# Lauren Cook, Ph.D, EIT
## *Curriculum Vitae*

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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**  **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)*

## STUDENT SUPERVISION

| Student | Degree | Project Title | Duration |
|---|---|---|---|
| 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 ACTIVITIES

### Teaching Assistant Experience

Dept of Civil & Environmental Engineering, Carnegie Mellon University
*Teaching Assistant, Climate Change Adaptation*
**Prof. Constantine Samaras** 🐦 @csamaras

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

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

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|---|---|---|---|
| 2019 | **Leadership in Academia Training** Fix the Leaky Pipeline Program, ETH Zürich | 2015–2016 | **Co Program Organizer** SUCCEED Summer Prog. for High School Students Carnegie Mellon University, Pittsburgh, USA |
| 2017 | **Future Faculty Program Completion** Eberly Center for Teaching Excellence, Carnegie Mellon University | 2015 - 2016 | **Scientist in the Classroom** National Center for Science Education Pilot |
| 2016 | **Bias Busters Training** College of Engineering, Carnegie Mellon University | | Central Valley, PA, USA |

## SERVICE AND MEMBERSHIPS

### Professional

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| 2016–2021 | **Member**, Infrastructure and Climate Network (ICNET) |
| 2016–2019 | **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

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|---|---|
| 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

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|---|---|
| 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

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|---|---|
| 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

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|---|---|
| LANGUAGES | English (Native), French (Bilingual), German (Level B1), Spanish (Limited Working Proficiency), Mandarin (Basic) |
| CONFERENCES | 18 oral presentations at international conferences and 3 invited talks |
| POSTERS | 7 posters at international conferences |

# Lauren Cook, Ph.D, EIT
## *Scientific Acheivements*

## PUBLICATIONS

### Peer-Reviewed (8, citations: 98, h-index: 6)

1. **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

2. **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

3. **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

4. **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

5. **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

6. 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

7. 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

8. **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

### Under Review

9. Cavadini, G.B. and **L. Cook** (In Revision) Green and cool roof choices integrated into rooftop solar energy modelling *Applied Energy*

10. Probst, N., Bach P., **Cook, L.**, Maurer, M. and J. Leitao (Under review) A critical review of Blue Green Systems for cooler cities: Do they work? *Landscape and Urban Planning*

### Conference Proceedings

11. 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. **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

2. **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,

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

4. **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

5. 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

6. **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

7. **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

8. **Cook, L.**,* McGinnis, S., and C. Samaras (2018). *Oral: Uncertainty in Adjustment Methods for Climate Updated Intensity-Duration-Frequency Curves*. American Geophysical Union 2017 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.