

FINAL PROGRAM



ENGINEERING SUSTAINABILITY 2015

APRIL 19-21, 2015

**INNOVATION AND THE
TRIPLE BOTTOM LINE**

**DAVID L. LAWRENCE CONVENTION CENTER
PITTSBURGH, PA**

UNIVERSITY OF PITTSBURGH

Mascaro Center
for Sustainable Innovation

Carnegie Mellon University
STEINBRENNER INSTITUTE
for Environmental Education & Research



WELCOME TO PITTSBURGH!

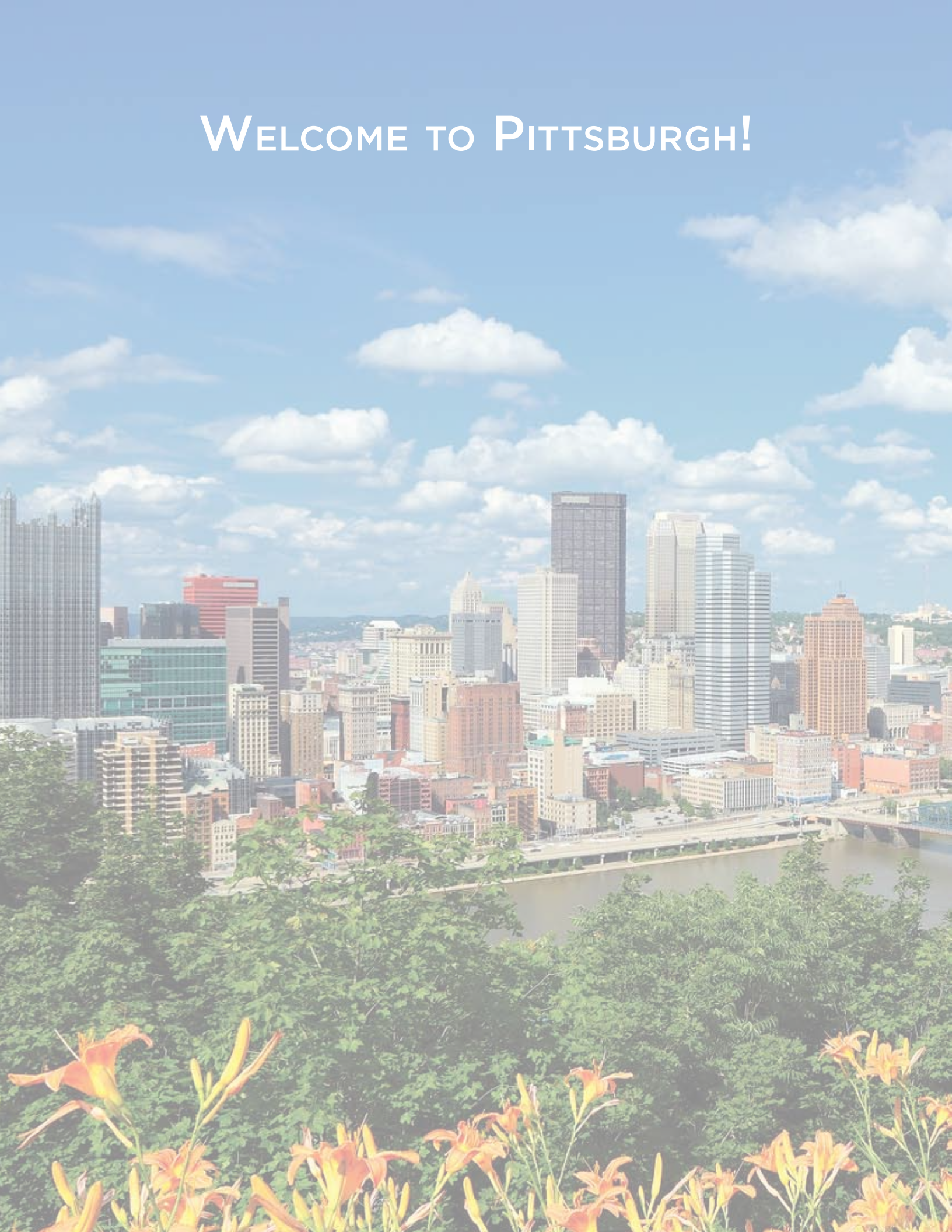




TABLE OF CONTENTS

Conference Guest Information.....	4
Letter from the Chairs.....	5
Plenary Sessions.....	6
Invited Speakers.....	8
Agenda at-a-Glance.....	10
Oral Presentations.....	11
Poster Presentations.....	16
Map of David L. Lawrence Convention Center.....	18
Conference Sponsors.....	Back Cover

UNIVERSITY OF PITTSBURGH

Mascaro Center for Sustainable Innovation

The Mascaro Center for Sustainable Innovation (MCSI) is a center of excellence in sustainable engineering, focusing specifically on the design of sustainable neighborhoods. The Mascaro Center was created to encourage and nurture new collaborative projects based on strong and innovative research, helping to translate the fundamental science of sustainability into real products and processes. Research conducted under the auspices of the Mascaro Center included projects on greening the built environment, the more sustainable use of water, and the design of distributed power systems.

www.engineeringx.pitt.edu/mcsi



The Steinbrenner Institute for Environmental Education and Research champions Carnegie Mellon University's commitment to making a difference in the way the world thinks and acts about the environment. The Steinbrenner Institute supports and facilitates interdisciplinary research and education activities at Carnegie Mellon, including bringing together faculty and students associated with 20 environmentally related research centers on campus to collaborate and pursue new initiatives. Environmental research at Carnegie Mellon focuses on two principal themes within the framework of transitioning to an environmentally sustainable society: (1) urban infrastructure and sustainable cities, and (2) energy transition strategies and the environment.

www.cmu.edu/steinbrenner

CONFERENCE GUEST INFORMATION

Registration Hours & Locations

Monday, 7:30 a.m. - 4:30 p.m.

4th Floor, David L. Lawrence Convention Center (DLLCC)

Tuesday, 8:00 a.m. - Noon

Speaker Ready Room

Room 411

There will be a computer and printer available during the conference for speakers to check their presentation and make small changes if necessary.

Monday, 7:30 a.m. - 4:30 p.m.

Tuesday, 7:30 a.m. - 3:00 p.m.

Poster Room

Room 411

All posters are to be delivered to the Poster Room by noon on Monday. Posters can be picked up in the same room on Tuesday from 8:00 a.m. - 3:00 p.m.

Badge Information

Please wear your ES 2015 name badges at all times. Not only is the badge your passport to all conference activities, but it also lists several important local phone numbers on the back. You may be denied access to educational sessions and events if you are not wearing your badge.

Transportation Information

Checker Cab: 412-381-5600

Yellow Cab: 412-321-8100

Super Shuttle runs from the Pittsburgh International Airport to the many downtown hotels. Reservations are not required but are encouraged. Pickup is located on the baggage claim level, in the rental car area, behind the elevators by Door 4. More information and advance reservations are available at:

www.supershuttle.com

The Airport Flyer bus (Port Authority of Allegheny County bus 28X) boards just outside the main terminal, Door 6. The cost is \$3.75 one-way to downtown Pittsburgh. For more information visit: www.portauthority.org/

Cell Phone Usage

As a courtesy to the speakers and fellow attendees, the ES 2015 staff requests that all cell phones and pagers be turned off or switched to silent mode in all presentation rooms.

Wi-Fi

Free wi-fi is available in the 4th floor registration area for all conference registrants for up to 30 minutes each day. Individual attendees can purchase extended basic wi-fi services for \$12.95/day.



Conference Evaluation

To eliminate paper waste, this year's conference evaluation can be found at

www.surveymonkey.com/s/es15conference.

Please go on-line to provide us with feedback on all aspects of the event including plenary/technical sessions, location and amenities. The evaluation survey will be available through April 27th.

Registration Lists

ES15 will not print paper copies of the registration list for each attendee; however, attendees may view a hard copy report at the registration desk. Additionally, attendees may download an electronic copy in PDF format in our speaker ready room (411) at no cost. Registrations received prior to April 13, 2015, will appear in the ES 2015 Registration List. The complete registration list, with an addendum, will be made available online and will include those attendees who registered after April 13, 2015, as well as on-site during the conference. Please visit the ES 2015 Web site (www.engineeringx.pitt.edu/MCSI/conference) following the conference to view the final, complete list.

Continuing Education Credits

Individuals who require certificates documenting their participation in ES 2015 for the Green Building Certification Institute (GBCI) or other continuing education purposes (e.g., professional engineer or geologist) should pick up a form at the registration desk to verify their session attendance. **If individuals provide their GBCI#, GBA will automatically report GBCI CEUs.** All conference sessions have been submitted to the U.S. Green Building Council for approval and are expected yield up to 14 GBCI continuing education credit hours.

Sponsored by Green Building Alliance





Eric J. Beckman

Faculty Director, Mascaro Center for Sustainable Innovation
University of Pittsburgh



Neil Donahue

Faculty Director, Steinbrenner Institute
Carnegie Mellon University

First, let us take this opportunity to welcome you all to Pittsburgh and Engineering Sustainability (ES) 2015: Innovation and the Triple Bottom Line.

We hope you not only have a rewarding conference experience, but also that you have the opportunity to take advantage of the many amenities that our city has to offer. Our conference has been designed to showcase cutting-edge science and engineering that focuses on greening the built environment, the sustainable use of water and energy, and sustainable transportation. Progress in these areas will require innovations from professionals in a variety of disciplines, and we are grateful to have scientific contributions from researchers in fields ranging from engineering to architecture to urban planning to the sciences. Designing more sustainable technologies and systems for the built environment is vital to the creation of sustainable global economies, hence our desire to showcase innovation in these areas.

We have arranged the program as a series of topical sessions, allowing you to focus your attention on a specific area or sample from a variety of topics. Each day will also include plenary speakers and interdisciplinary panels who will integrate, synthesize, and help us all look ahead.

This program contains comprehensive information about ES 2015, but if you have questions or need help, please visit the registration area or ask any of the ES 2015 volunteers. If we can do anything to make your time in Pittsburgh more enjoyable and productive, please let us know.



PLENARY SESSIONS

Monday – 8:30 a.m.

Christopher Flavin

Senior Fellow and President Emeritus of the Worldwatch Institute

“Building a Sustainable Future: The Road to Low Carbon Energy”



Christopher Flavin is a Senior Fellow and President Emeritus of the Worldwatch Institute. He previously served as Vice President for Research and President.

Flavin is a well-known expert on strategies for transforming energy systems to reduce dependence on fossil fuels and power a low-carbon future. He advises governments, businesses, and international financial institutions, and lectures widely around the world.

Mr. Flavin has authored three books: *Power Surge: Guide to the Coming Energy Revolution*, *Running on Empty: the Future of the Automobile*, and *Renewable Energy: the Power to Choose*. He has also published scores of articles for popular and scholarly publications.

He is a founding member of the Board of Directors of the Business Council for Sustainable Energy and serves on the Advisory Boards of the American Council on Renewable Energy and the Environmental and Energy Study Institute. He has a *cum laude* degree in economics and biology from Williams College.



The Heinz Distinguished Lectureship is sponsored by the Heinz Endowments for the establishment of a Green Construction and Sustainable Development Program at the University of Pittsburgh. The lectureship is an annual event that aims to bring to the University innovative, thought provoking, and forward-looking concepts appropriate for sustainable infrastructure development. This year’s lecture is being presented in conjunction with Engineering Sustainability 2015.

Monday – 12:30 p.m.

Shahzeen Attari

Assistant Professor, School of Public and Environmental Affairs, Indiana University

“Water Use: Effective Actions, Perceptions and System Thinking”

Shahzeen Attari is currently an assistant professor at the School of Public and Environmental Affairs (SPEA) at Indiana University, Bloomington. She is an Adjunct Research Scientist at the Earth Institute at Columbia University.

Her research focuses on the interactions between natural and social systems, particularly human behavior and climate change. Her previous work investigated preferences for behavior change and perceptions of energy

consumption. Her current work investigates effects of real-time energy feedback, how to use games for research and learning, and factors that motivate action in social dilemmas.

Previously, she was a postdoctoral fellow at The Earth Institute and CRED at Columbia University. She holds a PhD in Civil and Environmental Engineering and Engineering and Public Policy from Carnegie Mellon University. She holds a Bachelors of Science in Engineering Physics from The University of Illinois at Urbana-Champaign.



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Tuesday – 8:30 a.m.

Richard Luthy

Silas H. Palmer Professor in the Department of Civil and Environmental Engineering at Stanford University

Senior Fellow in the Woods Institute for the Environment

“Re-Inventing Urban Water Supplies in the Arid West”



Dick Luthy is the Silas H. Palmer Professor in the Department of Civil and Environmental Engineering at Stanford University, and Senior Fellow in the Woods Institute for the Environment. His area of teaching and research is environmental engineering and water quality. He is the Director of the National Science Foundation’s Engineering Research Center for re-inventing the nation’s urban water infrastructure (renewit.org) that promotes new strategies for urban water systems to achieve more sustainable solutions to urban water challenges – especially in regions experiencing chronic water shortages and vulnerabilities to cycles of very low precipitation like the American west and southwest. In related work, his research investigates cost-effective and natural approaches for sediment restoration.

Professor Luthy is a past chair of the National Research Council’s Water Science and Technology Board and he has served on various NRC committees. He is a former President of the Association of Environmental Engineering and Science Professors. He is a member of the National Academy of Engineering, a registered professional engineer, a board certified environmental engineer, and Water Environment Federation Fellow.

Tuesday – 12:30 p.m.

Joylette Portlock

President of Communitopia

“Communicating Climate Change with Humor”

Dr. Joylette Portlock is the President of Communitopia, a nonprofit based in Pittsburgh that focuses on climate change communication. There, she stars in a series of funny, short web videos on climate change targeted to the general public, called “Don’t Just Sit There – Do Something!” Dr. Portlock studied biology at M.I.T. and completed a PhD in genetics from Stanford University in 2006; she now works to give the public important scientific information it can use. She has worked on environmental issues at the local, state, and federal level, and has been focused on global climate change since 2007. Dr. Portlock is a HuffPost blogger and also currently serves on the Allegheny County Board of Health.



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INVITED SPEAKERS

JOULE BERGERSON

University of Calgary

“Energy Systems Sustainability Analysis”

Joule Bergerson is an Assistant Professor in the Chemical and Petroleum Engineering Department and the Centre for Environmental Engineering Research and Education in the Schulich School of Engineering at the University of Calgary. Bergerson’s primary research interests are systems-level analysis for policy and decision making of energy system investment and management. The focus of her work is developing tools and frameworks for the assessment of prospective technology options and their policy implications from a life cycle perspective. To date, her work has addressed fossil fuel derived electricity, oil sands development, carbon capture and storage renewable energy and energy storage technologies. Project researchers on Bergerson’s team work with scientists, engineers and members of the business community who are developing new energy technologies, to develop and refine techniques for prospective life cycle assessment. These techniques help prioritize research and development activities, by identifying technologies – or optimal combinations of technologies – that would provide particularly large life cycle benefits.

MATTHEW ECKELMAN

Northeastern University

“Non-energy Benefits of Residential Energy Efficiency Measures”

Matthew Eckelman is an Assistant Professor at Northeastern University in Civil and Environmental Engineering, with a secondary appointment in Chemical Engineering. His research interests include life cycle assessment, green engineering and construction, and sustainability of urban infrastructure. Dr. Eckelman consults regularly on sustainability-related projects with a range of businesses, non-profit institutions, and government agencies, and has served on panels at the National Academies and the National Institute for Standards and Technology on sustainable construction and manufacturing issues. He was a co-recipient of the Laudise Prize in Industrial Ecology in 2013 and awarded an NSF CAREER award in environmental sustainability in 2015. He holds a BA in Physics and Mathematics from Amherst College and a doctorate in Chemical and Environmental Engineering from Yale, where he was affiliated with the Center for Industrial Ecology and the Center for Green Chemistry and Engineering.

SHELIE MILLER

University of Michigan

“A Proactive Approach to Manage Unintended Consequences of Emerging Technologies”

Shelie Miller is an Associate Professor at the Center for Sustainable Systems at the University of Michigan, in the School of Natural Resources and Environment. An environmental engineer by training, her research interests focus on scenario modeling and life cycle assessment (LCA) of emerging technologies. Her research group works on developing methods to produce dynamic LCAs, in an effort to understand and mitigate potential unintended consequences at early stages of the design process. Current research focuses on bioenergy production and electrification patterns in developing countries. She is particularly interested in evaluating tradeoffs that arise in new technologies and using multi-criteria decision analysis to help guide decision making. Prior to joining the University of Michigan, she was on the faculty of the Environmental Engineering and Earth Sciences department at Clemson University. Dr. Miller is a recipient of the Presidential Early Career Award for Scientists and Engineers (PECASE) and was a 2013 National Academy of Sciences Kavli Frontiers Fellow.

SALLY NG

Georgia Institute of Technology

“Air Quality and Health: Does “Particulate Matter” Matter?”

Dr. Nga Lee “Sally” Ng is an assistant professor in the School of Chemical & Biomolecular Engineering and the School of Earth & Atmospheric Sciences at the Georgia Institute of Technology. She received her doctorate in Chemical Engineering from the California Institute of Technology. Prior to joining Georgia Tech, Dr. Ng was a postdoctoral scholar and subsequently a senior researcher at Aerodyne Research, Inc. Dr. Ng’s research focuses on the fundamental understanding of the underlying chemical mechanisms of aerosol formation and composition, as well as the health effects of aerosols. Her group uses a synergistic approach in studying aerosols by performing both laboratory chamber experiments and ambient field measurements using advanced mass spectrometry techniques. Dr. Ng serves as a co-editor of *Atmospheric Chemistry and Physics*. Dr. Ng also serves as a member of the Awards Committee and the Atmospheric Aerosols Working Group Chair for the American Association for Aerosol Research (AAAR). Dr. Ng has received the Sheldon K. Friedlander Award, the EPA Early Career Award, and the Health Effects Institute Walter A. Rosenblith New Investigator Award.

KRISTEN PARRISH

Arizona State University

“Small Buildings, Big Impacts: Promoting Energy Efficiency in Small Commercial Buildings Through 2030 Districts”

Kristen Parrish is an Assistant Professor in the School of Sustainable Engineering and the Built Environment at Arizona State University (ASU). Kristen’s work focuses on integrating energy efficiency measures into building design, construction, and operations processes. Specifically, she is interested in novel design processes that financially and technically facilitate energy-efficient buildings. Her work also explores how principles of lean manufacturing facilitate energy-efficiency in the commercial building industry. Another research interest of Kristen’s is engineering education, where she explores how project- and experience-based learning foster better understanding of engineering and management principles. Prior to joining ASU, Kristen was at the Lawrence Berkeley National Laboratory (LBNL) as a Postdoctoral Fellow (2009-11) and then a Scientific Engineering Associate (2011-2012) in the Building Technologies and Urban Systems Department. She worked in the Commercial Buildings group, developing energy efficiency programs and researching technical and non-technical barriers to energy efficiency in the buildings industry. She has a background in collaborative design and integrated project delivery. She holds a BS and MS in Civil Engineering from the University of Michigan and a PhD in Civil Engineering Systems from University of California Berkeley.

JORDAN PECCIA

Yale University

“Engineering Healthy Buildings”

Jordan Peccia is an Associate Professor of environmental engineering at Yale University, the director of Yale environmental engineering’s undergraduate studies, and the faculty advisor for Yale Engineers Without Borders. He is an associate editor for the journal *Indoor Air*, and is the 2014 chair of the Indoor Aerosols and Aerosol Exposure working group for the American Association for Aerosol Research. Research in the Peccia lab integrates microbiology with engineering to address important contemporary environmental problems. Principle areas of research include the following: (i) human exposure to bacterial and viral pathogens emitted during the land application of sewage sludge, (ii) the sources of and human exposure to bacteria and fungi in the indoor environment, and (iii) genome-wide gene expression investigations for improving biofuel feedstock production rates in photosynthetic microorganisms. He holds degrees in mechanical engineering (BS) and environmental engineering (MS) from Montana State University, and received his PhD in Environmental Engineering from the University of Colorado in the year 2000.

MIKE STENSTROM

UCLA

“Sustainable H₂O Supplies: Options for Better Stormwater Management”

Michael K. Stenstrom is a Distinguished Professor in the Civil and Environmental Engineering Department at the University of California, Los Angeles. He has a PhD in Environmental Systems Engineering from Clemson University and is a registered professional engineer in California. He has been with UCLA since 1977 in the capacity of assistant, associate and professor, in addition to several university administrative assignments, including Chair of the Civil and Environmental Engineering Department. He teaches undergraduate and graduate courses in water and wastewater treatment and has performed research in several areas of environmental engineering. He has won several awards including the Harrison Prescott Eddy Prize for innovative research (Water Environment Federation, 1992, 2014), the Walter L. Huber Award (ASCE), the Best Dissertation Award (Association of Environmental Engineering and Science Professors), the Dow Environmental Care Award, the Los Angeles Basin Section (California WEF) Research Award, and research innovation awards from the Los Angeles Regional Water Quality Control Board. He recently received the AEESP’s Fredrick George Pohland Medal for sustained and outstanding efforts to bridge environmental engineering research practice and education. Recently Professor Stenstrom has been working on stormwater management and best management practices for stormwater in highly urbanized environments such as Los Angeles.

ASHLYNN STILLWELL

University of Illinois

“Water, Energy, and a Sustainable Future: An Interdisciplinary Approach”

Dr. Ashlynn Stillwell is an Assistant Professor in Civil and Environmental Engineering at the University of Illinois at Urbana-Champaign. She earned a B.S. in Chemical Engineering from the University of Missouri (2006), and an M.S. in Environmental and Water Resources Engineering (2010), M.P.Aff in Public Affairs (2010), and PhD in Civil Engineering (2013) from The University of Texas at Austin. Her previous work experience includes consulting engineering at Burns & McDonnell (2006-2007) and policy research at the Congressional Research Service (2009). Dr. Stillwell received the National Science Foundation Graduate Research Fellowship and the American Water Works Association’s 2011 Academic Achievement Award for 2nd Place Master’s Thesis. Her research interests include the water impacts of thermoelectric power plants and the energy-water nexus pertaining to urban metabolism and public policy. More information about Dr. Stillwell’s research program is available at stillwell.cee.illinois.edu.

AGENDA AT-A-GLANCE

Sunday, April 19

5:30 p.m. **WELCOME RECEPTION** Tonic Bar and Grill

Monday, April 20

7:30 a.m. **REGISTRATION OPENS**
David L. Lawrence Convention Center (DLCC),
Fourth Floor

8:30 – 9:30 a.m. **Opening Plenary** (Room 407)

Conference Welcome
Eric J. Beckman, *Conference Chair*

*“Building a Sustainable Future: The Road to
Low Carbon Energy”*
Chris Flavin, *Senior Fellow and President
Emeritus of Worldwatch Institute*

9:30 – 9:45 a.m. **BREAK**

9:45 – 11:25 a.m. **TECHNICAL SESSIONS**
Potable Water (Room 408)
Air Quality (Room 409)
Renewable Energy (Room 410)

11:30- 12:30 p.m. **INVITED SESSION**
Sustainable Places (Room 408)
Sustainable Energy (Room 409)

12:30 – 1:30 p.m. **LUNCH** (Rooms 413-415)
*“Water Use: Effective Actions, Perceptions and
System Thinking”*
Shahzeen Attari, *Indiana University*

1:45 – 3:25 p.m. **TECHNICAL SESSIONS**
Stormwater and Water Treatment (Room 408)
Green Building Design and Construction
(Room 409)
Sustainable Transportation (Room 410)

3:30-4:30 p.m. **PANEL DISCUSSION** (Room 407)
*“Regional Climate Change and Sustainable
Infrastructure Adaptation”*

4:30- 6:00 p.m. **POSTER SESSION and SOCIAL**
(Room Garrison Overlook)

Tuesday, April 21

8:00 a.m. **REGISTRATION OPENS** (DLCC fourth floor)

8:30 – 9:20 a.m. **PLENARY SESSION** (Room 407)
*“Re-Inventing Urban Water Supplies in the
Arid West”*
Richard Luthy, *Stanford University*

9:30 – 10:30 a.m. **INVITED SESSIONS**
Sustainable Places (Room 408)
Sustainable Energy (Room 409)

10:30-10:45 a.m. **BREAK**

10:45-12:25 p.m. **TECHNICAL SESSIONS**
Sustainable Water (Room 408)
Innovation and Economic Development
(Room 409)
Energy and the Built Environment (Room 410)

12:30 – 1:20 p.m. **LUNCH** (Rooms 413-415)
“Communicating Climate Change with Humor”
Joylette Portlock, *Communiopia*

1:30 – 3:10 p.m. **TECHNICAL SESSIONS**
Water Availability and Use (Room 408)
Products, Systems and Innovation (Room 409)
Energy and the Built Environment (Room 410)



ORAL PRESENTATIONS

Monday, April 20 | 8:30 a.m. - 6:00 p.m.



OPENING PLENARY (8:30 - 9:30 a.m.) | Room 407

8:30 a.m. **Chris Flavin**
Worldwatch
Building a Sustainable Future: The Road to Low Carbon Energy

Coffee Break (9:30 - 9:45)

CONCURRENT I: POTABLE WATER (9:45 - 11:25) | Room 408

9:45 a.m. **Isaac Smith**
Green Building Alliance
Pittsburgh 2030 District: Water Baseline

10:10 a.m. **Sherri Cook**
University of Colorado at Boulder
A Comparison of Life Cycle Cost and Environmental Emissions of Conventional and Innovative Technologies for Small Water Systems

10:35 a.m. **Margaret Carneal**
Virginia Tech
WaterSense Home Label Progress: Lessons from Energy Star and LEED

11:00 a.m. **Noah Shaltes**
P. J. Dick Incorporated
Out of Sight and Under Spotlight: Strategic Management of Pittsburgh's Water

CONCURRENT I: AIR QUALITY (9:45 - 11:25) | Room 409

9:45 a.m. **Brent Stephens**
Illinois Institute of Technology
The Potential Impacts of Climate Change on Indoor Air Quality and Health

10:10 a.m. **Wing Tuet**
Georgia Tech
Oxidative Properties of Particulate Matter Mixtures

10:35 a.m. **Azizan Aziz**
Carnegie Mellon University
Building Data Analytics: Energy and Indoor Environmental Quality

11:00 a.m. **Lu Xu**
Georgia Tech
Effects of Anthropogenic Emissions on Aerosol Formation from Isoprene and Monoterpenes in the Southeastern United States

CONCURRENT I: RENEWABLE ENERGY (9:45 - 11:25) Room 410

9:45 a.m. **John Vernacchia**
Eaton
Utility Scale Solar PV and Energy Storage Systems

10:10 a.m. **Rami Haddad**
Georgia Southern University
A Technical and Economical Study of Implementing a Micro-grid System at an Educational Institution

10:35 a.m. **Dmitry Liapitch**
Rochester Institute of Technology
Comparison Between a Horizontal and Vertical Axis Wind Turbine for Offshore Installations

11:00 a.m. **David Riley**
Penn State University
Immersive Renewable Energy Teaching and Research Laboratories

ORAL PRESENTATIONS (CONTINUED)

Monday (continued)

**:: INVITED SESSION: SUSTAINABLE PLACES (11:30 - 12:30)
Room 408**

11:30 a.m. **Kristin Parrish**
Arizona State University
**Small Buildings, Big Impacts: Promoting Energy Efficiency
in Small Commercial Buildings Through 2030 Districts**

Noon **Matt Eckelman**
Northeastern University
**Non-energy Benefits of Residential Energy
Efficiency Measures**

**:: INVITED SESSION: SUSTAINABLE ENERGY (11:30 - 12:30)
Room 409**

11:30 a.m. **Joule Bergerson**
University of Calgary
Energy Systems Sustainability Analysis

Noon **Shelie Miller**
University of Michigan
**A Proactive Approach to Manage Unintended Consequences
of Emerging Technologies**

LUNCH PLENARY (12:30 - 1:30) | Rooms 413 - 415

12:30 p.m. **Shahzeen Attari**
Indiana University
**Water Use: Effective Actions, Perceptions and
System Thinking**

**CONCURRENT II: STORMWATER AND WATER TREATMENT
(1:45 - 3:25) | Room 408**

1:45 p.m. **Kyle Johnson**
Villanova University
**Leveraging Life Cycle Assessment in Next Generation
Infrastructure: A Sector-Level Case Study of Philadelphia's
Green Stormwater Infrastructure**

2:10 p.m. **Kaitlin Vacca**
AKRF
**Impact of Maintenance Considerations in Green
Stormwater Infrastructure Design - A Philadelphia
Stormwater Perspective**

2:35 p.m. **Sarah Strano**
Alcoa
**Alcoa's Natural Engineered Wastewater Treatment (NEWT™)
Technology Overview**

3:00 p.m. **Tom Batrone**
Hatch Mott MacDonald
**Using the Envision Rating System to Evaluate
the Sustainability Metrics of Green Stormwater
Infrastructure Design**

**CONCURRENT II: GREEN BUILDING DESIGN AND CONSTRUCTION
(1:45 - 3:25) | Room 409**

1:45 p.m. **Annie Pearce**
Virginia Tech
**Safety and Health in Green Buildings: An Occupational
Case Analysis and Rating System Evaluation**

2:10 p.m. **Somayeh Asadi**
Pennsylvania State University
**Development of Multiple Regression Model to Assess
Building Energy Consumption in Extreme Climate**

2:35 p.m. **Bhavna Sharma**
University of Cambridge
**Engineered Bamboo: Material Innovation for a Sustainable
Built Environment**

3:00 p.m. **Stella Osifo**
Morgan State University
**Sustainable Engineering and Landscape Design
Recommendations to Address Steam Leakage Issues
in the City of Baltimore**

INVITED



ORAL PRESENTATIONS (CONTINUED)

Monday (continued)

CONCURRENT II: SUSTAINABLE TRANSPORTATION (1:45 - 3:25) Room 410

- 1:45 p.m. **George Zaines**
University of Pittsburgh
Environmental Evaluation of Multistage Pyrolysis for Biofuel Production
- 2:10 p.m. **Tony Kerzmann**
Robert Morris University
Natural Gas Fueling Station Duopoly Simulation Using a Monte Carlo Algorithm
- 2:35 p.m. **Elizabeth Traut**
Carnegie Mellon University
Impacts of Land Use and Transit Availability on Potential Urban Greenhouse Gas Emissions Benefits of Electric Vehicles
- 3:00 p.m. **Kelsey Lantz**
Clemson University
Leveraging Big Data for Sustainable Transit in Emerging Economics

PANEL DISCUSSION (3:30 - 4:30) | Room 407

Regional Climate Change and Sustainable Infrastructure Adaptation

Moderator

David Dzombak, Hamerschlag University Professor and Head, Civil and Environmental Engineering, Carnegie Mellon University

Panelists

Peter Adams, Professor of Civil and Environmental Engineering, and Engineering and Public Policy, Carnegie Mellon University
Director, Center for Atmospheric Particle Studies

Barbara Carney, Project Manager, National Energy Technology Laboratory, U.S. Department of Energy

Richard Drum, Community Planner/Landscape Architect, U.S. Army Corps of Engineers

POSTER SESSION & SOCIAL (4:30 - 6:00) GARRISON OVERLOOK



Tuesday, April 21 | 8:30 a.m. - 3:10 p.m.



MORNING PLENARY (8:30 - 9:20) | Room 407

8:30 a.m. **Richard Luthy**
Stanford University
Re-Inventing Urban Water Supplies in the Arid West

**:: INVITED SESSION: SUSTAINABLE PLACES (9:30 - 10:30)
Room 408**

9:30 a.m. **Sally Ng**
Georgia Institute of Technology
Air Quality and Health: Does “Particulate Matter” Matter?

10:00 a.m. **Jordan Peccia**
Yale University
Engineering Healthy Buildings

**:: INVITED SESSION: SUSTAINABLE WATER (9:30 - 10:30)
Room 409**

9:30 a.m. **Mike Stenstrom**
UCLA
Sustainable H₂O Supplies: Options for Better Stormwater Management

10:00 a.m. **Ashlynn Stillwell**
University of Illinois
Water, Energy, and a Sustainable Future: An Interdisciplinary Approach

Coffee Break (10:30 - 10:45)

**CONCURRENT III: SUSTAINABLE WATER (10:45 - 12:25)
Room 408**

10:45 a.m. **Erik Coats**
University of Idaho
An Integrated Suite of Technologies to Enhance Nutrient Removal and Resource Recovery

11:10 a.m. **William Charles**
Mascaro Construction Company, LP
Cardinal Wuerl North Catholic High School: Improving Water Efficiency in a Fast-Growing Community

11:35 a.m. **Donald Newman**
Buchart Horn Inc.
Evaluation of Green Stormwater Infrastructure Under Borough of Etna’s Sustainable Master Plan for Combined Sewer Compliance

Noon **Catherine Barr**
Villanova University
Nutrient Export for a Green Roof in Comparison to Other Land Uses

CONCURRENT III: INNOVATION AND ECONOMIC DEVELOPMENT (10:45 - 12:25) | Room 409

10:45 a.m. **Jason Wirick**
Phipps Conservancy
Living Building Performance Measured and on Display: Energy, Water, and Indoor Air at Phipps Center for Sustainable Landscapes

11:10 a.m. **Thomas Macagno**
Chatham University
Evaluating Levels of Eco-innovation to Support Developing Sustainable Products

11:35 a.m. **Aurora Sharrard**
Green Building Alliance
Pittsburgh 2030 District: Downtown Transportation Baseline & Survey

Noon **Jeremy Snyder**
Buro Happold
The Tower at PNC Plaza: Building the Façade Through Integration and Analysis

CONCURRENT III: ENERGY AND THE BUILT ENVIRONMENT (10:45 - 12:25) | Room 410

10:45 a.m. **Rodolfo Valdes-Vasquez**
Colorado State University
The Perceived Value of Using BIM for Energy Simulation

11:10 a.m. **Patcharapit Promoppatum**
Carnegie Mellon University
Use of Phase Change Materials for the Energy Saving of HVAC Systems in Buildings

:: INVITED



ORAL PRESENTATIONS (CONTINUED)

Tuesday (continued)

11:35 a.m. **Honnie Leinartas**
Illinois Institute of Technology
Optimization of Cost-effective Whole House Retrofit Packages for Targeting 50% Annual Energy Use Reductions in Existing Chicagoland Homes

Noon **Michael Whiston**
University of Pittsburgh
Carbon Dioxide Emissions and Primary Energy Consumption from Operation of a Solid Oxide Fuel Cell Microturbine System



LUNCH PLENARY (12:30 - 1:20) | Rooms 413 - 415

12:30 p.m. **Joylette Portlock**
Communiopia
Communicating Climate Change with Humor

CONCURRENT IV: WATER AVAILABILITY AND USE (1:30 - 3:10) Room 408

1:30 p.m. **Bruk Berhanu**
The University of Texas at Austin
Technical Feasibility of Water Efficiency and Reuse Technologies as Demand-Side Strategies for Urban Water Management

1:55 p.m. **William Rhoads**
Virginia Tech
The Water Age Problem: Unintended Consequences of Water Conservation

2:20 p.m. **James Good**
Veolia North America
Making the Value of Water Case for Reuse

2:45 p.m. **James Hunter**
Morgan State University
LEED Building Case Study: Morgan State University's Center for the Built Environment and Infrastructure Studies

CONCURRENT IV: PRODUCTS, SYSTEMS AND INNOVATION (1:30 - 3:10) | Room 409

1:30 p.m. **Jennifer Mueller-Price**
Rose-Hulman Institute of Technology
What we Talk about when we Talk about Sustainability, Innovation, and Entrepreneurship

1:55 p.m. **Michael Carbajales-Dale**
Clemson University
Beyond GDP: National Accounting in the Age of Resource Depletion

2:20 p.m. **Sandeep Langar**
University of Southern Mississippi
Rainwater Harvesting Technologies and Strategies: Implementation by Designers Actively Utilizing Building Information Modeling (BIM)

CONCURRENT IV: ENERGY AND THE BUILT ENVIRONMENT (1:30 - 3:10) | Room 410

1:30 p.m. **Kevin Ketchman**
University of Pittsburgh
Energy Improvements and Small Commercial Buildings: The Overlooked Opportunity

1:55 p.m. **Fuju Wu**
Penn State University
Student Centered Home Energy Engagement Curriculum: the National Energy Leadership Corp (NELC)

2:20 p.m. **Syedmohammadhossein Hosseinian**
Texas A&M University
Optimal Planning of Energy Efficiency Programs with Paid-from-savings Financing Strategy

2:45 p.m. **Brock Glasgo**
Carnegie Mellon University
Understanding the Potential for Electricity Savings and Assessing Feasibility of a Transition Towards DC Powered Buildings Using Real Load Data



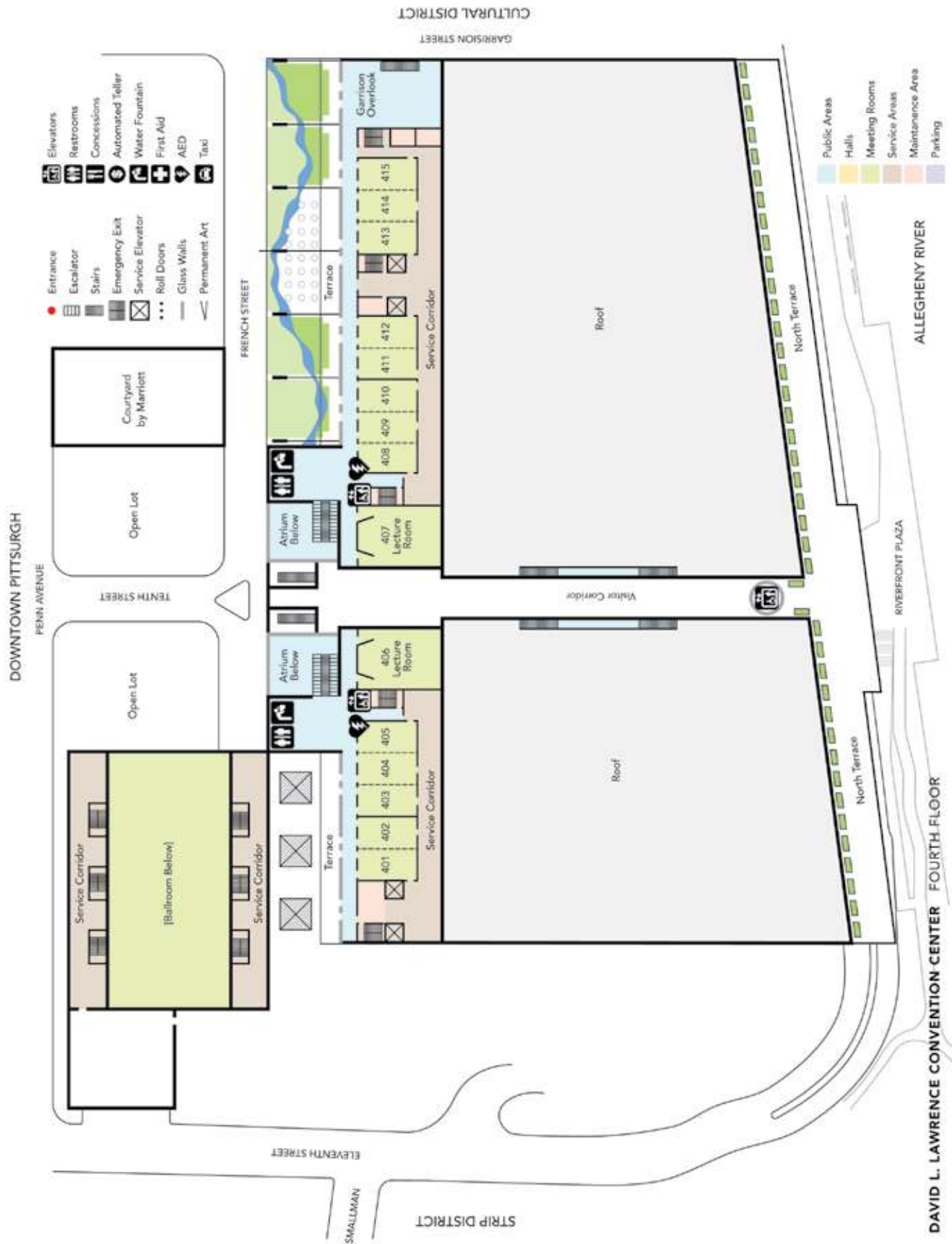
POSTER PRESENTATIONS

1.	Layla Saleh	Masdar Institute of Science and Technology	Towards Net-zero Carbon Buildings in UAE: Techno-economic Assessment of Options for Sustainable Energy Transition in Buildings
2.	Adib Amini	University of South Florida	Environmental Impact and Cost Assessment of Ion Exchange Drinking Water Treatment for Organics Removal
3.	Sara Abdollahi	Carnegie Mellon University	Water Withdrawal from Household Consumption in the United States
4.	Nicole Barclay	Clemson University	Investigating the Role of Community Participation in Design Decisions for Green Infrastructure
5.	Swaetha Jebackumar	Colorado State University	Identifying Metrics for Measuring Stakeholder Engagement in Net-Zero Energy Buildings
6.	Rami Haddad	Georgia Southern University	Feasibility/Environmental Analysis for a Photovoltaic Energy Systems for Commercial Buildings
7.	Joel Perkovich	Green Infrastructure Network	Revitalizing Neighborhoods and Water Quality with Green Infrastructure Design – Visions From the South Side Green Infrastructure Charrette
8.	Maryam Arbabzadeh	University of Michigan/ Center for Sustainable System	Design Principles for Green Energy Storage Systems
9.	Kellen Pastore	Villanova University	Low Cost Data Logging for Green Infrastructure
10.	Chelsea Mann	Arizona State University	Teaching Urban Sustainability Strategies Through Vertical Integration and Problem-based Learning
11.	Casey Canfield	Carnegie Mellon University	Using Deliberative Democracy to Identify Climate Change Policy Priorities
12.	Diana Chen	Clemson University	Gastropod Shells: Quantitative Biomimicry for Adaptable Structures
13.	Rami Haddad	Georgia Southern University	Solar Golf Carts – A Practical Approach to Sustainability Awareness
14.	Kara Peterman	Northeastern University	An Introduction to Thermal and Structural Response of Thermal Break Strategies in Steel Building Systems
15.	Naif Albelwi	University of Pittsburgh	Enhancing Urban Metabolism Framework: Moving beyond Accounting and Towards Strategy
16.	Mark Santana	University of South Florida	The Influence of Smart Growth on Drinking Water Embodied Energy in Tampa, Florida
17.	Ashley Neptune	Villanova University	Constructed Stormwater Wetlands: A Sustainable Green Infrastructure Solution
18.	Rebecca Ciez	Carnegie Mellon University	Optimizing Energy Storage: a Techno-economic Analysis for Hybrid Microgrid Systems
19.	Savannah Mozingo	Clemson University	Comparison of the Environmental Effects of Transportation in Istanbul and Lagos
20.	Somayeh Asadi	Pennsylvania State University	Climate Effect on Environmental Performance of Solar Shades Used for Residential Windows
21.	Shauhrat Chopra	University of Pittsburgh	Understanding Resilience of Metrorail Transit Systems in Polycentric Megacities: A Case Study of Delhi and London Metro Systems
22.	Katayoun Taghizadeh	University of Tehran	Designing a Mobile Facade as a Solution for Energy Saving
23.	Joseph Schadt	Villanova University	Load Capacity and Thermal Efficiency Optimization of a Research Data Center Using Computational Modeling
24.	Lauren Cook	Carnegie Mellon University	Integrating Climate Change Data and Uncertainty into Stormwater Infrastructure and Engineering Design Decisions
25.	Diana Chen	Clemson University	Enabling Adaptable Buildings: Strategies for Designers
26.	Candace Grogg	Robert Morris University	Development of K-12 Curriculum Based on Sustainability Concepts
27.	Stephanie Cortes	University of Pittsburgh	Case Study for Sustainable Building Modeling on a University Campus
28.	Damon Weiss	Enviro Social Capital	The Green Infrastructure Pay-for-Success Partnership: Private Investment for Public Benefit

POSTER PRESENTATIONS (CONTINUED)

29.	Pratik Doshi	Virginia Polytechnic Institute and State University	Multi-Criteria Decision Support Tool Skeleton (DSTS) For Water Heaters: Facilitating Selection Among Residential Sector Stakeholders
30.	Kelly Good	Carnegie Mellon University	Evaluation of Coal-fired Power Plant Bromide Discharges in the Allegheny River
31.	Emily Smail	Clemson University	The Pursuit of Happiness - and Sustainable Transportation
32.	Parham Azimi	Illinois Institute of Technology	The Impact of Residential Building Characteristics on Indoor Particles of Outdoor Origin in Three Types of Homes in Multiple Climates: Old Homes, Typical Existing Homes, and New Sustainably Built Homes
33.	Jessica Zielinski	The University of New Haven	UNH Stormwater Research – Green Infrastructure Adaptations to Intensifying Rainfall
34.	Jin Dai	University of Pittsburgh	Fabricating a Sustainable Electrode for Microbial Fuel Cells using Bamboo Charcoal and Polyaniline
35.	Benjamin Chambers	Virginia Tech	Green Building and the Brown Marmorated Stink Bug
36.	Kelly Klima	Carnegie Mellon University	What is the National Flood Insurance Program?
37.	Torkan Fazli	Illinois Institute of Technology	The Energy Consequences of Excess Static Pressure in Residential Heating and Air-conditioning Systems: Differences Between Existing and New Energy Efficient Homes
38.	Nicole Campion	The University of Pittsburgh	An Evidence-Based Design Analysis: Understanding the Benefits of Green Design on a Women's Oncology Unit
39.	Ying Fang	University of Pittsburgh	Grid Models and Building Models of Residential Energy Loads
40.	Suduck Kim	Virginia Tech	Energy Conservation through Manipulation of Glazing Type and Area
41.	Flore Marion	Carnegie Mellon University	Dynamic Shading of Skylights Improve Indoor Office Environment
42.	Akram Ali	Illinois Institute of Technology	Open Source Building Science Sensors: An Open Source Sensor Network for Indoor Environmental Data Collection
43.	Dongfan Guo	University of Pittsburgh	Examining Porosity in Reticulated Vitreous Carbon Foams for a Sustainable Wastewater Treatment Process
44.	William Manion	Virginia Tech	Case Studies of Active Living Walls
45.	Samuel Markoff	Carnegie Mellon University	The Implications of Population Growth on Climate Action Planning at the Metropolitan Level
46.	Kelsey Hinton	Indiana University	Investigating Systems Thinking for Residential Water Use
47.	Ghulam Qadir	United Arab Emirates University, UAEU	Identifying Green Building Construction Barriers in UAE
48.	Melissa Bilec	University of Pittsburgh	Life Cycle Assessment in Hospital Operating Rooms: Environmental Impacts from Four Types of Hysterectomy
49.	Min Jae Suh	Virginia Tech	Green Construction Education and Training in the U.S.
50.	Joe Moore	Carnegie Mellon University	Environmentally Transformed Metal Nanomaterials Affect Freshwater Microbial Communities Differently than Pristine and Ionic Forms
51.	Constance Bodurow	Lawrence Technological University	[sw]LAB NZE Prototype Detroit: Transdisciplinary in Action
52.	Daniel Gomez	Universidad EAN	Doing What We Teach
53.	Jorge Vendries	University of Pittsburgh	Using a Multi-Regional Input-Output Model with a Disaggregated Power Generation Sector to Estimate the Environmental Effects of an All-Electric Vehicle Fleet in the U.S.
54.	Idowu Rasaki	Zenity Touch Engineering (PTY)	Sustainable Distributed Power for the Built Environment
55.	Jihyun Park	Carnegie Mellon University	The Correlation of Technical Attributes Of The Building Systems, User Satisfaction, and Indoor Environmental Quality
56.	Man Yu	University of Graz; University of Queensland	Solar Photovoltaic Development in Australia: A Life Cycle Sustainability Assessment Study
57.	I. Daniel Posen	Carnegie Mellon University	Green Feedstocks Versus Green Energy in U.S. Plastics Production
58.	Kenneth Sears	Carnegie Mellon University	Potential for Reducing Thermoelectric Water Consumption Through Flue Gas Moisture Capture at Coal- and Natural Gas-fired Plants
59.	Lauren Strahs	Carnegie Mellon University	Characterization of Natural Organic Matter for Prediction of Membrane Fouling
60.	Michelle Tom	Carnegie Mellon University	Environmental Impacts of Extra Food Consumption of US Overweight and Obese Adults

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