

Lu Liu, Ph.D.

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Civil, Construction & Environmental
Engineering
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Expertise: *Water-energy-climate nexus; urban water sustainability; human-natural system modeling*

EDUCATION

- | | | |
|-------------|--|--|
| 2014 – 2017 | Ph.D., Civil Engineering
(specialized in Water Resources Engineering) | University of Maryland,
College Park, MD |
| | <ul style="list-style-type: none">Dissertation: “<i>Water-Energy-Climate Nexus: interdependencies and tradeoffs, and implications for strategic resource planning</i>” (Advisor: Dr. Barton Forman) | |
| 2010 – 2012 | M.S., Environmental Science
(Water Resources track) | University of Oklahoma,
Norman, OK |
| | <ul style="list-style-type: none">Thesis: “<i>Assessments and projections of regional hydro-climatic variability over the Southern U.S.: potential teleconnections with El Niño/Southern Oscillation</i>” (Advisor: Dr. Yang Hong) | |
| 2008 – 2010 | B.S. (with distinction), Environmental Science | University of Oklahoma,
Norman, OK |
| | <ul style="list-style-type: none">Capstone: “<i>Chemical constituents in water and sediment from Grand Lake O’ the Cherokees, Oklahoma, downstream from the tri-state lead-zinc mining district</i>” | |
| 2006 - 2008 | Degree sought – B.S., Environmental Science
(transferred to University of Oklahoma) | Beijing Normal University,
Beijing, China |

PROFESSIONAL EXPERIENCE

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|--|-----------------------------------|
| Iowa State University
Assistant Professor | Ames, IA
2021 – Present |
| Houston Advanced Research Center
Research Associate | The Woodlands, TX
2020 – 2021 |
| Rice University
Postdoctoral Research Associate (Advisors: Dr. Qilin Li, Dr. Lauren Stadler, and Dr. Leonardo Duenas-Osorio) | Houston, TX
2018 – 2020 |
| University of Maryland/Joint Global Change Research Institute
Graduate Research and Teaching Assistant | College Park, MD
2014 – 2017 |
| International Institute for Applied Systems Analysis
Young Scientists Summer Program Fellow | Laxenburg, Austria
Summer 2016 |
| Joint Global Change Research Institute
Post-Master Research Associate | College Park, MD
2012 – 2014 |

GRANTS

Awarded

The Cynthia & George Mitchell Foundation, \$12,000 (PI: Lu Liu)	2019 – 2020
National Science Foundation Grant Opportunities for Academic Liaison with Industry, \$305,505 (PI: Lauren Stadler)	2019 – 2022
Department of Energy FY19 Advanced Manufacturing Office Multi-Topic, \$1,463,534 (PI: Gavin Dillingham)	2020 – 2023
The Alfred P. Sloan Foundation, \$600,000 (PI: Gavin Dillingham)	2021 – 2023

Pending

Environmental Protection Agency, \$3,000,000 (PI: Kaoru Ikuma)	2021 – 2024
Iowa Water Center and Iowa Nutrient Research, \$60,000 Center (PI: Lu Liu)	2022 – 2024
The Presidential Interdisciplinary Research Seed Grant, \$50,000 (PI: Yuyu Zhou)	2022 – 2024
Entergy Physical Risk Assessment, \$150,000 (PI: Gavin Dillingham)	2022 – 2022

REFEREED PUBLICATIONS

Pending

24. Zhou X., Q. Li, **L. Liu**, J. Doss-Gollin, L. Stadler, L. Dueñas-Osorio (2021), *Approximate modeling of large hybrid water supply systems to explore optimal integration configuration* (in preparation).
23. **Liu L.**, C. Rehmann, A. Arenas, M. Kiparsky, Y. Wang, K. Ikuma, and J. Charbonnet (2021), *An information-driven approach to accelerate the adoption of water reuse in US small communities* (in preparation)
22. Zhang T., Y. Zhou, T. Saad, **L. Liu** (2021), *Urban heat island drives up US building cooling energy consumption with large spatial heterogeneity* (in preparation)
21. **Liu L.**, X. Zhou, L. Dueñas-Osorio, L. Stadler, and Q. Li (2021), *Distributed urban water system enhances system resilience to disruptive incidents* (in preparation).
20. Li X., Y. Zhou, Y. Liu, X Zhang, P. Kyle, **L. Liu**, M. Hejazi, G. Jia, and W. Gutowski (2020), *Rising challenges of thermoelectric cooling water withdrawal in the Western United States*, One Earth (under review).

Published

19. **Liu L.**, E. Lopez, L. Dueñas-Osorio, L. Stadler, Y. Xie, P. Alvarez, and Q. Li (2020), *The importance of system configuration for distributed direct potable water reuse*, Nature Sustainability. DOI: 10.1038/s41893-020-0518-5.
18. Zhang X. H. Li, R. Leung, **L. Liu**, M. Hejazi, B. Forman, and W. Yigzaw (2020), *River regulation alleviates the impacts of climate change on US thermoelectricity production*, Journal of Geophysical Research. DOI: 10.1029/2019JD031618.
17. **Liu L.**, M. Hejazi, G. Iyer, and B. Forman (2019), *Implications of water constraints on electricity capacity expansion in the United States*, Nature Sustainability. DOI: 10.1038/s41893-019-0235-0.

16. Li X, V. Chris, M. Hejazi, R. Link, Z. Huang, **L. Liu**, L. Feng (2018), *Tethys – A Python Package for Spatial and Temporal Downscaling of Global Water Withdrawals*, Journal of Open Research Software. DOI: 10.5334/jors.197.
15. **Liu L.**, S. Parkinson, M. Gidden, E. Byers, Y. Satoh, K. Riahi, and B. Forman (2018), *Quantifying the potential for reservoirs to secure future surface water yields in the world's largest river basins*, Environmental Research Letters. DOI: 10.1088/1748-9326/aab2b5.
14. **Liu L.**, M. Hejazi, H. Li, B. Forman, and X. Zhang (2017), *Vulnerability of US thermoelectric power generation to climate change when incorporating state-level environmental regulations*, 2, 17109, Nature Energy. DOI: 10.1038/nenergy.2017.109.
13. Voisin N., M. I. Hejazi, L. R. Leung, **L. Liu**, M. Huang, H. Li, and T. Tesfa (2017), *Effects of sectoral water withdrawals, allocation and consumptive use on the redistribution of water resources in an integrated water model*, Water Resources Research. DOI: 10.1002/2016WR019767.
12. Talati S., H. Zhai, P. Kyle, M.G. Morgan, P. Patel, **L. Liu** (2016), *Consumptive water use from electricity generation in the Southwest under alternative climate, technology and policy futures*, Environmental Science and Technology. DOI: 10.1021/acs.est.6b01389.
11. Scott M. J., D. S. Dalya, M. I. Hejazi, P. G. Kyle, **L. Liu**, H.C. McJeon, A. Mundra, P. L. Patel, J. S. Rice, N. Voisin (2016), *Sensitivity of future U.S. Water shortages to socioeconomic and climate drivers: a case study in Georgia using an integrated human-earth system modeling framework*, Climatic Change. DOI: 10.1007/s10584-016-1602-8.
10. Li, H.-Y., L. Ruby Leung, T. Tesfa, N. Voisin, M. Hejazi, **L. Liu**, Y. Liu, J. Rice, H. Wu, and X. Yang (2015), *Modeling stream temperature in the Anthropocene: An earth system modeling approach*, Journal of Advances in Modeling Earth Systems, 7, 16611679, DOI:10.1002/2015MS000471.
9. Kim S., M. Hejazi, **L. Liu**, K. Calvin, L. Clarke, J. Edmonds, P. Kyle, P. Patel, M. Wise, E. Davies (2015), *Balancing global water availability and use at basin scale in an integrated assessment model*. Climatic Change. DOI: 10.1007/s10584-016-1604-6.
8. Hejazi M., N. Voisin, **L. Liu**, L. Bramer, D. Fortin, J. Hathaway, M. Huang, P. Kyle, L.R. Leung, H.Y. Li, Y. Liu, P. Patel, T. Pulsipher, J. Rice, T. Tesfa, C. Vernon, Y. Zhou (2015), *21st century United States emissions mitigation could increase water stress more than the climate change it is mitigating*. Proceedings of the National Academy of Sciences of the United States of America, 112 (34), DOI: 10.1073/pnas.1421675112.
7. **Liu L.**, Hejazi M., Patel P., Kyle P., Davies E., Zhou Y., Clarke L., Edmonds J. (2015), *Water demands for electricity generation in the U.S.: Modeling different scenarios for the water energy nexus*. Technological Forecasting and Social Change, 94, 318-334, DOI:10.1016/j.techfore.2014.11.004.
6. Hong Y., **L. Liu**, L. Qiao, and P. Adhikari (2014), *Chapter 4: Climate Change and Hydrological Hazards*, Handbook of Engineering Hydrology (1st edition), CPC Press. DOI: 10.1201/b16683.
5. Voisin, N., **L. Liu**, Hejazi, M., Tesfa, T., Li, H., Huang, M., Liu, Y., and Leung, L. R. (2013), *One-way coupling of an integrated assessment model and a water resources model: evaluation and implications of future changes over the US Midwest*, Hydrology and Earth System Sciences, 17, 4555-4575, DOI: 10.5194/hess-17-4555-2013.
4. Zhang N., Y. Hong, Q. Qin, **L. Liu** (2013), *VSDI: a visible and shortwave infrared drought index for monitoring soil and vegetation moisture based on optical remote sensing*. International Journal of Remote Sensing 34(13): 4585-4609. DOI:10.1080/01431161.2013.779046.
3. **Liu L.**, Y. Hong, J. Looper, R. Riley, B. Yong, Z. Zhang, J. Hocker, M. Shafer (2012), *Climatological Drought Analyses and Projection using SPI and PDSI: A Case Study for Arkansas Red River Basin*. Journal of Hydrologic Engineering. DOI: 10.1061/(ASCE)HE.1943-5584.0000619.

2. Liu L., Y. Hong, J. E. Hocker, M. A. Shafer, C. N. Bednarczyk (2012), *Hydro-climatological Drought Analyses and Projection using Meteorological and Hydrological Drought Indices: A Case Study in Blue River Basin, Oklahoma*, Water Resources Management. DOI: 10.1007/S11269-012-0044-y.

1. Liu L., Y. Hong, E. J. Hocker, M. A. Shafer, L. M. Carter, J. J. Gourley, C. N. Bednarczyk, P. Adhikari (2012), *Analyzing Projected Changes and Trends of Temperature and Precipitation in the Southern U.S. from 16 Downscaled Global Climate Models under Different Emission Scenarios*, Theoretical and Applied Climatology. DOI:10.1007/s00704-011-0567-9.

INVITED TALKS

- Liu L. (2021), *Tackling the challenges at the interface of water, energy, and climate systems from a modeling perspective*, October 15, 2021, University of the Chinese Academy of Science (virtual).
- Liu L. (2021), *Urban water system of the future: a road to sustainability and resilience*, January 15, 2021, Stanford University (virtual)
- Liu L. (2019), *Vision for urban water system of the future*, August 15, 2019, Strategic Asset Management Symposium, Houston, TX.
- Liu L. (2019), *Characterization of water-energy nexus with systems analysis approach*, February 15, 2019, Rice University, Houston, TX.
- Liu L. (2019), *Water-Energy nexus and environmental sustainability*, January 18, 2019, University of Houston, Houston, TX.
- Liu L. (2018), *Alternative water supply from wastewater reuse for the City of Houston*, June 18, 2018, Tsinghua University, Beijing, China.
- Liu L. (2016), *Global assessment of exploitable surface reservoir storage under climate change*. December 12-16, 2016, AGU Fall Meeting, San Francisco, CA.
- Liu L. (2016), *Water-Energy-Climate Nexus: Climate change impacts on thermoelectricity generation in the United States*, January 6, 2016, Tsinghua University, Beijing, China.

TEACHING EXPERIENCE

- Developed and taught CE574X “*Integrated Assessment Modeling and Science-Policy Integration for Global Environmental Change*” Iowa State University
Fall, 2021
- Co-lecturer for GCEE 6320 “*Global Climate: Physical Models*” University of Houston
Spring, 2021
- Guest lectured for CEE7397 “*Watershed Hydrology & Modeling*” University of Houston
Fall, 2020
- Co-mentored two M.S. students on Master’s thesis at Tsinghua University, China Rice University
2018 – 2020
- Guest lectured for CE597 “*Energy-Environment Nexus*” Penn State University
Spring, 2020
- Guest lectured for CEVE434 “*Fate and Transport of Contaminants in the Environment*” Rice University
Fall, 2019

- Guest lectured for CEVE101 “*Fundamentals of Civil and Environmental Engineering*” and CEVE307 “*Energy and the Environment*” Rice University
Spring, 2019
- Teaching Assistant for ENCE305 “*Fundamentals of Engineering Fluids*” University of Maryland
Spring, 2017
- Supervised two undergraduate students on capstone research University of Oklahoma
2011 – 2012
 - Produced two paper publications
- Guest lectured for CEES5020 “*Climate Change/Natural Hazards*” University of Oklahoma
Fall 2010

SERVICE

- Organized and hosted 2019 Chinese Environmental Scholars Forum with 180 attendees, Rice University, 2019.
- Contributed to STEM education in K-12 as LEAD E-Mentor for Elizabeth Seton High School, Maryland, 2018.
- Member of American Geophysical Union, 2013 – present.
- Peer reviewer for *Nature Sustainability* (number of paper reviewed: 2), *Nature Energy* (1), *Nature Communications* (2), *Environmental Research Letters* (22), *Journal of Applied Remote Sensing* (1), *International Journal of Remote Sensing* (1), *Civil Engineering and Environmental Systems* (1), *Environmental Science & Technology* (2), and *Climatic Change* (2), *Journal of Water Resources Planning and Management* (2), *Journal of Integrative Environmental Sciences* (1), 2014 – present.
- Designed and hosted workshops for K-12 STEM teachers under the Creating Critical Connections in Math and Science (C3MS) program, University of Oklahoma, 2011.

AWARDS

Future Faculty Fellow

Rice University 2019

Selected by the George R. Brown College of Engineering to participate in the Future Faculty Fellows program for pursuit of academic careers.

CEE Student Spotlight

University of Maryland 2017

Graduate advisor-nominated and faculty-approved recognition throughout the department for outstanding achievement in graduate research and charitable service during the program.

Outstanding Graduate Assistant Award

University of Maryland, Department of Civil and Environmental Engineering 2016

Department-nominated and faculty-approved recognition throughout the university for outstanding achievement in graduate research and community service during pursuit of a graduate degree.

IIASA Young Scientist Summer Program Annual Fund Award

International Institute for Applied Systems Analysis 2016

Selected from 200+ applicants worldwide to participate in the three-month summer program at IIASA in Austria to conduct research on global water-energy nexus. Research findings published on *Environmental Research Letters*.

Engineering Deans Honor Roll

University of Oklahoma 2009 – 2010

GPA-based recognition throughout the School of Engineering for outstanding achievement in graduate research and curriculum work.

Outstanding Senior in Environmental Science

University of Oklahoma 2010

Faculty-nominated and department-approved recognition throughout the university for outstanding performance in undergraduate study. Honored at university-wide graduation commencement.

John & Dolores Owensby Family Scholarship & Guy Bradford Treat Memorial Scholarship

University of Oklahoma 2009

Honored for outstanding performance and individual achievement in undergraduate study.

Undergraduate Research Opportunity Program Award

University of Oklahoma 2009

Awarded \$400 to conduct research on solar power potential under the supervision of a faculty member in the Department of Civil Engineering and Environmental Science.

Academic Scholarship

Beijing Normal University 2007

Awarded ~\$150 for outstanding academic performance and being ranked top 5% of the class (~44 students).