
*Champions for Sustainability
Member Workshop Summary Series*

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Current Trends in Sustainable Communities (4th Annual EWRI/ASCE/C4S Sustainability Conference)

**Workshop Date:
September 22, 2011**

In collaboration with:



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Executive Summary

Co-organized with the Environmental and Water Resources Institute (EWRI) of the American Society of Civil Engineers (ASCE) Pittsburgh Section, this fourth annual sustainability conference highlighted how communities can deliver cost effective and environmentally sustainable solutions. Some topics covered were:

- The Sustainable Infrastructure Rating System
- Sustainable community and transportation investments by PennDOT
- Marcellus Shale sustainability challenges
- The sustainable design plan for Masdar City, UAE

C4S Workshop Series

Champions for Sustainability engages its members by convening a series of events and workshops for its membership approximately six times per year. Each workshop event explores a strategic topic of interest for the membership. Events make accessible current trends and challenges, provide access to tools, knowledge, and examples, and engage the membership in assessments and reflections to help craft the regional practice of sustainability. This publication series summarizes and makes accessible the most important outcomes from these workshop events.

About C4S

Champions for Sustainability brings together companies large and small, from many different industries, entrepreneurs, community leaders, university researchers, educators, and other social ventures to put sustainability into practice. C4S aspires to be the most effective region-based collaboration of leaders accelerating the practice and policy of sustainability in business and civic circles. Champions for Sustainability provides value to firms and organizations that seek sustainable solutions to operational practices through convening, networking, and direct consulting.

Memberships and Information:

- Champions for Sustainability www.C4SPgh.org
- Sustainable Pittsburgh www.sustainablepittsburgh.org

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1 Event Summary

Title: Current Trends in Sustainable Communities (4th Annual Sustainability Conference)

Location: Phipps Conservatory, Pittsburgh, PA

Date: September 22th, 2010

1.1 Agenda

8:00 - 8:45	Registration/Breakfast	
8:45 - 9:30	PADEP Secretary - State of the Union Keynote Speaker: Michael Krancer <i>Secretary of the Pennsylvania Department of Environmental Protection</i>	
9:30 - 10:00	ASCE's Sustainable Report Card Revealed "The Institute for Sustainable Infrastructure: Sustainability Rating Systems and Promoting Sustainable Performance for Engineering Projects" Peter D Binney, PE, <i>Director of Sustainable Infrastructure at Merrick & Company, Aurora, Colorado; Chair, Technical Committee and Past Board Member, Institute for Sustainable Infrastructure</i>	
10:00 - 10:15	Break	
10:15 - 10:45	ASCE's Sustainable Report Card Practice "Demonstration Projects Using Institute of Sustainable Infrastructure's Rating System" Peter D Binney, PE, <i>Director of Sustainable Infrastructure at Merrick & Company, Aurora, Colorado; Chair, Technical Committee and Past Board Member, Institute for Sustainable Infrastructure</i>	
10:45 - 11:15	Marcellus Shale Impacts and Opportunities "Community Impacts and Opportunities in Pennsylvania Due to Marcellus Shale Industry" Jason L. Weigle, Ph.D., <i>Professor in Community and Economic Development at Pennsylvania State University</i>	
11:15 - 11:45	Marcellus Shale Impact Fees or Not to Be? "Community Sustainability and the Role of Impact Fees in the Marcellus Shale Industry" Jan Jarrett, <i>President and CEO of PennFuture, Harrisburg, Pennsylvania</i>	
11:45 - 1:00	Lunch	
1:00 - 1:30	Sustainable Project Financing "Funding Sustainable Projects through Municipal Bonds" Chris Perlitz, <i>Infrastructure Financing Manager at Municipal Capital Markets, Denver, Colorado</i>	
1:30 - 2:00	Sustainable Trends in the Transportation Sector "PennDOT's State Smart Transportation Initiative" Dan Cessna, <i>PennDOT District 11 Executive</i>	
2:00 - 2:15	Break	
2:15 - 3:00	International Masdar City "World's First Zero Carbon City: Sustainable Infrastructure in Masdar City, United Arab Emirates" Jane Barron, <i>Project Manager at Mott MacDonald for the Masdar Site-wide Infrastructure Design Consultancy, London, United Kingdom</i>	
3:00 - 4:00	Local Sustainability in Practice Presentation and Tour: "The Phipps Conservatory Center for Sustainable Landscapes: One of the World's First Living Buildings" Jason Wlrick, <i>Director of Facilities and Sustainability at Phipps Conservatory</i>	

1.2 Event Speakers

Michael Krancer



Secretary of the Pennsylvania Department of Environmental Protection

Michael Krancer was nominated by Governor Tom Corbett to be the Secretary of Environment Protection (DEP) on January 18, 2011. The nomination was confirmed by the Pennsylvania State Senate on April 26, 2011.

Until he was nominated by Governor Tom Corbett to be Pennsylvania's Acting Secretary of the Department of Environmental Protection (DEP), Mike Krancer was a Judge on the Pennsylvania Environmental Hearing Board (EHB). The EHB is the state-wide trial/appellate court for environmental cases which tries appeals from actions of the DEP. He was first nominated to serve as a Judge on the EHB by Pennsylvania Governor Tom Ridge in October 1999. The Senate of Pennsylvania confirmed the nomination and Mr. Krancer took the oath of office in November 1999. In February 2003, Judge Krancer was named by Pennsylvania Governor Edward G. Rendell as Chief Judge and Chairman. Before becoming a Judge, Mr. Krancer was a litigation partner at the Dilworth and Blank Rome law firms in Philadelphia. His practice involved complex commercial, white collar criminal, and environmental litigation. Judge Krancer stepped down from the EHB in April 2007 to devote full time to his candidacy for Justice of the Pennsylvania Supreme Court. Acting Secretary Krancer became an Assistant General Counsel for the Exelon Corporation in June 2008. While with Exelon he provided legal counsel in the areas of environmental, health and safety compliance and litigation. He also worked on energy policy matters and with the company's government relations team. He was asked by Governor Rendell to return to the EHB as a Judge in 2009.

Peter Binney, P.E.



Director of Sustainable Infrastructure: Sustainability Rating System and Promoting Sustainable Performance for Engineering Projects

Peter Binney, PE, MASCE has over 35 years of experience in civil engineering projects throughout the US and internationally. He is currently Director of Sustainable Infrastructure for Merrick and Company Aurora, CO and was appointed to the Board of the Institute for Sustainable Infrastructure (ISI) by the American Society of Civil Engineers when it was first incorporated; he is currently supporting ISI in the development of various sustainable engineering rating systems. He has worked for consulting engineering companies as well as directing a major water utility where he conceived and directed the construction of a \$700 million planned indirect potable water system on a fast track delivery schedule. The project exhibits many of the traits of a successful sustainable civil engineering project and has been recognized by ACEC 2011 Honors Engineering Excellence Award and by APWA 2011 Public Works Project of the Year – Large Environmental Project. He specializes in water and natural resources projects and supports a number of public and private clients in the planning and delivery of complex and regulatory/ public-sensitive infrastructure projects. He holds post-graduate degrees in Civil Engineering and in Water Resources Engineering and is a member of ASCE and AWWA.

Jason L. Weigle, Ph. D.



Professor in Community and Economic Development Due to Marcellus Shale Industry

Dr. Weigle is an Instructor in Community and Economic Development at Penn State and a consulting sociologist specializing in education and research on the social and community impacts related to Marcellus Shale Natural gas development. Jason received his Ph.D. in Rural Sociology and Human Dimensions of Natural Resources and the Environment from Penn State, where his research focused on perceptions of Marcellus Shale Natural Gas development and how these perceptions influence action within communities. Currently his research and consulting focus on population and community change in response to growth driven by natural gas development. Jason has worked for both state and county government and has extensive experience in solid and hazardous waste management as well as water quality monitoring and watershed management. Jason and his family live in Wellsboro, PA, which is seeing significant impacts from natural gas development.

Jan Jarrett



President and CEO at PennFuture, Harrisburg, Pennsylvania

Jan Jarrett is President and CEO of Citizens for Pennsylvania's Future (PennFuture). As President of PennFuture, Jarrett works with a staff of 25 in offices in Harrisburg, Philadelphia, Pittsburgh, West Chester and Scranton.

Jarrett joined PennFuture when it was founded in 1998. She has earned the respect of leaders in the environmental and conservation community by leading successful campaigns to gain voter approval of the Growing Greener bond, adoption of the state rule requiring power plants to reduce mercury pollution, adoption of the Pennsylvania Clean Vehicle program, enactment of the recent \$650 million alternative energy package, passage of the Pennsylvania Climate Change Act and more. She has more than 20 years of experience working in Pennsylvania on environmental and conservation causes. Before joining PennFuture, she worked at the Chesapeake Bay Foundation as its Grassroots coordinator. After that she led an alliance that ensured environmental interests were represented before proceedings at the Pennsylvania Public Utility Commission. Jarrett also sits on the board of directors for the State Environmental Leadership Program, a national network of state-based environmental advocacy organizations. Jarrett is a native of Pennsylvania and has a bachelor of social sciences from Penn State University.

Chris Perlitz



Infrastructure Financing Manager at Municipal Capital Markets, Denver, Colorado

Christopher Perlitz has over 15 years experience in the public and private sectors in business development, finance, and business modeling. He has experience with Federal and State loan programs for Broadband, Energy, and the Water/Wastewater Utilities with a track record of innovating business in emerging markets. He was involved in one of the first deployments of IPTV networks, wireless VoIP, and several renewable energy projects. He holds a Bachelor of Science Degree from the University of Colorado with graduate work around the USDA/Rural Development programs. He is an active member of the National Broadband Strategy Coalition and several "Green" non-profit organizations and in the process of developing a program utilizing the capital markets and private equity to maximize Federal Gov't grant and loan programs.

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Dan Cessna



District Executive at PENNDOT District 11

H. Daniel Cessna, P.E., was appointed District Executive for the Pennsylvania Department of Transportation, Engineering District 11-0 on May 13, 2005. District 11 encompasses 2,167 miles of roads and 1,773 bridges in Allegheny, Beaver and Lawrence Counties in addition to the Fort Pitt, Liberty, and Squirrel Hill Tunnels in Allegheny County. District 11 employs 805 and has an annual operating budget of \$400 million.

Mr. Cessna has been with the Department since 1992. He has held a variety of management positions at both the county and district level and in the three functional areas of PENNDOT: maintenance, design, and construction. Prior to coming to District 11, he was the Assistant District Executive for Design in District 10 headquartered in Indiana, PA. Cessna also served as a Construction Project Manager, Assistant Indiana County Maintenance Manager, Jefferson County Maintenance Manager, and Assistant Construction Engineer all within District 10.

Jane Barron



Project Manager at Mott MacDonald for the Masdar Sitewide Infrastructure Design Consultancy, London, United Kingdom

Jane has many years of experience in civil, environmental and sustainable engineering. She is a Chartered Engineer and Chartered Environmentalist. She has been a Council Member for the Institution of Civil Engineers and the Institution of Chartered Water and Environmental Management for many years. She has been involved in major infrastructure projects in the UK including the Channel Tunnel, the Channel Tunnel Rail Link and Crossrail - the cross-London rail link. Jane has been project managing Mott MacDonald's site wide infrastructure design commission at Masdar City as they seek to design innovative, sustainable solutions in a challenging economic climate.

Jason Wirick



Director of Facilities and Sustainability at Phipps Conservatory

As director of facilities and sustainability for Phipps Conservatory and Botanical Gardens in Pittsburgh, Pa., Jason Wirick advances sustainable design ideals, maintains and pursues safe, healthy and sustainable operating management practices, and leverages the benefits of naturalizing the built environment for one of America's greenest public gardens. He holds a bachelor of science degree from Virginia Tech University and a master of business administration degree, with a focus on corporate sustainability and social responsibility, from Duquesne University. A LEED® Accredited Professional, Wirick has supervised hundreds of contractors on award-winning construction projects and facilitated design development with architects, developers, designers, engineers, contractors, and consultants. Wirick will be presenting on Phipps' Center for Sustainable Landscapes, a living building that is now under construction, and expected to meet or exceed the three highest green standards: the Living Building Challenge, LEED® Platinum and SITES® Certification for landscapes.

1.3 Event Sponsors

Platinum:



Hatch Mott
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Gold:



Lennon, Smith, Souleret
Engineering, Inc.
Civil Engineers and Surveyors



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Many thanks to the generous financial support our sponsors contributed towards making this event a success.

2 Workshop Report Results—Participant Information

2.1 Event Attendees:

The following organizations had representatives attend this workshop:

Almes Enterprises LLC
Buchart Horn, Inc.
Cardinal Resources LLC
Carnegie Mellon University (27)
CCAC
Ceisler Media (2)
Chester Engineers
Civil & Environmental Consultants, Inc.
Civil and Environmental Technologies LLC
Collective Efforts, LLC (2)
Duquesne University (2)
Energy Independent Solutions
Everpower
EWRI CMU graduate chapter
FedEx Ground (2)
GAI CONSULTANTS INC (3)
Gannett Fleming, Inc. (3)
GSD Solutions
Hatch Mott MacDonald (5)
HDR Engineering Inc.
Heinz MSPPM
HRV Conformance Verification Assoc Inc
IA Construction Corporation
K U Resources Inc
Lennon, Smith, Souleret Engineering, Inc. (5)
Moon Township Municipal Authority
PEC/ Duquesne U.
Pittsburgh Green Innovators
Pittsburgh Water & Sewer Authority
Point Park University
Retired
SCA
Shaler Township
Sieg & Associates, Inc.
Slippery Rock University
Sustainable Pittsburgh (3)
Township of Upper St. Clair (2)
Trumbull Corporation
University of Pittsburgh (4)
USCGB (2)
A total of 94 people attended the event.

2.3 Event Summary

An audience of 94 professionals participated in the 4th Annual Sustainability Conference as hosted by Pittsburgh's partnership of engineering, policy, and sustainability community leaders from the Environmental and Water Resources Institute (EWRI), American Society of Civil Engineers (ASCE), and Champions for Sustainability (C4S). The event featured engaging presentations on cutting edge topics relating to making Southwestern Pennsylvania's communities more sustainable, such as ASCE's sustainability report card rating system, state energy policy, Marcellus shale, municipal infrastructure bond financing, sustainable trends in regional transportation, and cutting edge designs for sustainable cities and living buildings.

Pennsylvania Secretary of the Department of Environmental Protection Michael Krancer kicked off the event with an overview of state priorities relating to energy policy, for which he emphasized the massive upcoming needs for reinvestment in water-related and electrical infrastructure. His presentation messaged the theme that environmental policy is at a transitional yet strategic period, driven by need to address large-scale challenges in energy infrastructure, water infrastructure, brownfields, air quality, energy efficiency, economics and security. The DEP is changing/reorganizing in an attempt to move forward with these challenges. Of interest are collaborative approaches involving private capital and encouragement towards best practices in order to have big impacts. There is a prominent role for renewable energy projects going into the future with a diverse energy portfolio as a short term, pragmatic requirement. The Secretary emphasized that dialog is very important with the DEP on all of these issues.

Peter Binney provided a very helpful overview of the new ASCE sustainability rating system for infrastructure that has been under development. The system assesses infrastructure projects from the perspective of economic, environmental and equity impacts. This rating system is needed because there are \$2.2 trillion needed over the next 5 years to repair the U.S.'s infrastructure. Projects are assessed according to their reliability, resilience, affordability, supportability, balance, adaptability, efficiency, effectiveness, and durability. Infrastructure presents a different challenge compared to buildings. Building design and construction is usually controlled by a single organization. The public nature of infrastructure affects macro ecosystems, communities, and regions. It is important to recognize that we are building 2050 today. Economic choices have time horizons that span long periods of time, so an effective assessment tool is helpful and necessary.

The Institute for Sustainable Infrastructure (ISI) was created by three major public infrastructure professional societies to address the gap of providing guidance for assessing the sustainability of infrastructure projects. The new ISI rating system is based on 2 dimensions of any project: performance (efficiency) and pathway (effectiveness) aspects. It consists of 10 major criteria that can be scored by members and eventually assessors. The ISI rating system is launching an education campaign where professionals can receive an additional accreditation in using the rating system. The system is

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currently open for public comment, and version 2.0 of the standards/system will become available in 2012. The tool is available at www.sustainableinfrastructure.org.

Professor Radslav Vidic of the University of Pittsburgh provided an update on some technical proposals related to reducing water management impacts for Marcellus Shale activities. The size of the Marcellus reserve is very large, approx 21 years of US supply. Each well requires between 3-7 million gallons of water. There are short-term and long-term water problems involved with the treatment of Marcellus shale flowback and producer water. There are no simple solutions for disposal of this water (unlike the situation in Texas and Arkansas for Barnett shale). Current disposal injection wells have approximately 10 – 15 years of capacity, so eventually this solution will run out of capacity. Treatment of the water is problematic, as it is 5 times more concentrated than sea water. One promising option includes mixing of acid mine drainage water (AMD) with flowback water to precipitate out some of the chemicals—this is being explored, as well as using AMD water for the fracking process itself.

Jan Jarrett of Citizens for Pennsylvania's Future provided an overview of some policy initiatives relating to the Marcellus industry in Pennsylvania. The development of Marcellus is being driven by the vastness of the resource and its location near markets. Usually higher cost item on a gas bill is transportation costs (40%). Because of the proximity of the resource to high-demand markets in the Northeast U.S., companies can make a profit even if prices are low for gas. The early leases for drilling have been hugely profitable. By the middle of 2011, nearly 4000 wells have been drilled. Over 10,394 permits were issued in last 2 years. Projections are that there can be as high as 100,000 wells drilled in the near future. The development of this nonrenewable resource means that this source will eventually be gone. This poses a challenge to communities where drilling happens. It requires environmental policies to break the boom/bust cycle—the right regulatory regimen needs to be put into place.

Despite the inability for Pennsylvania to enact a severance fee, there may be hope in the Oil and Gas lease fund, which receives funds from lease payments and royalties from drilling on public land. This fund may bring in close to \$1B by 2018. The fund creates an opportunity to address sustainability issues. One plan could involve putting the money in the trust fund for 20 years and then use interest to endow restoration and conservation projects forever. This is one option to ensure a “sustainable end” to the story once all the gas is gone. In 2009, the Oil and Gas Lease Fund received more money than it had in its life since 1955 during the auction of state forest land.

Chris Perlitz provided a helpful overview of how municipal bonds are issues to help fund infrastructure projects in municipalities. He covered different types of bond instruments, the role of credit agencies, and the way it is possible to research issuance of bonds in municipalities. Bond information can be obtained at www.Emma.msrb.org. He covered different bond programs, such as stacked insurance models for brownfield sites, programs through the USDA Rural Development program from the Rural Electrification Act of 1935, interim construction loans, energy performance contracts, and design/build/finance models to expedite project funding.

Dan Cessna of PennDot provided an overview of state sustainable transportation initiatives. Going forward we cannot use land and build highways like we have done in the past. Small changes to local transit can have big impacts on the whole system. PennDot's program has been attempting to get people to think outside of existing standards, using judgment, to come up with better solutions. Some core principles covered were:

1. Money counts—don't have all the money we need
2. Leverage and preserve existing investments
3. Choose projects with a highvalue/price ratio
4. Safety always and safety only
5. Look beyond levels of service
6. Accommodate all modes of travel
7. Enhance local network
8. Build towns not sprawl
9. Understand and build with context in mind
10. Develop local governments as strong land use partners

Some projects that embody the PA Community Transportation Initiative include: the Point Park/ Ft Pitt Blvd project; the roundabout in Rochester, PA; North Park pedestrian and bike access; Park Manor Blvd near Ikea; the Route 28 project; and the Gateway to Oakland project, all of which can be viewed at www.smart-transportation.com.

Jane Barron provided an overview of the design of Masdar City. The project had a vision to the forefront of sustainable technology with a 100 year design life for which it is possible to experiment with the latest ideas and technology. Design a sustainable infrastructure for the whole city that is flexible—so that something can be “plugged in” in 50 years. Big challenges include cultural constraints dictated by Sharia law as well as severe water shortages. Solar panels were ruled out for electricity because of the need to use water to clean dust from solar panels. The recession has slowed the project—this is good because of more time can provide more thoughtful responses to the challenges in designing these systems.

The conference concluded with an inspiring presentation about Phipps conservatory's Living Building Challenge project, for which the conservatory strives to become the most sustainable conservatory in existence and for which there will be many cutting edge innovations in how buildings and sustainable technology operate.

2.3 Business Needs Survey Regarding Sustainable Communities

1. **In your opinion, what are some ways a focus on sustainable infrastructure and communities can help local engineers, researchers, policymakers and designers to become more innovative?**

Knowledge of National Sustainable Trends

Provide conference introducing recent national projects.

Formulation of Policy/Regulations

Look at ordinance/regulation change to reduce impact

Challenge stakeholders to raise standards and codes to include Sustainable Solutions.

Engineers plan with fewer constraints

Regional support for sample projects with monitoring that is to guide the engineers, researchers, policymakers, and designers.

Cost Benefit Analysis

Provide clear demonstrable savings via sustainable practices

Return on investment

Lower long-term cost

Education of Sustainable Principles

Education of sustainability provides opportunities for people

Create a new idea that sustainability implies problem preventing

Cross sector transparency / information sharing will help increase innovation.

2. **In your opinion, what is the region's most pressing priority in terms of sustainable infrastructure projects in our region? What are your reasons for this view?**

Water Management

Water issues- safety of drinking water CSO's, stormwater management.

Stormwater runoff

Sanitary Sewer System improvements that will improve water purity and protect water sources.

Energy Use & Efficiency

Energy efficiency- energy is being used on laundry drying and other facilities could be developed to save money.

Electric savings- many people leave the empty rooms lights on

Energy efficiency- energy is being used on laundry drying and other facilities could be developed to save money.

Transportation Linkage

Transportation infrastructure- deteriorating roads, bridges.
Public transportation is lacking extensions- difficult to get from one section of the city to another-Southside to Eastend/Westside
Transportation in the heart of the city is deteriorating as a result of sprawl

Housing Options

Improving housing stock in the urban neighborhood core.

Policy Formulation & Govt Subsidies Programs

Insuring govt subsidies only supports sustainable solutions vs. sprawl.
Revising policy, rules/laws to support sustainability.

Conservation Efforts

Adopting more conservation practices-huge waste across the board.
Abandoned mine drainage should be a priority.

3. What strategy should the region pursue to foster more support for a sustainable community?

Awareness of Sustainable Principles

Public awareness of long term impact of business as usual.
Educational outreach to politicians & citizens
Dialogue should be positioned on common needs
Improvements in infrastructure

Rehabilitation of Buildings

Encourage resettlement of urban areas that are greatly underutilized but efficient and fully functional infrastructure.

Policies/Incentives on Sustainable Projects

Urge gov't to spend more money on environmental issues.
Local gov't embracing Bottom up approach
Incentives sustainable practices in water/wastewater/stormwater by including volume based calculations.

4. What are barriers to the adoption of sustainable infrastructure/sustainable community solutions? What can be done to overcome those barriers?

Examples of Green Investments

The investment people have during the sustainable projects
Show people success projects.

Financial Incentives/Blockades

Money & understanding education funds for projects.
Cost/Leverage/bonds/grants
Budget

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Shifting cost to someone else - impact of subsidized rates
Reduce costs of available technologies on renewals to make it affordable to the masses

Cultural Differences

To many municipalities, under educated and too provincial in thinking
People's old culture & old habit.
Competing priorities, political desire to do otherwise, lobbying power

- 5. What are some new breakthroughs in terms of technologies, policies, or information that you think are critical to achieving broader demand for sustainable infrastructure/sustainable community solutions?**

Prospected Energy Usage

Incentives for consumers on renewable energy
Marcellus Shale drilling

Community Input & Impact

Affordability, Accessibility, Education & Communication
Basic marketing of cost savings & sustainability to average citizen
Linking small solutions to solve grand scale problems

Green Technologies

Greener construction materials

- 6. What are some resources that the organizers should work to bring to the region in order to better serve your and the region's interests related to sustainable infrastructure and communities?**

Education Opportunities

Outreach/Education

Political Support

Cooperation between municipalities in the region.
Elected officials policy platform

Presentation of Successful Green Project

International success stories
Visibility of sustainable projects

General

- 7. What motivated you to participate in today's event?**
Member of EWRI
Past conference experiences

Informed by professor
Becoming involved in everyone's duty
Familiarizing myself with sustainability
Interest in guest speakers

8. What expectations did you have for today's event? Were these expectations met?

Collaboration of Fields in Sustainability

Interest in urban development through sustainable solutions.
Interest in integrating sustainability, engineering and design.
Learn new insight on technologies and ideas of sustainability

Local Progress Towards Sustainable Solutions

I expected more local sustainable initiatives.
Expectations were met

9. What new information did you learn and/or new connections did you make at this workshop?

Interest in Speakers

Here senator speak
Meeting public officials, professors and professionals

Information on Organizations

Enjoyed information from Penn Dot and Penn Future
AMD could be used as Frac Fluid!
ISI organization/rating system

Others

Financial aspects
Marcellus shale topics
Capital Market is a big issue for many sustainable engineers