Zofnass Program for Sustainable Infrastructure

November 12 -13, 2018

ZOFNASS PROGRAM WORKSHOP:

Innovations for a Sustainable Infrastructure

SPEAKERS FROM:
Barclays, Bentley Systems, City of Columbus, City of Los Angeles Bureau of Engineering, Columbus Yellow Cab, EFCG, FEMA Water Sector Puerto Rico, Harvard Business School, Harvard University, HNTB, Inter-American Development Bank, Institute for Sustainable Infrastructure, Kadak Associates, LOEB Fellowship GSD, Louis Berger, NV5, Parsons, Rebuild by Design, 100 Resilient Cities, Stantec, Texas Central Railway, TRC, University of Geneva, Wren House Infrastructure Management, Zofnass Program Harvard University.

DAY 1

Harvard Business School
Cumnock Hall Room 102
Soldiers Field, Boston, MA

<12:30 pm> **WELCOME**

PANEL 1 <12:50 pm>
SYNERGIES & INTEGRATION FOR SUSTAINABLE INFRASTRUCTURE

<2:40 pm>
HBS CASE STUDY SESSION ON SUSTAINABILITY

PANEL 2 <3:50 pm>
DISRUPTIVE TECHNOLOGIES TOWARDS SUSTAINABILITY

<6:55 pm> **WRAP-UP DAY 1**

DAY 2

Harvard Graduate School of Design
Gund Hall, Room 112 (Stubbins)
48 Quincy Street, Cambridge, MA

<8:30 am> **WELCOME**

PANEL 3 <8:30 am>
SUSTAINABLE DEVELOPMENT GOALS AND INNOVATION

PANEL 4 <10:25 am>
WHAT TYPES OF PROCUREMENT LEAD TO SUSTAINABLE PROJECTS?

PANEL 5 <1:25 pm>
A CASE STUDY: REBUILDING WATER SYSTEMS IN PUERTO RICO AFTER MARIA: THINKING OUT OF THE BOX?

<4:20 pm> **CLOSING REMARKS**

ZOFNASS PROGRAM
FOR SUSTAINABLE INFRASTRUCTURE

Harvard University
Graduate School of Design

Special thanks to all speakers, moderators, and the Zofnass Program Sustainable Infrastructure Advisory Board (SIAB).

Workshop Coordination:
Judith Rodríguez,
jirodrig@gsd.harvard.edu

ZOFNASS PROGRAM WORKSHOP

Innovations for a Sustainable Infrastructure

Monday, November 12
12:00 pm to 7:00 pm
Harvard Business School
Cumnock Hall Room 102
33 Harvard Way
Boston, MA 02163

Tuesday, November 13
8:30 am to 4:20 pm
Harvard Graduate School of Design
Gund Hall Room 112 (Stubbins)
48 Quincy St
Cambridge, MA 02138

Innovations for sustainable and resilient infrastructure are disrupting the business as usual approach to infrastructure.

The focus of the ZPH Workshop is to discuss what are the key innovations addressing environmental challenges and driving sustainable projects on all phases of infrastructure development: planning & financing, construction, and operation & maintenance. Innovations for sustainable infrastructure is a topic that has emerged learning from case studies on the business case for sustainable infrastructure, engagement with our Sustainable Advisory Board (SIAB), and from recent ZPH participation in UN events.

The different panels explore the role of stakeholders in disruptive projects, and how are these innovative solutions financed and developed.

The workshop is structured into the following panels:

1) Synergies and Integration for Sustainable Infrastructure;
CS) HBS Case Study on Sustainability;
2) Disruptive Technologies Towards Sustainability;
3) Sustainable Development Goals and Innovation;
4) What types of Procurement Lead to Sustainable Projects?;
5) A Case Study: Rebuilding Water Systems in Puerto Rico After Maria: Thinking Out of the Box?

ZOFNASS PROGRAM
FOR SUSTAINABLE INFRASTRUCTURE

Agenda

DAY 1 at HBS

WELCOME <12:30 pm>

ZOFNASS PROGRAM WORKSHOP

Spiro Pollalis — Professor and Director of the Zofnass Program, Harvard University

Paul Zofnass — President and Zofnass Program Initial Sponsor, Environmental Financial Consulting Group

PANEL 1 <12:50 pm>

SYNERGIES AND INTEGRATION FOR SUSTAINABLE INFRASTRUCTURE

Moderated by Andreas Georgoulias, Director, Environmental Financial Consulting Group

Spiro Pollalis — Professor and Director of the Zofnass Program, Harvard University

John Lynch — Director Social Impact Banking, Barclays

Bryna Lipper — LOEB Fellow, Harvard University GSD / 100 Resilient Cities

<coffee break>

HBS CASE STUDY SESSION on Sustainability <2:40 pm>

SOUND GROUP CHINA: URBAN WASTE ENTREPRENEURS

John Macomber — Senior Lecturer, Zofnass Program Advisor, Faculty Chair of the HBS Africa Research Office, Harvard Business School

<coffee break>

Agenda

DAY 1 at HBS

PANEL 2 Part I <3:50 pm>

DISRUPTIVE TECHNOLOGIES TOWARDS SUSTAINABILITY

Moderated by Marty Janowitz, Vice President Sustainable Development, Stantec

Katherine Zehnder — Vice President, HNTB Corporation

Bud Braughton — Program Manager, City of Columbus

Morgan Kauffman — CEO / Owner, Columbus Yellow Cab

<short break>

PANEL 2 Part 2 <5:35 pm>

DISRUPTIVE TECHNOLOGIES TOWARDS SUSTAINABILITY

Moderated by Marty Janowitz, Vice President Sustainable Development, Stantec / SIAB

Hakim Drissi — Managing Director, Wren House Infrastructure Management / SIAB

Phil Bownes — General Counsel, Wren House Infrastructure Management /SIAB

Andrew C. Kadak — Consultant, Kadak Associates Inc

Chris Barron — Chief Communications Officer, Bentley Systems / SIAB

<end Day 1>

WELCOME Day 2

Spiro Pollalis — Professor and Director of the Zofnass Program, Harvard University

PANEL 3 <8:30 am>

SUSTAINABLE DEVELOPMENT GOALS AND INNOVATION

Moderated by Karen Lutz, Sustainability Director, TRC / SIAB

Alexandre B. Hedjazi — Director GEPP program / Senior Lecturer, University of Geneva

Cristina Contreras — Research Associate, Zofnass Program Harvard University

Katie P. Wilson — Associate Vice President, TRC

Thomas Gloria — Program Director, Sustainability, Harvard University

<coffee break>

PANEL 4 <10:25 pm>

WHAT TYPES OF PROCUREMENT LEAD TO SUSTAINABLE PROJECTS?

Moderated by Laura Bonich, Vice President, NV5 / SIAB

Robert Eckels — Director, Texas Central Railway

Michael Sarullo — Division Engineer, Division Manager of the Environmental Engineering Division, City of Los Angeles, Bureau of Engineering

Agenda
DAY 2 at GSD

Catherine Sheane — Sustainability and Resilience Practice Lead, Parsons

Maria Lehman — VP Infrastructure NY, Parsons

Graham Watkins — Principal Environmental Specialist, Inter-American Development Bank

Amy Chester — Managing Director, Rebuild by Design

<Lunch break>

PANEL 5 <1:25 pm>

A CASE STUDY: REBUILDING WATER SYSTEMS IN PUERTO RICO AFTER MARIA: THINKING OUT OF THE BOX?

Moderated by Thomas Lewis, President, Louis Berger / SIAB

Judith Rodríguez — Research Associate and Program Administrator, Zofnass Program Harvard University

Andrés García-Martinó — Water Sector Director, FEMA

Alex Nadolishny — Program Manager, Louis Berger

Katrin Bruebach — Associate Director, Urban Water & Sanitation, 100 Resilient Cities

Anthony Kane — Managing Director, Institute for Sustainable Infrastructure

<end of Workshop>

Day 1 Location
Harvard Business School

Cumnock Hall Room 102 (downstairs)

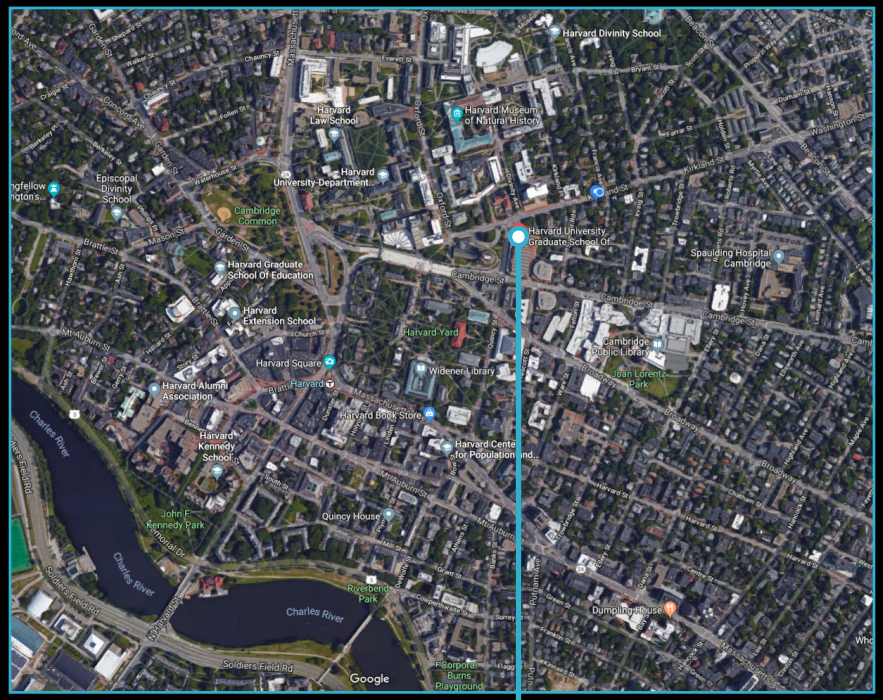
Cumnock Hall, HBS
Room 102 (downstairs)
33 Harvard Way
Boston, MA 02163

SIAB Dinner location
(by invitation only)
Henrietta's Table (Charles Hotel)
1 Bennett Street, Cambridge, MA 02138

Public transportation is recommended, as well as other mobility options such as Uber, or Lyft. Parking permit available for purchase.

Day 2 Location
Harvard Graduate School of Design

Gund Hall Room 112 (Stubbins)



Gund Hall, GSD
Harvard GSD, Rooms 112 (Stubbins)
48 Quincy St
Cambridge, MA 02138

Innovations for a Sustainable Infrastructure

<Lunch available for all attendees from 12:00 pm>

<12:30 pm>

WELCOME ZOFNASS PROGRAM WORKSHOP

Spiro Pollalis, Professor and Director of the Zofnass Program for Sustainable Infrastructure, Harvard University

Paul Zofnass, President and Zofnass Program Initial Sponsor
Environmental Financial Consulting Group

<12:50 pm>

PANEL 1: SYNERGIES AND INTEGRATION FOR SUSTAINABLE INFRASTRUCTURE

Moderator
Andreas Georgoulias, Director, Environmental Financial Consulting Group

Five Areas of Innovation for Planning Sustainable Infrastructure
Spiro Pollalis, Professor and Director of the Zofnass Program for Sustainable Infrastructure, Harvard University

The presentation explores the role of innovation in efficiently addressing sustainable infrastructure projects and the related challenges, applicable to all phases of infrastructure development: planning & financing, construction, operation & maintenance.

The presentation is structured in five parts, key enablers of innovation for reaching sustainability goals:

A. Tools for measuring sustainability: the contribution of tools that measure sustainability and resilience in both the Infrastructure project-level and infrastructure system-level.
B. Synergies of infrastructure projects: the role of the systemic, high- level approach in terms of both performance and cost-benefits through multi-purpose solutions.
C. Disruptive technologies: the potential of out-of-the-box ways of planning infrastructure as opposed to historical datasets as paradigms of new projects.
D. Digital design and simulation tools: the opportunity to study and improve sustainability and better monitor the environmental performance of infrastructure projects.
F. Procurement: a key to establishing sustainability as a core guiding principle in a project's development, allowing innovation and creativity.

Sustainability Linked Loans
John Lynch, Director Social Impact Banking, Barclays

On June 8, 2018, Barclays acted as the sole sustainability structuring agent on the first syndicated sustainability-linked revolving credit facility for a US corporate borrower. The aggregate $1.4bn of new facilities enable long standing client CMS Energy and its primary subsidiary Consumers Energy (CMS) to reduce its loan interest rate payable through meeting defined targets related to environmental sustainability, specifically renewable energy generation.

Sustainability-linked loans are innovative products that allow issuers to demonstrate their commitment to sustainability. From a lender's perspective, the facilities encourage a company to make its business practices more sustainable by providing a direct financial incentive through the potential for lower financing cost. In addition to the standard pricing grid, the loan structure incorporates a secondary pricing mechanic tied to a sustainability target. Improvement or degradation relative to the sustainability benchmark can result in a drawn pricing discount or premium.

"We will continue to strive to demonstrate thought leadership in sustainable finance, and to partner with companies with strong environmental, social and governance practices across sectors to create innovative financing products," comments Jed Lynch, Head of Social Impact Investment Banking. "Society will benefit as corporations increasingly integrate sustainability considerations into their business decisions."

Implementing Sustainable and Resilient Cities
Bryna Lipper, LOEB Fellow, Harvard University GSD / 100 Resilient Cities

The presentation and discussion will focus on how cities are implementing their sustainability and resilience goals and initiatives: examining the opportunities and barriers, how to broker cross sector collaboration, exploring which industries and technologies are ripe to support delivery, what policy and regulatory practices are working, the shifts which need to occur in design and planning, and the institutions, structures and functions which inhibit success.

Q & A
Led by Andreas Georgoulias.

<2:30 pm > Coffee break.

<2:40 pm>
HBS Case Study on Sustainability

CASE STUDY
SOUND GROUP CHINA: URBAN WASTE ENTREPRENEURS

Moderator
John Macomber, Senior Lecturer, Zofnass Program Advisor, Faculty Chair of the HBS Africa Research Office, Harvard Business School

This will be an interactive discussion about considerations in financing resilient infrastructure in the solid waste sector. Attendees are expected to read and think about the HBS teaching case study, and we will consider the issues together. The core decision concerns a private sector entrepreneur in China with advanced solid waste composting capability, who competes with state owned enterprises amid government policies supporting a rival technology. The handling of municipal solid waste takes up to 50% of the annual budget of many urban areas in the developing world, and handling of waste is become a measure of urban resilience. Wen Yibo, the CEO of Sound Group China, has to decide whether to focus on his water treatment business, on composting of municipal solid waste, or a pivot to investing in waste-to-energy facilities. At the end of the case study analysis we will turn to the substantial relevant experience of the Zofnass participants in the group to consider how to apply the lessons learned in the discussion.

Link to case study:
http://hbr.org/product/Sound-Group-China--Urban-/an/211086-PDF-ENG

Q & A
Led by John Macomber.

<3:40 pm > Coffee break.

<3:50 pm>
PANEL 2: DISRUPTIVE TECHNOLOGIES TOWARDS SUSTAINABILITY

Moderator
Marty Janowitz, Vice President Sustainable Development, Stantec / SIAB

Introduction to Panel

From Creative Destruction to Creative Futures
Marty Janowitz

We face a tsunami of global crises – climate change, population, politics, finance, to urban intensification and deterioration. For better or worse, old, new and renewed infrastructure will significantly impact the outcomes. Such historical moments aren't new. The influential 20th Century economist, Joseph Schumpeter characterized them as periods of 'creative destruction'.

Creative destruction is the core of a dynamic, change-oriented socio-economic outlook that highlights the powerful role of innovation and entrepreneurship in driving transformation. Schumpeter proposed that outdated methods will ultimately be undermined and superseded by creative new approaches. He argued that innovation is the critical dimension and comes from the 'wild spirits' of entrepreneurs - a process of industrial mutation that incessantly revolutionizes social structures from within. I propose that emerging sustainable infrastructure perspectives and methodologies are such a catalyst towards urban and social regeneration. But ignoring, resisting or retrenching, will lead only to a slow descent into obsolescence and further deterioration.

Relevant lessons include the 19th century construction of The Illinois Central – triggering a new industrial empire and the death sentence for the West's old agriculture; Manhattan's constant reinvention, often at the expense of preserving its concrete past; and companies that once revolutionized industries only to see their dominance vanish as rivals launched transformational new options (e.g. horse drawn carriages, Polaroid, Xerox, the Walkman, and now the printed newspaper). I will identify elements and emerging patterns within pioneering sustainable infrastructure and urban renewal that clarify our choices to rapidly shape the future or risk being shaped by it.

PANEL 2

Part 1

PANEL 2

Abstracts

Part 1

Automated Vehicles – An Overview
Katherine Zehnder, Vice President, HNTB Corporation

We're on the cusp of a transformation in transportation, driven by advances in vehicle automation, connectivity, electrification and sharing.

The changes will be disruptive. Disruption created by automated vehicles pose a myriad of technical, institutional and operational challenges.

Disruption also creates opportunities. There are several business cases being tested for automated vehicles including:

· Urban applications such as ride-hailing services and fleets of shared use vehicles
· First and last mile mobility opportunities
· Residential and campus circulation
· Highway maintenance operations
· Truck automation and platooning

This session will provide an overview of how automated vehicle technology is progressing and what we can expect in the future.

San Francisco Technology and Zero Emissions Vehicle Plan
Katherine Zehnder

San Francisco International Airport (SFO) is expected to grow from 55.8 million airport passengers (MAP) in 2017 to as much as 71.1 MAP through the planning horizon identified in the Airport Development Plan 2016 (ADP), which sets forth the long-range plan to guide the Airport's development. SFO staff has set goals to improve the passenger experience while meeting the State of California's mandate for zero emissions vehicles (ZEV). The long-term goal of the California ZEV Program is to have 1.5 million ZEVs in California by 2015. To accomplish this California has required manufacturers to sell specific numbers of clean vehicle technologies including battery electric, plug-in hybrid electric, and fuel cell vehicles.

Meeting the ZEV mandate will require installation of 6,000 to 10,000 electric vehicle (EV) charging stations at SFO to accommodate passenger, employee, and commercial vehicles along with aircraft ground support equipment (GSE). This presentation is focused on the ZEV mandate for transportation and addresses a technology strategy to minimize peak power demands, minimize energy demands, contribute to efficiency of airport operations, and transport passengers within the airport as conveniently as possible.

Smart Columbus Electrification Program
Bud Braughton, Program Manager, City of Columbus

The City of Columbus pursued and won a grant from Paul G. Allen Philanthropies with the goal of laying a practical path to replacing carbon-based fuel consumption and inspiring action across the region to protect and sustain the environment through decarbonization and electrification. With the cooperation of partners such as American Electric Power (AEP) and the Columbus Partnership, Columbus is using this grant as the catalyst to change the long-term trajectory of carbon emissions in the 7-county Columbus region (Franklin, Delaware, Fairfield, Licking, Pickaway, Madison, Union) and demonstrate the rewards of using clean energy sources in lieu of fossil fuel based sources.

The project aims to measurably decrease light-duty transportation greenhouse gas (GHG) emissions expressed in equivalent metric tons of carbon dioxide (MTeCO2) through 5 grant priorities are:
· Decarbonization,
· Fleet EV adoption,
· Autonomous and multi-modal system in the city,
· Consumer EV adoption and
· Charging infrastructure.

Columbus Yellow Cab Fleet Electrification
Morgan Kauffman, CEO / Owner, Columbus Yellow Cab

The case study focus is the electrification of the Columbus Yellow Cab (CYC) taxi fleet. The scope of the case study is the planning, implementation and operation of the first 10 new electric vehicles (EV) and 8 solar charging units with 16 Level 2 ports, introduced to the CYC fleet in 2018. The use of 2 existing permanent Level 2 chargers also supported the program. The case study aims to contribute to the understanding of the variables affecting the business case for electrifying the CYC fleet, through the identification of barriers (such as risks, availability of charging, customization), implementation considerations, and best practices.

CYC operates as a taxi service, as well as a Transportation Network Company (TNC – as defined by Ohio House Bill 237), in Columbus, Ohio. CYC was founded in 1928 by the Kauffman family and continues to remain a locally owned company operated by the Kauffman's third generation. CYC has developed a start-up mindset that allows them to take calculated risks that have kept the company profitable and relevant in a rapidly changing industry. CYC wants to offer an electric alternative to the internal combustion engine vehicles in their fleet. There first foray into electric vehicles was a Tesla Model S 85 acquired in 2016 and run for 65,000 miles.

Q & A
Led by Marty Janowitz.

<5:25 pm > Coffee break.

<5:35 pm>
Part 2

Approach to technological disruption from a Long-Term investor´s perspective

Hakim Drissi, Managing Director, Wren House Infrastructure Management
Phil Bownes, General Counsel, Wren House Infrastructure Management

Hakim Drissi and Phil Bownes, representatives of Wren House Infrastructure on the SIAB, will be sharing some thoughts with the group on how technological disruption is perceived and approached from the perspective of a long-term infrastructure investor.

Through its investment activities, Wren House frequently encounters the challenges and opportunities that disruptive technological changes present. In order to effectively manage such eventualities, a clear understanding of disruption drivers and their potential consequences is key.

As part of this presentation, Hakim and Phil will be sharing perspectives on how Wren House seeks to adapt to and embrace disruption through close interaction with management teams, promoting flexibility, anticipation, change culture and proactivity. They will briefly talk about the approach followed and the challenges typically encountered by the investment team when trying to assess new investments in the context of the potential implications of disruptive environments.

Additionally, Hakim and Phil will be presenting a real-life case study of one of Wren House's portfolio companies, which reinforces the importance of embracing innovation and illustrates how small changes can quickly re-define the way we think about infrastructure.

Ever Think About Nuclear Energy?

Andrew C. Kadak, Consultant, Kadak Associates Inc.

Nuclear energy has been much maligned but continues to reliably supply about 20 % of US electricity demands without emissions of climate altering pollutants. The challenge for nuclear energy is innovating to combat high construction costs and meeting market demands which are directed at smaller modular reactors to support more decentralized energy grids. Currently, there are almost 50 new innovative designs being developed to address electricity and process heat needs. Additionally, there are some radical ideas such as using nuclear for home heating and micro-reactors for completely off-grid power sources.

One of these ideas is to use reprocessed nuclear waste as a heat source for homes. This would help solve the nuclear waste problem and by recycling the used fuel, more electricity can be produced. Additionally, if fast reactors are deployed, we can extend the useful life of uranium by thousands of years since these reactors make more fuel than they consume.

Lastly, micro reactors are being developed in the range of 200 kwe to 40 Mwe electric for completely off grid applications. These reactors, and nuclear energy in general, are very high density power sources minimizing land use. Such plants can be regionally distributed to accommodate efficient electric grid expansion. These new plants would not require refueling for 10 to 20 years with extremely fail safe designs. In summary, nuclear energy is, and can be, an ideal energy source for sustainable development.

Infrastructure Digital Twins for Improving Project Delivery and Asset Performance

Chris Barron, Chief Communications Officer, Bentley Systems / SIAB

When considering the sustainability of infrastructure, it is important to look more broadly that just the carbon footprint of the project and resulting infrastructure asset, to engineering for increased capacity, reliability, resilience, adaptability, and how one might extend the useful life of the operating asset. Now, with the convergence of technologies for photogrammetry, cloud computing, machine learning, and BIM, it is possible to create a fit-for-purpose Digital Twin of the physical asset which can enable simulations and analytics which can, in turn, provide visibility into potential outcomes of different engineering and operational scenarios for improved performance and sustainability. In this presentation we'll describe the technologies that are being used to create and curate Digital Twins and provide some real-world examples which leverage these technologies for better outcomes.

Q & A
Led by Marty Janowitz.

<6:55 pm > Wrap-up Day 1.

<7:20 pm > Zofnass Program SIAB Dinner at Henrietta's Table, Charles Hotel (by invitation only)

PANEL 3

<7:00 am> Sustainable Infrastructure Advisory Board (SIAB) Breakfast Meeting (by invitation).

<8:30 am>

WELCOME Day 2

Spiro Pollalis, Professor and Director of the Zofnass Program for Sustainable Infrastructure, Harvard University

PANEL 3: SUSTAINABLE DEVELOPMENT GOALS AND INNOVATION

Moderator

Karen Lutz, Corporate Sustainability Director, TRC / SIAB Representative

Infrasystems Integration & Sustainability Acceleration

Alexandre B. Hedjazi, Director GEPP program / Senior Lecturer, University of Geneva

In less than a decade the city of Geneva has been able to design and implement a novel urban energy infrastructure that will help the City accelerate and amplify its sustainability agenda based on infra system integration. An urban infrasystem is defined as the integrated system of both hard and soft infrastructure, with hard infrastructure as the physical roads, bridges and fiber optic cables, and soft infrastructure as the policies and engagement of various stakeholders/political regimes that shape or impact the outcomes of the hard infrastructure (Pincetl 2016). In this case study we briefly review the key features of Geneva's metropolitan areas and its energy and transportation systems; we explain the infrasystem components and basic functions; benefits of integration, the components of acceleration and amplification dynamics and the question of Scale. The case of Genliac project and the extension of Geneva Airport will illustrate the importance of infra-system related tradeoff formulation towards accelerating and amplifying urban sustainability agendas while reinforcing stakeholders engagement and deliberative models.

Creating a Common Language. The Role of Infrastructure Sustainability in Achieving the SDGs

Cristina Contreras, Research Associate, Zofnass Program Harvard University

Sustainable Infrastructure (SI) is of critical importance to achieve the 2030 Development agenda and to secure strong, sustainable growth. The access to basic services such as good health and well being (SDG 3), quality education (SDG4), clean water and sanitation (SDG6) or affordable and clean energy (SDG 7), can only be achieved by environmentally responsible, socially equitable and economically viable infrastructure projects. Although infrastructure plays an important role in achieving sustainable growth and development, there is no clear understanding of how sustainable infrastructure tools such as Envision relate to the SDGs. As a result, a reconciliation effort will be required to align, streamline and operationalize different frameworks to design, construct and operate infrastructure projects. This presentation will look at the lessons learned with Envision, and how to leverage the knowledge acquired in the infrastructure sustainability arena over the last years to advance the Sustainable Development Agenda.

From Local to Global: How Local Actions Support Energy and Climate Goals

Katie P. Wilson, Associate Vice President, TRC

One Goal, Many Paths

California continues to set bold new energy and climate goals, in support of SDGs 7 and 13. California's goals include a Zero Net Energy (ZNE) mandate for new residential construction by 2020 and new commercial construction by 2030. The to-be-built standards will ensure that future development doesn't contribute to the problems currently created in an already-built arena.

What about that built environment? California's Global Warming Solutions Act of 2006 (Assembly Bill 32) was landmark legislation that set an absolute statewide limit on greenhouse gas emissions, and confirmed California's commitment to transition to a sustainable, clean energy economy. Ten years after the passage of AB 32, California extended and strengthened the limit on greenhouse gas emissions with the passage of Senate Bill 32 in 2016. The state raised its goal for greenhouse gas emissions to 40 percent below 1990 levels by 2030. California is now demonstrating impressive outcomes from the implementation of its climate policies. After the first decade of AB 32 implementation, California's economy is growing while carbon pollution is declining. With innovative advancements in clean energy and energy efficiency, the state is well on the way to meeting its renewable energy target recently upped from 50% to 60% by 2030 and 100% carbon free sources by 2045.

Ms. Katie Wilson from TRC will present four case studies of examples of how government and industry in California is approaching their responsibility to advance these energy and climate action goals. These client case studies include:

- San Diego Association of Governments (SANDAG) Energy Roadmap Implementation and Climate Action Planning
- City of Carlsbad Clean Energy Microgrid for Resiliency
- Disneyland Resorts GHG Emissions Reduction Strategy
- City of Santa Barbara ZNE Roadmap

The regional and local efforts described in these case studies provide insights into the many paths that can be pursued to achieve resilient and clean local power infrastructure.

Envision's Role in Higher Education of the SDGs

Thomas Gloria, Program Director, Sustainability, Harvard University, Division of Continuing Education

The incorporation of Envision into the curriculum of the Development Practice Master's Program at Harvard University's Division of Continuing Education is a key component to educating the next generation of infrastructure professionals. Students in the Development Practice degree program gain knowledge, practical skills, and experience to critically evaluate and address the multidimensional challenges of sustainable development, such as, climate change, extreme poverty, gender inequality, and access to clean water and sanitation. Through our learner-centered approach, students are able to define problems, engage with stakeholders, evaluate evidence, determine priorities of action, and manage outcomes. Envision's intrinsic aspects of sustainability make it a powerful tool to comprehensively and systematically consider infrastructure development that incorporates the 17 sustainable development goals.

In this presentation, key learning outcomes of our program are introduced and discussed in the context of the various interconnections of sustainable infrastructure within Envision. Learning outcomes provide students with the ability to:

· Develop a holistic understanding of policy instruments, social complexities, human health risks, ecological system dynamics, technological innovations, and financial models to advance sustainable development;
· Identify and challenge status quo assumptions, seeking alternatives, determining solutions and reflecting on results;
· Engage with the global network of development professionals;
· Employ state of the art project management techniques; and
· Leverage local knowledge through global practice.

Fundamental sustainability skills of normative, anticipatory, strategic, and interpersonal competencies from an overarching systems thinking approach are reinforced.

Q & A

Led by Karen Lutz.

<10:10 am > Coffee break.

<10:25 am>

PANEL 4: WHAT TYPES OF PROCUREMENT LEAD TO SUSTAINABLE PROJECTS?

Moderator

Laura Bonich, Vice President, NV5 / SIAB Representative

Sustainable Infrastructure Finance – Discipline of the Market for the Public Good

Robert Eckels, Director, Texas Central Railway

Connecting people and communities with a system that is not only sustainable in its own right but supports a system that improves the quality of life, resilience and economic, social and environmental sustainability of the cities it serves and the region through which it passes.

This presentation looks at the Texas Central high-speed rail project utilizing the N700-S Shinkansen technology deployed between Tokyo and Osaka by the JR Central Railroad. We will discuss how the service corridor between Houston and Dallas was selected, why this technology is superior to traditional alternatives, how the system will integrate with the communities it serves and how that integration supports the financial model to deliver this project. We will also touch on other significant infrastructure projects planned for the Southeast Texas region and compare sustainability considerations with public and public-private financing models.

Sustainability Procurement Practices in the City of Los Angeles, Bureau of Engineering

Michael Sarullo, Division Engineer, Division Manager of the Environmental Engineering Division, City of Los Angeles, Bureau of Engineering

In April 2015, the mayor of Los Angeles released L.A.'s first-ever Sustainable City pLAn. Accordingly, the Bureau of Engineering (BOE) embraced Envision as the sustainability standard for infrastructure projects and in November 2016, the Los Angeles City Council adopted a motion supporting the BOE's decision to utilize Envision as the infrastructure rating system. Additionally, in March 2018 the mayor released L.A.'s first Citywide Resilience Strategy to make Los Angeles stronger and safer. These plans together with other program specific plans such as the Integrated Resource Plan, Recycled Water Master Plan, Enhanced Watershed Management Plans, One Water LA 2040 Plan have provided a framework for BOE to introduce sustainability into its projects. These plans were developed in conjunction with various other City Departments and Bureaus which resulted in the formation of synergistic partnerships working together on sustainable projects whereas prior efforts were somewhat fragmented.

PANEL 4

Abstracts

Evaluating Sustainability Performance on a P3 Transportation Mega-Project: Ohio River Bridges, East End Crossing

Catherine Sheane, Sustainability and Resilience Practice Lead, Parsons
Maria Lehman, VP Infrastructure NY, Parsons

The Louisville-Southern Indiana Ohio River Bridges East End Crossing (EEC) Project consists of a 2,300-foot cable-stay bridge linking Prospect, Kentucky in northeast Louisville to Utica in Southern Indiana, a 1,700-foot twin bore tunnel, and eight miles of new-terrain highway. The EEC Project used the infrastructure sustainability framework, the Institute for Sustainable Infrastructure's (ISI) Envision rating system, to drive sustainability decision-making and evaluate performance. As Indiana Department of Transportation's (INDOT's) largest Public Private Partnership (P3) project to date and the only one involving new construction, at the time of its completion in late 2016, this $763 million project was largest single infrastructure project in North America to be third-party certified by a infrastructure sustainability rating system and the first Platinum Envision™ award for a major river crossing.

The goal presentation is to convey the following main ideas:

· Early commitment to sustainability by the Owner is critical to ensure that sustainability practices are followed throughout the project lifecycle.

· Envision's versatility and focus on transformative practices that consider lifecycle performance are inherently compatible with the scope and requirements of large P3 infrastructure projects.

· Collaboration among project team members and integration throughout all project phases optimizes sustainability performance and Envision credit achievement. It also strengthens relationships among participating firms and serves as on-the-job sustainability training in a rapidly growing specialty.

· As early adopters of the Envision process on a unique project, we will discuss challenges and lessons learned by the Project Team throughout the process.

The IDB's Sustainable Infrastructure Framework and the Importance of Upstream Planning

Graham Watkins, Principal Environmental Specialist, Inter-American Development Bank

The Inter-American Development Bank Group (IDBG) is the leading source of development financing for Latin America and the Caribbean. As part of its effort to promote sustainable infrastructure in the region and globally, the IDBG has launched its Sustainable Infrastructure Framework in early 2018 in coordination with the Public-Private Infrastructure Advisory Facility (PPIAF), The Brookings Institution, and with strong input from the Harvard Zofnass Program as well as other public and private sector players. The Framework has four sustainability pillars: Economic and Financial; Environmental and Climate; Social; and Institutional. These are to be implemented in the infrastructure project cycle – from planning and design, construction and tendering, to financing and decommissioning – within the IDBG and externally with public and private sector clients. Furthermore, the Framework places strong emphasis on strengthening upstream decision-making processes to ensure that the right project is chosen, including through appropriate sustainable procurement policies. The IDBG's input will provide detailed insights on the Framework and its further use, recent developments in its effort to promote upstream decision-making processes and green procurement in particular, and also briefly touch upon its other current initiatives in the field of sustainable infrastructure.

Rebuild by Design- Innovative Procurement in Resilient Design

Amy Chester, Managing Director, Rebuild by Design

Rebuild by Design, initially created by the government, led response to the devastation of Hurricane Sandy in the Northeast United States used a public private partnership mode to parter the best minds of the world with communities in the affected region to create large-scale, design driven infrastructure solutions to address future climate change.

The model, then replicated for the National Disaster Resilience Competition, used disaster recovery funds as an incentive for local government and communities to work together. This model, now independent from government, has since been applied on all scales including a non-disaster situations such as planning for sea level rise in the Bay Area, transportation planning in Atlanta, Georgia, restoring an urban forest in Athens, Greece and on a mobile home park in Boulder, Colorado. The model is currently being considered in Puerto Rico as part of their disaster recovery plan.

Q & A
Led by Laura Bonich.

<12:30 am > Lunch Break, food available for all attendees.

PANEL 5

Abstracts

<1:25 pm>

A CASE STUDY
REBUILDING WATER SYSTEMS IN PUERTO RICO AFTER MARIA: THINKING OUT OF THE BOX?

Moderator
Thomas Lewis, President, Louis Berger US / SIAB Representative

Rebuilding with Nature: Challenges and Ideas for Rebuilding Puerto Rico Water Systems

Judith Rodríguez, Research Associate and Zofnass Program Administrator, Harvard University

The presentation will provide a big picture of the context and challenges facing water systems in the island of Puerto Rico that is recovering from hurricanes Irma and Maria. There is a pressing need, as well as an opportunity, to rethink water systems to be safer, more reliable, and adapted to climate change in order to ensure the wellbeing and the environment, as well as the operations of government and businesses. Approaches that are based on rebuilding with nature can foster sustainability, resilience, as well as promote a blue economy, one that is based on the health and sustainable management of its water resources such as rivers, and oceans. Blue economy represents an opportunity for islands in the Caribbean that face particular challenges for sustainable development, such as small and declining populations, limited resources, vulnerability to natural disasters and external shocks, and strong dependence on imports. As a provocation for the panel, out of the box ideas will be presented for water systems that are based on nature, on synergies between other infrastructure systems, and on promoting a blue economy.

Roadmap Toward Resilience for Water Infrastructure in Puerto Rico

Andrés García Martinó, Water Sector Director, FEMA

The aftermath of Category 4 Hurricane Maria (September 20th, 2017) created the perfect storm to what experts consider one of the most complex water infrastructure systems in the US. All drinking water and waste water services were down, most flood control pumps were out of service, the spillway and outlet works of a major dam were severely damaged causing emergency evacuations, and significant volumes of sediments clogged drainage systems and reduced storage capacity of major water supplies.

The public water utility (PRASA) owns and operates 166 treatment plants producing 500+ MGD of drinking water to 97% of the population and 220+ MGD of treated sewage serving to 55% of population, over 3,500 tanks and pump stations, and over 20,000 miles of pipes. Additionally, three percent of the population (over 90,000 people) receive drinking water from 240 community aqueducts with over 500 components (wells, intakes, tanks) island wide. There are 47 flood control pump stations, 36 major dams, over 50 miles of irrigation canals and various small hydroelectric systems.

In February 2018, the Bipartisan Budget Act 2018 (BBA2018) was approved, which in combination with the Stafford Act, create unique opportunities for historical improvements to 'critical services' infrastructure.The BBA2018 refers to 'replace or restore the function of a facility or system to industry standards without regard to pre-disaster condition of the facility or system'; and 'Replace or restore components of the facility or system not damaged ... to industry standards'. Guidelines are being developed as the BBA2018 provides additional authorities for restoration of critical services, including water.

FEMA and the Government of Puerto Rico are implementing a unique and unprecedented Solutions Sector Based Team approach. Since March 2018, the Water Sector is co-lead by FEMA, PRASA and EPA, with important collaborations from multiple US and PR agencies and NGOs. Identifying multiple funding sources, other than FEMA, is a main task assigned to the Solutions Team. This is essential to achieve a resilient water infrastructure.

The Recovery Plan for Puerto Rico became the official roadmap for all infrastructure capital investments, August 2018. Regarding water infrastructure, the Plan's goal for water is for '... systems to be safer, more reliable, and protected from future disasters...'.

By accomplishing resiliency, water systems in PR will: 1. Protect human health and the environment, 2. Ensure continuity of water and wastewater services, 3. Provide efficiency and financial sustainability to its operation. Furthermore, to provide clarity and a structured and orderly implementation, industry standards and solutions/projects toward resilience for each system or component are grouped as: 1. Energy Resiliency and Redundancy, 2. Capacity Redundancy, 3. Controls and Instrumentation Capability.

A methodology will be implemented at the solutions/project conceptual and design stages to measure levels of resilience at each water system and/or components, for each defined solution. A continuous improvement approach will also be methodically applied. The common goal is for water systems to become stronger and more resistant against future similar events. It will be the result of a collaborative effort among the Government of Puerto Rico, FEMA, EPA, NGOs and the people of Puerto Rico.

PANEL 5

Abstracts

Microgrids in Temporary Power Applications - Experience Implementing Substation-Level Diesel Microgrids and Facility-Level Hybrid Solar/Diesel Microgrids in Puerto Rico

Alex Nadolishny, Program Manager, Louis Berger US

Historically, temporary/emergency power has been provided on the facility or individual load level and did not include renewable or hybrid technologies. Following Hurricane Maria that hit Puerto Rico in September of 2017, Louis Berger engaged in two initiatives that used innovative approaches to providing temporary power and in doing so created a precedent that should allow bringing the modern technology to emergency power applications.

In a close cooperation with US Army 249th Power Battalion, Louis Berger designed, installed and operated temporary substation-level microgrids that allowed powering not only critical infrastructure loads normally supported by FEMA and USACE missions, but rather entire communities numbering tens of thousands of residents.

As a part of a philanthropic Give-Back initiative, Louis Berger has also deployed several Mobile Hybrid (Solar/Storage/Diesel) power generators in both the off-grid prime power mode as well as in the grid-tie, behind-the-meter microgrid configuration. This is a new, disruptive technology applicable for temporary and remote power applications where power reliability and quality, cost of fuel and maintenance, as well as environmental impact are driving factors. The unique length of the PR temporary power mission (over 12 months) has provided an opportunity to collect necessary application and use data for a mission-level assessment of the new technology against the baseline of conventional mobile diesel generators.

Water System Resilience

Katrin Bruebach, Associate Director, Urban Water & Sanitation, 100 Resilient Cities

Water management is complex, encompassing overlapping and interconnected systems and multiple stakeholders. Water and sanitation services are shaped by financial and political considerations, affected by urban growth, land use planning and environmental management. Consequently, rebuilding and planning for a resilient water system is neither simple nor straightforward.

Hurricanes Irma and Maria in September 2017 accentuate the need for social and economic transformation across Puerto Rico. But the catastrophe also creates an unprecedented, generational opportunity to build a more equitable and resilient society. The island needs to upgrade outdated and inadequate infrastructure, and, importantly, integrate a holistic, systems-based resilience approach into the recovery work. This will require clear guidance what resilient projects and resilient infrastructure are and ensuring that resilience principles are not only considered in designing infrastructure but also in water management.

100 Resilient Cities defines resilience as the capacity to respond, survive, adapt, and grow in response to shocks and stresses. To 'further' the resilience objective, FEMA and its partners have an important role to play to ensure that better infrastructure is built, innovation is unleashed, and nature-based solutions are promoted. It also requires influencing complex systems that impact service delivery. Rebuilding a water system that can endure, adapt and transform in the face of change and future disasters, whilst improving the quality of life for its people, requires a better understanding of strengths and weaknesses and identification of opportunities to integrate resilience into all aspects of water management. Improving the ability of assets and networks to anticipate, absorb, adapt to and recover from disruption is paramount. Equally, building the capacity of service providers to cope with and recover from disruption, anticipate trends and variability in order to maintain critical water supply and sanitation services and protect the natural environment, is critical. Building a resilient water system requires not only resilient infrastructure but also corporate, financial and operational resilience of water supply and sanitation service providers.

Innovation Trends for Envision Rated Water Infrastructure

Anthony Kane, Managing Director, Institute for Sustainable Infrastructure

The presentation is a brief overview of several Envision rated water infrastructure projects that have utilized innovative methods to achieve heightened sustainability and resilience. Envision is a framework that includes 64 sustainability and resilience indicators, called 'credits', organized around five categories: Quality of Life, Leadership, Resource Allocation, Natural World, and Climate and Resilience. The purpose of Envision is to foster the dramatic and necessary improvement in the sustainable performance and resiliency of physical infrastructure by helping owners, planners, engineers, communities, contractors, and other infrastructure stakeholders to implement more cost-effective, resource-efficient and adaptable long-term infrastructure investments.

Fundamentally, Envision is about supporting higher performance through more sustainable choices in infrastructure development. The framework provides a flexible system of criteria and performance objectives to aid decision makers and help project teams identify sustainable approaches during planning, design, and construction that will carry forward throughout the project's operations and maintenance and end-of-life phases. Using Envision as a guidance tool, stakeholders are able to collaborate to make more informed decisions about the sustainability of infrastructure.

Q & A

Led by Thomas Lewis.

<4:00 pm > **Closing remarks by Spiro Pollalis.**

<4:20 pm > End of Workshop

Bios (in speaking order)

Welcome

Spiro Pollalis

Professor and Director of the Zofnass Program for Sustainable Infrastructure, Harvard University

After 30 years as full Professor at Harvard, Spiro N. Pollalis has moved to the Research Professor position to spend more time on research and consulting. Since 2008, he is the Director of the Zofnass Program for the Sustainability of Infrastructure that has led to the Envision Rating System and the development of Planning Guidelines for Sustainable Cities. He is also the Principal Investigator of the project Gulf Sustainable Urbanism for 10 cities in the Arab Gulf, sponsored by the Qatar Foundation. He has taught as a visiting professor at the ETH-Zurich, Switzerland; TU-Delft, Holland; and Uni-Stuttgart, Germany. He serves as the co-chair of the Advisory Committee for the Future Cities Lab of the Singapore-ETH Center (SEC) and chairs the Sustainability Workgroup for the Future of Construction at the World Economic Forum.

Prof. Pollalis is the chief planner for the DHA City Karachi for 600,000 people, currently under construction, for the Lahore Development Authority City, for the Lahore Knowledge Park and for the master plan of Faisalabad. He served as the Chairman and CEO of the public company for the redevelopment of Hellinikon, the former Athens airport, and he developed the base master plan and business plan (www.pollalis-hellinikon.com) and as a member of the Planning Committee of Athens. Prof. Pollalis serves as Board member in large engineering firms and consults governments on sustainability.

Professor Pollalis received his first degree from the University in Athens (EMP) and his Master's and PhD from MIT. His MBA in high technology is from Northeastern University. He has an honorary Master's degree in Architecture from Harvard.

Paul Zofnass

President, Environmental Financial Consulting Group, and Zofnass Program Founder

Paul is President of the Environmental Financial Consulting Group (EFCG), a firm he founded in 1990 to provide strategic and financial advice to the environmental and infrastructure engineering/consulting ("e/c") industry. EFCG currently serves as a retained advisor to over 50 major e/c firms, and has served as an advisor to over 300 firms over the past 27 years, and completed over 140 M&A assignments. Prior to that he spent 17 years in finance at Citibank and at Oppenheimer, where he was Managing Director in Investment Banking. He is an alumnus of Harvard College, Harvard Law School and Harvard Business School.

He is a long-term environmentalist, having assisted Harvard to establish its Environmental Studies Program in the 1990's and providing its first Environmental Scholarship; initiating and contributing the Zofnass Tree Identification Program to NYC's Central Park; creating the Zofnass Family Preserve/Westchester Wilderness Walk, a 250 acre nature preserve with a 10-mile long hiking trail in Pound Ridge, NY, 45 miles from NYC; donating a permanent New England Forest Exhibition at the Harvard Museum of Natural History, and creating the Zofnass Infrastructure Sustainability Program at Harvard to develop a rating system to evaluate Sustainability as it applies to major civil infrastructure projects. He serves as a Faculty Member for Harvard's Department of Organismic and Evolutionary Biology; served on the Visiting Committee to Harvard's Arnold Arboretum; a Board member of Riverkeeper; a Board member of the Mount Auburn Cemetery in Cambridge, and served for 20 years on the board of the Westchester Land Trust.

PANEL 1

John Lynch

Director Social Impact Banking, Barclays

Jed Lynch is a Director in the U.S. Investment Banking Division at Barclays and leads the Social Impact Banking team. Jed advises positive-impact companies, which are businesses with a product or service that addresses an environmental or social challenge, on capital raising and corporate strategy. He also works with large-cap companies on the structuring of sustainable financing products and ESG strategy.

Jed joined Barclays in 2008 and previously worked in equity capital markets and debt capital markets. Jed graduated from Yale College and double majored in Economics and International Studies.

Bryna Lipper

Loeb Fellow, Harvard University GSD / 100 Resilient Cities

Bryna Lipper has held leadership roles in government, nonprofit, and private sector organizations dedicated to advancing the quality of urban life. As co-founder and senior vice president for 100 Resilient Cities, she led the formation of its urban resilience practice and global network to enable cities to adapt to 21st century challenges. During her tenure this work reshaped the policies, governance, and politics of cities within 47 nations. Prior to that, Lipper directed Philanthropic Research and Initiatives for the Office of International and Philanthropic Innovation at the US Department of Housing and Urban Development, leading strategies to spur philanthropic partnerships, promote policy innovation, and increase aligned investments. She was vice president for Marketing, Communications, and Government Affairs at the National Building Museum and cofounder of the Global Studio—a nonprofit encouraging design students and building professionals to serve in vulnerable communities. Lipper has spoken and consulted widely and has won numerous honors, including a PLACES Fellowship from the Funders' Network for Smart Growth and Livable Communities.

Andreas Georgoulias

Director, Environmental Financial Consulting Group

Andreas Georgoulias is the Director for International work at EFCG. He joined EFCG in his current role in March but has been collaborating with the firm since 2006. He has advised major engineering consulting and construction firms, multilateral development banks and infrastructure funds. He has worked in assignments and projects in more than 20 countries throughout the world. He is affiliated with the Zofnass Program for Sustainable Infrastructure at Harvard University, where he has been a faculty for eight years and still teaches at the executive education programs. His PhD at Harvard studied risk management processes at engineering and construction firms. He also holds degrees in engineering and project management.

HBS CASE STUDY SESSION

John Macomber

Senior Lecturer, Zofnass Program Advisor,
Faculty Chair of the HBS Africa Research Office, Harvard Business School

John Macomber is a member of the Finance faculty at Harvard Business School. His research focuses on urbanization and particularly the opportunity for private finance of public infrastructure in cities in the global South: Latin America, Africa, South Asia, and Asia/Pacific. His primary MBA course at HBS is "Building Sustainable Cities and Infrastructure," in the Finance unit. Mr. Macomber is the Faculty Chair of the Harvard Business School Africa Research Office and a Zofnass Program advisor. He has also taught at MIT and the Harvard Design School in both graduate programs and Executive Education. Prior to joining the HBS faculty, Mr. Macomber spent several decades in the real estate and construction industry. He is a graduate of Dartmouth College and Harvard Business School.

PANEL 2

Marty Janowitz

Vice President Sustainable Development, Stantec / SIAB

As Stantec's Vice President, Sustainable Development Marty has been responsible for guiding Stantec's efforts to become an exemplary model of sustainability in its operations and to advance integrated services addressing important evolving trends. He has played a prominent role in the emergence of sustainable infrastructure within integrated urban systems, to optimize lifecycle triple bottom line (economic, environmental, and social) benefits and efficiencies.
Marty is a member of the Sustainable Infrastructure Advisory Board of the Zofnass Program at Harvard GSD and the Institute for Sustainable Infrastructure Envision Review Board. A hands-on practitioner, he was senior advisor on the world's first wastewater treatment and transportation projects to achieve Envision Award and for more than 10 other completed and ongoing Envision-related designs and verifications including as lead Verifier on the largest Envision awarded project. Marty was selected a member of Canada's Clean 50 - outstanding contributors to sustainable development and clean capitalism.

Katherine Zehnder

Vice President, HNTB Corporation

Katherine Zehnder, PE, PTOE, AICP is a Vice President with HNTB Corporation, where she has worked for 20 years in a variety of roles including Ohio Practice Leader. She currently advises agencies across the US on transportation technology. In 2016 she led a consultant team hired by the City of Columbus to develop their two Smart City grant proposals. The city beat 77 other midsize cities to be awarded $40m from the USDOT and $10 from Paul G. Allen Philanthropies.

Katie enjoys assisting clients solve their greatest challenges. She lives in Westerville, Ohio with her husband, Don, and 6-year-old daughter, Ashley Marie.

Bud Braughton

Program Manager, City of Columbus

Bud Braughton, PE is a licensed electrical engineer. He spent 27 years with Conrail and CSX improving and modernizing railroad signal systems. For the past 15 years he's worked for the City of Columbus leading the planning, design, and construction of major downtown and special projects – including 28 projects in preparation for the City's 2012 bicentennial celebration. Since the City of Columbus was awarded the $10m Smart City grant from Paul G. Allen Philanthropies in 2016, he has been leading delivery of the 42 grant projects. Bud lives in Grove City, Ohio with his wife. They have two daughters, a son and 2 grandsons.

Morgan Kauffman

CEO / Owner, Columbus Yellow Cab

Morgan Kauffman is the owner and CEO of Columbus Yellow Cab. After spending 20 years working in and running a family logistics and trucking business, Morgan returned to Columbus Yellow Cab. Columbus Yellow Cab was established by Morgan's grandfather in 1928 using proceeds from his produce sales at The North Market.

Morgan sees this an exciting time for taxi services. Market disruption hit the established taxi business and he welcomes the competition, as it helps propel positive changes.

Morgan most enjoys seeing driver partners achieve their financial goals and works every day to champion their right to a level playing field. Beyond the business, Morgan is a major supporter of the arts and small business and an avid one-wheeler. He resides in Columbus with his wife Lindsey and their two children.

Hakim Drissi

Managing Director, Wren House Infrastructure Management / SIAB

Hakim is the Managing Director of Wren House Infrastructure. Hakim drove Wren House's investments in North Sea Midstream Partners, Thames Water, Associated British Ports, Global Power Generation, Viesgo, London City Airport and Australia's TransGrid.

Prior to Wren House, in 2013, he served as a senior banker within the Investment Banking Department of BoA Merrill Lynch based in London and New York. Hakim worked with clients on a number of cross border mergers and acquisitions and structured financing transactions across all infrastructure asset classes, with particular focus on the energy and power and transport infrastructure sectors. Hakim holds a bachelor degree in Computer Science from Queens College.

Phil Bownes

General Counsel, Wren House Infrastructure Management / SIAB

Phil joined Wren House Infrastructure in 2014 and has 13 years of experience in large-cap international M&A. Phil has worked on all of Wren House's portfolio investments.

Prior to joining Wren House, Phil worked in private practice for Slaughter and May's London and Hong Kong offices and the London office of White and Case.

He has a bachelors degree in Jurisprudence from the University of Oxford.

Andrew C. Kadak

Consultant, Kadak Associates Inc

Dr. Kadak's has a diverse background ranging from day-to-day operations of nuclear plants; to senior executive utility management; to teaching in the Nuclear Science and Engineering Department at the Massachusetts Institute of Technology.

Dr. Kadak was formerly President and CEO of the Yankee Atomic Electric Company (YAEC) that operated the Yankee Atomic Nuclear Power station. Yankee also provided engineering, safety and environmental support services to Vermont Yankee, Maine Yankee, and Seabrook station through its Nuclear Services Division.

Dr Kadak was President of the American Nuclear Society in 1999-2000. He has served as a board and executive committee member of the Nuclear Energy Institute and the industry's Advisory Committee on High Level Waste. In 2005, Dr. Kadak was named by President Bush to serve on the US Nuclear Waste Technical Review Board for two four year terms.

From 1998 to 2010, Dr. Kadak was a Professor of the Practice in the Nuclear Engineering Department of the Massachusetts Institute of Technology. His research interests include the development of advanced reactors, in particular the high temperature pebble bed gas reactor and space nuclear power systems.

Chris Barron

Chief Communications Officer, Bentley Systems / SIAB

Chris Barron is Chief Communications Officer for Bentley Systems. He joined Bentley as VP of Corporate Marketing in 2008 and was named CCO in 2015. A registered architect, Mr. Barron left architectural practice in 1983 to pursue a career in marketing of computer-aided-design software to the AEC industry.

Prior to joining Bentley, Mr. Barron was marketing director for Autodesk's AEC Market Group, corporate marketing manager for Softdesk and senior marketing manager for Intergraph. Mr. Barron holds a bachelor's degree in Biology and Geography from Middlebury College and a Master of Architecture degree from Harvard University.

PANEL 3

Karen Lutz

Corporate Sustainability Director, TRC / SIAB

Ms. Lutz has 30 years' experience in environmental and sustainability consulting in both the public and private sector. Areas of expertise include ESG/sustainability advising, facilitation of strategy development, and reporting/communications. Utilizing a variety of standards and benchmarking tools, she assists clients in in developing measurable solutions that bridge economic, social and environmental goals.

As TRC's Sustainability Director, Karen also leads her company's corporate sustainability program. Her responsibilities include integration of sustainability into TRC's business systems, internal and external communications and reporting, and advancement of market facing services, including sustainable infrastructure, clean energy, and sustainability/ESG advisory services.

Alexandre B. Hedjazi

Director GEPP program / Senior Lecturer, University of Geneva

Alexandre Hedjazi has received a doctoral degree in Urban Planning from University of Grenoble in France and a Ph.D from School of Public Affairs – University of California Los Angeles (UCLA). Dr. Hedjazi's started his research career on the financing of urban infrastructures and Public-Private Governance which contributed to the final document of OECD's Conference for Partnership in the XXI Century. Dr. Hedjazi later joined UCLA to conduct research on regional development and security where among many courses and seminars he lectured on Regionalisation and Energy Security. Since joining the University of Geneva in 2007, he has taught many courses on Urban Sustainability and transitions as well as territorial development, bringing scholars and practitioner to explore and discuss the nexus of development, security and the environment. Bridging his academic research and his experience in the Caspian Sea region, his latest work concerns the impact of emerging economic and political insecurities on regional cooperation and development in the the Caspian Region. Alexandre Hedjazi is also engaged in a research project on system integration in the greater Geneva region through air transportation, energy and environmental nexus analysis.

Cristina Contreras

Research Associate, Zofnass Program for Sustainable Infrastructure, Harvard University

Cristina Contreras is currently a Research Associate at the Zofnass Program for Sustainable Infrastructure at Harvard University. Her research focuses on promoting sustainable practices in infrastructure projects on a global scale, examining and exploring the challenges and opportunities that sustainability can provide to countries and companies. During the last six years at Harvard, she has worked in several research projects ranging from the coordination and supervision of the Infrastructure 360º Awards to identification of the economic implications of sustainability practice in infrastructure projects. As part of the Infrastructure 360 awards team, an initiative sponsored by the Inter-American Development Bank, Cristina has worked in quantifying infrastructure sustainability in more than 40 projects (water and sanitation, transportation and energy) in 12 countries. She also works as an independent consultant for International Financial Institutions to help define a common framework for sustainable infrastructures.

Ms. Contreras' work has been presented in numerous national and international conferences and she has contributed to several published books. Ms. Contreras received her Bachelor's degree in Technical Architecture from Universidad Politecnica de Madrid and a Master's degree in Sustainability and Environmental Management from Harvard University.

Katie P. Wilson
Associate Vice President, TRC

As Associate Vice President, Ms. Wilson manages government and commercial projects with TRC's Advanced Energy team. Her current responsibilities align energy management with climate action plan implementation for two dozen governmental agencies in Southern California. Ms. Wilson has 30 years of project management experience in the government and utility industries, supporting energy, sustainability and environmental planning efforts at local and regional levels. Recent projects include conducting feasibility studies for community clean energy microgrids and completing a greenhouse gas reduction program for a major California theme park. She has executed professional services for energy programs for the four California investor owned utilities, the California Energy Commission, and publicly owned utilities. With three decades of experience managing complex environmental projects and programs for governments and utilities, she understands the nuances of harnessing multiple competing missions, perspectives and visions to craft outcomes that are rationale and supported.

Thomas Gloria
Program Director, Sustainability, Harvard University, Division of Continuing Education

Dr. Gloria is Director of the Sustainability programs at Harvard University's Division of Continuing Education (DCE). The program offers a Master of Liberal Arts in the field of Sustainability and Development Practice to more than 300 matriculated master's students and 1,800 overall enrollments. In addition to his duties as Director, he is a trusted advisor to fortune 500 companies on strategic sustainability initiatives. Dr. Gloria is Chair of the International Society of Industrial Ecology's Life Cycle Sustainability Assessment Committee, Associate Editor of the Journal of Industrial Ecology, member of the US TAG to ISO/TC 59/SC 17 Sustainability in Building and Civil engineering works and serves on Ceres' GM Company Sustainability Stakeholder Committee. He regularly lectures for the Harvard University Extension School and Tufts University.

He holds a Ph.D. and M.S. in Civil and Environmental Engineering from Tufts University and a B.Sc. in Electrical and Computer Science Engineering from the University of Connecticut.

PANEL 4

Laura Bonich
Vice President, NV5 / SIAB

Laura Bonich, PE, LEED AP specializes in providing strategic approaches for infrastructure master planning, (power, transportation, water, wastewater, reclaimed water and drainage). Laura advocates for the sustainable optimization of infrastructure recommending innovative best practices rather than traditional code compliance design approaches with an emphasis on reducing project cost. Laura is a member of the Harvard GSD Sustainable Infrastructure Advisory Board, Chair of the Institute for Sustainable Infrastructure National Technical Committee for the Envision Infrastructure rating system, Member of the USGBC Waterbuild Advisory Board, past branch president of the American Society of Civil Engineers and holds a Master's in Business Administration.

NV5 is a provider professional consulting services in Construction Quality Assurance, Infrastructure, Energy, Program Management, and the Environment with a 60 year history; Ranked 54 out of top 500 design firms by ENR (2017 Engineering News Record) and #1 by Zweig White Hot Firms List.

Robert Eckels
Director, Texas Central Railway

Robert Eckels is a founder and board member of Texas Central Railway, "America's Bullet Train." From private High-Speed Rail to public infrastructure to P3 professional sports venues, he has developed a reputation for creative financing solutions and leadership. He served in the Texas House of Representatives and for 12 years as County Judge/Executive for Harris County (Houston) Texas. As Judge he was chair of the Harris County Toll Road Authority, a 500 lane mile toll road system where he built creative partnerships with Houston METRO and Texas DOT. With TXDOT and local jurisdictions, he built the Houston Transtar Transportation and Emergency Operations Center into a global model of interagency partnerships for transportation operations and sustained training and planning for disaster mitigation, response and recovery.

Robert is an attorney in private practice and a member of the Bar in Texas, New York, DC and Colorado.

Michael Sarullo
Division Engineer, Division Manager of the Environmental Engineering Division, City of Los Angeles, Bureau of Engineering

Mr. Sarullo has a B.S. degree in Civil Engineering over 30 years of Civil Engineering experience managing wastewater projects for the City of Los Angeles, Bureau of Engineering (BOE). He currently serves as the Division Manager of the Environmental Engineering Division (EED) which is responsible for implementing wastewater and water reclamation projects at the Cities' four treatment plants providing Project Management, Design and Construction Management services. His Division delivers an average of $75 million dollars of sustainable infrastructure projects annually and through his leadership BOE has recently won 3 Envision awards (one silver and two platinum) in 2018.

Catherine Sheane
Sustainability and Resilience Practice Lead, Parsons

Catherine Sheane is a Sustainability and Resilience Practice Lead at Parsons with 16 years of experience in engineering, architecture, and sustainability. She received her BSE in Civil Engineering from Princeton University in 1999 and her MS in Civil Engineering with a focus on Infrastructure Sustainability from Carnegie Mellon University in 2006. Her specialties include development and communication of sustainability strategy, managing sustainable project design, construction, and documentation (including third-party certification frameworks such as LEED and Envision), corporate social responsibility reporting, and LCA. She is also a licensed professional engineer with experience in structural condition inspection projects, and design assignments for large-scale bridges and tunnels. Catherine is currently working on the sustainability aspects of several projects, including the LA World Airports Landside Access Modernization Program (LAMP) and the Gordie Howe International Bridge between Detroit, Michigan and Windsor, Ontario.

Maria Lehman
VP Infrastructure NY, Parsons

Maria Lehman P.E., F.ASCE, ENV SP. With more than 37 years of experience, Ms. Lehman has held leadership positions in both the public and private sectors. Currently she is the VP Infrastructure NY at Parsons. Her expertise is in economic development; quality assurance; highway, transportation, and facility planning, design and construction; environmental assessment; emergency management; and infrastructure operations and maintenance. She has successfully completed projects ranging from $10,000 to $4 billion. She served as the Chief Operating Officer and Acting Executive Director for the NYS Thruway Authority, and during that time served as the Project Executive for the replacement of the Tappan Zee bridge.

Graham Watkins
Principal Environmental Specialist, Inter-American Development Bank

Graham Watkins is Principal Environmental Specialist leading the knowledge and strategy agenda for the Climate Change Division of the Inter-American Development Bank. Graham previously worked in the safeguards unit of the Bank specializing in sustainable infrastructure and improving the management of biodiversity and natural resources in Bank operations. He was the Executive Director of the Charles Darwin Foundation in Galapagos from 2005 to 2009 and prior to this he was the Director General of the Iwokrama International Centre for Rain Forest Conservation and Development in Guyana. Graham's professional life includes more than 30 years of experience in sustainable infrastructure, biodiversity, collaborative wildlife and fisheries management, and working with indigenous peoples. Graham has a PhD from the University of Pennsylvania and a Masters from the University of Oxford.

Amy Chester
Managing Director, Rebuild by Design

Amy Chester is the Managing Director for Rebuild by Design, an organization formed to run the Hurricane Sandy Design Competition, which resulted in almost $1 billion in awards from the US Department of Housing and Urban Development to seven projects to address structural and social vulnerabilities. Rebuild now brings its collaborative research and design approach to address climate challenges in cities in the U.S. and around the world.

Previously, Chester worked for NYC Mayor Michael Bloomberg as Chief of Staff to the Deputy Mayor for Legislative Affairs and as a Senior Policy Advisor where she was responsible for the public engagement strategy of PlaNYC. Chester has also worked at the NY City Council and more than a dozen electoral and issue based campaigns, as well as working to build affordable housing and provide benefits to freelance workers.

Bios

PANEL 5

Thomas Lewis
President, Louis Berger US / SIAB

Thomas (Tom) Lewis is the president for Louis Berger's U.S.-based operating company. Lewis previously served as the company lead for its environmental practice and founded and led the disaster management and recovery practice, personally taking part in many disaster recovery and resilience programs over the past 25 years. Prior to joining Louis Berger, Lewis spent 5 years at the Connecticut Department of Transportation as an engineer and project manager. He has expertise and has presented frequently on the topics of sustainability, renewables, waste management and resource efficiency, resilience, and disaster planning and recovery. He earned a bachelor's in civil engineering and a master's in geoenvironmental engineering from the University of Connecticut, and a Juris Doctorate in environmental law from Rutgers University. He is a licensed PE in multiple states, is active in multiple professional organizations, and serves on multiple company boards as well as for the Transportation Research Board.

Judith Rodríguez
Research Associate and Zofnass Program Administrator, Harvard University

Judith Rodríguez is a Research Associate and Program Administrator at Harvard University Zofnass Program for Sustainable Infrastructure. She focuses on key questions surrounding the sustainability and resilience of infrastructure, landscape, and cities. Her experience in sustainability and resilience includes assessments of large-scale infrastructure, of flood resilience best practices for cities, and mapping vulnerabilities to climate change.

Judith holds dual Master's degrees in Landscape Architecture and Urban Design from Harvard University GSD, and a Master in Architecture from the Illinois Institute of Technology. She is an Envision Sustainability Professional, a LEED Accredited Professional, and a Municipal Vulnerability Preparedness provider certified by the MA Executive Office of Energy and Environmental Affairs.

Andrés García Martinó
Water Sector Director, FEMA

Andrés García Martinó serves as the FEMA Water Sector Director in The Caribbean Area Division in Puerto Rico. Andrés is a graduate of the University of Puerto Rico, Rio Piedras campus, where in 1993 he got his bachelor's degree in Environmental Science. He continued his studies in the University of Connecticut, where he graduated with a masters in Water Resource Management.

Some of the many diverse roles that Andrés has fulfilled include, professor of Applied Hydrology (1997-2001) in the University of Puerto Rico, Rio Piedras; Hydrologist for the International Institute of Tropical Forestry, USDA Forest Service. Rio Piedras, P.R. (1995-2001); Assistant to Puerto Rico Aqueduct and Sewer Authority Contract Administrator and assistant to Puerto Rico Infrastructure Financing Authority Director (2001-2002); Executive Assistant to the Governor's Chief of Staff. La Fortaleza, Governor's Office (2003-2004); Vice President Puerto Rico Aqueduct and Sewer Authority (2006-2008); City Administrator and Executive Director, Municipality of San Juan, Puerto Rico (2017).

Scientist, Leader, Innovator, Educator, Public Servant passionate about water and most of all his land, Puerto Rico.

Alex Nadolishny
Program Manager, Louis Berger US

Alex Nadolishny has 25 years of experience in managing engineering design, project delivery and emergency management. He successfully completed multiple high profile projects for a client list that includes early-stage technology developers, project developers, major oil and utility companies, defense contractors, federal government agencies, as well as local government and public agencies.

After servings as Incident Commander during November-December 2017 for US Army Corps of Engineers' Temporary Power Mission in Puerto Rico following Hurricanes Irma and Maria managing a 800-strong mission deploying, servicing and maintaining over 1,000 generators throughout Puerto Rico and outer islands, Alex is now focusing on the development of microgrids in PR.

Prior to joining Louis Berger US, Alex served as a CEO of a technology start-up, QA/QC Manager and Project Manager at an engineering firm and a Division Manager at a large international contracting firm. In addition to his extensive experience in the US, Mr. Nadolishny has also worked internationally with projects in Italy, Romania, Denmark and Japan.

Katrin Bruebach
Associate Director, Urban Water & Sanitation, 100 Resilient Cities

Katrin is an Associate Director at 100 Resilient Cities (100RC) in the Solutions Development and Innovation Team. As Pillar Lead for Urban Water, Drainage and Sanitation, she provides guidance and thought leadership on all things related to urban water and wastewater systems, including scanning and identifying relevant solutions, tools, funding sources, service providers and other potential partners who can bring value to 100RC member cities. Within 100RC Cities her responsibility is to identify, develop, and facilitate the implementation of urban water solutions to enhance the resilience of member cities. Katrin leads global partnership opportunities within the urban water sector and helps 100RC to identify complementary programs across the urban landscape that leverage urban water initiatives to support health, energy, flood control, and green infrastructure solutions. Besides her global responsibilities, she has provided technical support and subject matter expertise to a selected number of 100RC member cities incl. Cape Town, Jakarta, and Surat. She was also part of 100RC's expert team that supported the establishment of the Resilient Puerto Rico Advisory Commission, a collaborative effort led by Puerto Rico's philanthropic, business, government, and NGO sectors to rebuild an island that is physically, socially and economically resilient for the future. In this context she acted as a special advisor to the Water Sector Solutions Group of the Federal Emergency Management Agency (FEMA), an agency of the United States Department of Homeland Security, supporting the preparation of the Puerto Rico Economic and Disaster Recovery Plan.

Prior to joining 100RC, Katrin has been instrumental in improving water and sanitation delivery in some of the most economically challenged countries in the world. She has spent 15 years developing capacities of organizations and building partnerships to produce lasting and meaningful results in improving water supply and sanitation service provision in developing countries across Africa and the Middle East. Katrin is fluent in German and English and holds an advanced degree in Civil Engineering from the University of Hannover, Germany.

Anthony Kane
Managing Director, Institute for Sustainable Infrastructure

Anthony Kane is Managing Director of the Institute for Sustainable Infrastructure in Washington, DC where he oversees and directs the research and further development of the Envision sustainable infrastructure framework. Kane holds a Bachelor of Architecture summa cum laude from Virginia Tech and a Master in Design Studies from the Harvard Graduate School of Design.

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