

EDUCATION

MIT | Cambridge, MA

Ph.D. in Architecture:

Building Technology

2018 | GPA: 4.9/5.0

Thesis: International Comparative
Analysis of Urban Water Systems

M.S. in Architecture:

Building Technology

2011 | GPA: 4.8/5.0

Thesis: Modeling the Water Consumption
of Singapore Using System Dynamics

B.S. in Mechanical Engineering

2008 | GPA: 4.8/5.0

Concentration in Sustainability Science

COURSEWORK

GRADUATE

System Dynamics

Statistical Learning and Data Mining

Computational Science and Engineering

Time Series Analysis

Socioeconomic Impact Analysis

Infrastructure Economics

Finance

Risk and Decision Analysis

Engineering Systems Analysis

Spatial Analysis

Geographic Information Systems

Surface Hydrology

Water Resources Management

UNDERGRADUATE

Solid State Chemistry

Design and Manufacturing

Dynamics and Control

Measurement and Instrumentation

Mechanics of Materials

Product Engineering

Thermal Fluids Engineering

Desalination

Design for Development

Sustainability Science

LANGUAGES

English (native) • French • Chinese
(Mandarin) • Portuguese • Spanish

EXPERIENCE

MIT | Urban Metabolism Group | Research Assistant

June 2011 – January 2018 | Cambridge, MA

- Developed a new approach and open-source software (in R and Python) for systematic and quantitative analysis of sustainability of urban water systems.
- Identified a six-type typology by statistical clustering of 142 international cases.
- Selected two cases studies, Los Angeles and Singapore, from the typology and compared using ANOVA, time-series, and spatial analysis, yielding policy insight.

IBM | Graduate Research Intern

May – August 2013 | Nairobi, Kenya

Completed three projects at the Nairobi Research Lab before its opening in Fall 2013 (whereas other intern groups completed only one of three projects):

- Created a Monte Carlo model of water demand and simulated future water stress in Nairobi under uncertain precipitation and population growth.
- Led user interface and system architecture design of a mobile app for FlashCast, a local mobile advertising business.
- Led design and implementation of a \$150 prototype weather station (1/10 the cost of commercial products) and led a week-long STEM workshop for high-school students to explore the use of home-grown hardware in education markets.
- Initiated relationships with the national Kenyan water ministry and iHub, a technology incubator.

MIT | Urban Metabolism Group | Research Assistant

September 2009 – May 2011 | Cambridge, MA

- Developed a new integrated decision model, in both Vensim and Excel, of urban water demand, supply, infrastructure efficiency, and water tariffs for simulating future revenues under uncertain economic growth, population growth, demand, energy costs, and new technology.
- The model well-approximated 60 years of historical behavior in Singapore and highlighted areas of policy resistance.
- Compared the costs and benefits of conservation policies and different types of new infrastructure, including reservoirs, water recycling, and desalination.

HARVARD + MIT | Picturing to Learn | Research Assistant

July 2005 – December 2008 | Cambridge, MA

- Seeded the idea for a collaborative Harvard/MIT study of drawing and visualization in university science courses from a research project on polymer electrolyte composition in thin-film lithium ion batteries.
- Designed and implemented the pilot study of 500 students in a solid-state chemistry course at MIT, whose results led to \$600,000 in NSF grants.
- Supervised other student researchers in data collection.
- Co-designed the database for multimedia collected from twelve courses, collaborating with a software engineer.

PROGRAMMING/SOFTWARE SKILLS

R • Python • \LaTeX • ArcGIS/GRASS GIS/QGIS • HTML/CSS/Markdown • SQL • Vensim • Matlab • GAMS • PowerPoint • Word • Excel • Photoshop • Illustrator

LEADERSHIP

NSF | RCN Sustainable Cities | Student Workshop Organizer

Spring 2014 | Phoenix, AZ

- Created and organized an interdisciplinary workshop for graduate students from ten institutions.

MIT | Sustainability Summit | Panel Organizer

2014 | Cambridge, MA

- Organized panel on infrastructure financing and urban resilience for hundreds of researchers and practitioners.

Sub-Saharan Africa Bicycle Tour | Co-organizer

Spring 2009 | Africa

- Co-organized a bicycle tour across Africa, cycling 3,600 miles through South Africa, Botswana, Zambia, Malawi, and Tanzania.

MIT | Urban Recycling Club, Bexley Hall | Co-Organizer

2006 – 2008 | Cambridge, MA

- Co-organizer of an informal MIT group for those interested in exploring waste streams.
- Collected used cooking oil from local restaurants to fuel a Ford F-250 truck to take participants to harvest edible food from dumpsters at various supermarkets in Middlesex County.
- Proceeds were distributed to residents at the dormitory and Food Not Bombs.

MIT | 2.009: The Product Engineering Process | Team Integrator

Fall 2007 | Cambridge, MA

- Led a team of 16 mechanical engineering students in the senior capstone project.
- Developed a bicycle-powered nut grinder for small-business owners in Ghana.
- Responsibilities included defining project goals, organizing tasks and deliverables, managing communication, and representing our team to stakeholders and course staff

Continental United States Bicycle Tour | Co-organizer

Summer 2007 | North America

- Co-organized a bicycle tour across North America, cycling 3,700 miles across thirteen states: Oregon, Washington, Idaho, Montana, South Dakota, Iowa, Illinois, Indiana, Ohio, Pennsylvania, Maryland, West Virginia, and Virginia.

MIT | Women's Independent Living Group | Various positions

2004 – 2007 | Cambridge, MA

- House manager, membership coordinator, food steward, and computer chair at various times for 40-member living group.

PUBLICATIONS

- [1] Karen Noiva, John E. Fernández, and James L. Wescoat. "Cluster Analysis of Urban Water Supply and Demand: Toward Large-Scale Comparative Sustainability Planning". In: *Sustainable Cities and Society* 27 (2016), pp. 484–496.
- [2] Karen Marie Noiva. "International Comparative Analysis of Urban Water Systems". Ph.D. thesis. MIT, 2017.
- [3] Karen Noiva Welling. "Modeling the Water Consumption of Singapore Using System Dynamics". S.M. thesis. MIT, 2011.
- [4] Matthias Wörlen, Bettina Wanschura, Herbert Dreiseitl, Manfred Moldaschi, James L. Wescoat, Jr., and Karen Noiva. *Strengthening Blue-Green in Our Cities: Enhancing Blue-Green and Social Performance in High Density Urban Environments: Final Report*. Rambøll Foundation, 2016.

COMMUNITY SERVICE

2012 – 2014	MIT	Graduate Women's Group	Mentored undergraduate and graduate women
2011 – 2013	MIT	IDEAS Global Challenge	Mentored teams on innovation for rapidly developing markets
Spring 2008	MIT	2.007	Mentored mechanical engineering undergraduates on design and engineering for the annual robot competition
2004 – 2007	MIT	Medlinks	First-responder and student health liaison