McGinnis, S., and C. Samaras (2020) The Effect of Modelling Choices on Updating Intensity Duration Frequency Curves and Stormwater Infrastructure Designs for Climate Change. *Climatic Change* doi.10.1007/s10584-019-02649-6
4. **Cook, L.**, Samaras, C., and J.M. VanBriesen (2019) Using Rainfall Measures to Evaluate Hydrologic Performance of Green Infrastructure Systems under Climate Change. *Sustainable and Resilient Infrastructure* doi.10.1080/23789689.2019.1681819
5. **Cook, L.**, Samaras, C., and J.M. VanBriesen (2018) A Mathematical Model to Plan for Long-Term Effects of Water Conservation Choices on Dry Weather Wastewater Flows and Concentrations. *J. Environmental Management*. 206C, 684 - 697. doi.10.1016/j.jenvman.2017.10.013
6. **Cook, L.,** Anderson, C.J., and C. Samaras (2017) A Framework for Incorporating Downscaled Climate Output into Existing Engineering Methods: Application to Precipitation Frequency Curves. *J. Infrastructure Systems*. 23 (4). doi.10.1061/(ASCE) IS.1943-555X.0000382
7. Fischbach, J.R., Siler-Evans, K., Wilson, M., Tierney, D., **Cook, L.**, and L. May (2017) Resilient Stormwater Management in Allegheny County and the Pittsburgh Metropolitan Region: A Pilot Study. Santa Monica, Calif.: RAND Corporation, RR-1673-MCF, 2017
8. Marchetti, P.A., Gupta, V., Grossmann, I.E., **Cook, L.**, Valton, P.M., Singh, T., Li, T., and J. Andre (2014) Simultaneous Production and Distribution of Industrial Gas Supply-chains. *Journal Computers & Chemical Engineering*. 69, 39-58. doi.10.1016/j.compchemeng.2014.06.010
9. **Cook, L.** and R. McCuen (2013). The Hydrologic Response of Solar Farms. *Journal Hydrologic Engineering*. 18(5), 536-541. doi.10.1061/(ASCE)HE.1943-5584.0000530

In Prep

10. Rodriguez, M., Cook L., Fu, G., Butler, D., Yuan Z. and K. Sharma (In Prep) Spatial interactions between green infrastructure, shallow groundwater, and combined sewers systems influence urban drainage system resilience *Water Research*
11. Probst, N., Bach P., **Cook, L.**, Maurer, M. and J. Leitao (In Prep) A critical review of Blue Green Systems for cooler cities: Do they work? *Landscape and Urban Planning*

Conference Proceedings

12. Olmstead, S., O'Connor, A., Samaras, C., **Cook, L.**, and B. Martinez-Pastor (2017) A Climate Engineering Assessment for Transportation Assets - Incorporating Probabilistic Analysis into Extreme Weather and Climate Change Design Engineering. Transportation Research Board 2017 Annual Meeting.

SELECTED COMMUNICATIONS AT INTERNATIONAL CONFERENCES

1. Cavadini, G.B. and **L. Cook*** (2021). *Oral: Comparing rooftop choices for cooler cities and more electricity*. American Geophysical Union 2021 Fall Meeting, New Orleans, LA, USA

2. **Cook, L.*** and T. Larsen (2021). *Oral: Performance based design of multifunctional green roofs*. International Conference on Urban Drainage (ICUD) 2021, Online

3. Cavadini, G.B.* and **L. Cook** (2021). *Oral: Integrating sustainable rooftop choices into solar panel planning*. CISBAT 2021, Lausanne, CH

4. **Cook, L.***, VanBriesen, J., and C. Samaras (2020) *Oral: Using Rainfall Measures to Evaluate Hydrologic Performance of Green Infrastructure Systems under Climate Change*. Joint International Resilience Conference, The Netherlands

5. **Cook, L.**, VanBriesen, J.*, and C. Samaras (2019) *Oral: Using Rainfall Measures to Evaluate Hydrologic Performance of Green Infrastructure Systems under Climate Change*. American Geophysical Union 2019 Fall Meeting, San Francisco, CA, USA

6. **Cook, L.*** and T. Larsen (2020) *Oral: Comparing Rooftop Choices for Cooler Cities and More Electricity*. Eawag Symposium, Dubendorf, CH

7. **Cook, L.*** VanBriesen, J.M., and C. Samaras, C. (2020) *Poster: An Early Warning to Adapt Green Infrastructure*. 9th International Conference on Sewer Processes and Networks (SPN9), Aalborg, DK

8. Lopez-Cantu, T.*, **Cook, L.**, and C. Samaras (2019). *Oral: Robust Decision Making for Resilience*. American Geophysical Union 2019 Fall Meeting, San Francisco, CA, USA

9. **Cook, L.***, McGinnis, S., and C. Samaras (2018). *Oral: The Effect of Modelling Choices on IDF Curves and Stormwater Infr.*. University Council on Water Resources (UCOWR) 2018 Conference, Pittsburgh, PA, USA

10. **Cook, L.***, Weinburg, R., Goradia, A., and C. Kolb (2018). *Oral: Higher Highs, Lower Lows: Increased Variability within the Ohio River Basin*. UCOWR 2018 Conference, Pittsburgh, PA, USA

11. **Cook, L.***, McGinnis, S., and C. Samaras (2018). *Oral: Uncertainty in Adjustment Methods for Climate Updated Intensity-Duration-Frequency Curves*. American Geophysical Union 2018 Fall Meeting, New Orleans, LA, USA

*indicates presenter

ADVANCES IN SCIENTIFIC KNOWLEDGE

Theme 1: Inter and transdisciplinary collaboration

Through her education in civil & environmental engineering and energy systems, Dr. Cook has recognized that inter and transdisciplinary collaborations are needed to solve the critical engineering challenges that lie ahead. With this in mind, she has transcended boundaries between water systems, energy infrastructure, and climate science, becoming an expert in translational work across disciplines. During her doctoral research, she worked with climate scientists from the University of Iowa and the US National Center for Atmospheric Science (NCAR) to convert coarse resolution climate data into high resolution precipitation information that could be used in stormwater design analyses. She used the skills and knowledge gained through these collaborations to work with policy researchers at the RAND corporation on a study evaluating the resilience of Pittsburgh's sewer system. Together with the RAND colleagues, these results were presented to local decision-makers to help them decide on a strategy that could meet changes in stormwater regulations decreed by the US Environmental Protection Agency (EPA). During her post-doctoral work, she continued the practice of inter and transdisciplinary collaboration by partnering with researchers from ETH, as well as, European companies, to build four small scale photovoltaic green roofs for experimentation and modelling. In preparation for the start of her tenure track research, she was recently awarded funding as PI for a highly interdisciplinary project related to blue-green biodiversity, which brings together stakeholders and researchers in Zurich, including specialists in ecology and biodiversity, water systems, land use planning, and social science.

Theme 2: Downscaled future rainfall for stormwater applications

In line with the goal to resolve critical engineering challenges through interdisciplinary efforts, the underlying objective Dr. Cook's doctoral research was to provide engineers with future climate information that could be used to increase the resilience of urban drainage systems. Using output from regional climate models, she developed methods to assemble and convert climate projections into two formats used in engineering design and planning. With a combination of statistical approaches, she created (1) sub-daily, future rainfall time-series for use in continuous hydrologic simulation models, and (2) future intensity-duration-frequency (IDF) curves, which are commonly used by engineering practitioners to represent extreme rainfall. Given the uncertainty of climate projections and downscaling techniques, she also evaluated the effect of modelling choices on stormwater infrastructure designs for climate change, and found that variations in downscaling approaches have consequences for engineering infrastructure, including the potential to double the size and cost of a stormwater pipe. She is currently working with an MSc student to standardize the approach for future IDF curve generation through the use of Bayesian inference.

Theme 3: Performance based design of multi-functional blue-green infrastructure systems

Since her undergraduate education and research at the University of Maryland, Dr. Cook has been interested in the design and performance of blue-green infrastructure (BGI), which include vegetated basins, green roofs, and constructed wetlands. During her doctoral research, she began to to track the hydrologic performance of vegetated basins using observed rainfall measures. The method she developed provides a straightforward way for stakeholders to evaluate BGI performance over time without climate models, hydrologic simulations, or on-site sensors that may not be easily accessible. Informed by this work and prior knowledge of energy systems (from her MSc program), during her postdoctoral research at Eawag, she developed a new research concentration in multi-functional green roofs, exploring their ability to achieve multiple environmental benefits, including stormwater runoff attenuation, heat mitigation, and improving the efficiency of integrated photovoltaic (PV)-green roof systems. Through this research, she discovered numerous trade-offs in performance based design of multi-functional green roofs, which she highlighted in an interdisciplinary literature review that showed how the green roof design properties ultimately influence the ability of the green roof to meet different objectives. During the design and construction a PV-green roof field experiment for this work, she has also gained valuable competencies in sensor selection, maintenance, and data management, which will be used in future research projects to facilitate real-time data gathering. She is currently working on efforts to establish an integrated model that can be used for performance based design of multi-functional BGI systems, as part of the urban transition towards sustainable, liveable, and resilient cities.