Welcome to the *Climate-Safe Infrastructure* Webinar Series

Supporting AB2800 and the Work of California's Climate-Safe Infrastructure Working Group

June 6, 2018 | 12-1pm

CALIFORNIA natural resources AGENCY

Hosts

Juliette Finzi Hart | USGS

Co-Facilitator of CSIWG's work

Email: jfinzihart@usgs.gov

Susi Moser | Susanne Moser Research & Consulting

Co-Facilitator of CSIWG's work

Email: promundi@susannemoser.com

AB 2800 (Quirk): Purpose

Examine how to integrate scientific data concerning projected climate change impacts into state infrastructure engineering, including oversight, investment, design, and construction.

AB2800 Working Group and Support Team

Co-Facilitators

Juliette Finzi Hart
USGS

Susi Moser
Susanne Moser
Research & Consulting

The Climate-Safe Infrastructure Working Group

Amir Aghakouchak
UC-Irvine

Bruce Swanger
Cal-Trans

Chester Widom
DGS, State Architect

Cis Liban
L.A. Metro

Dan Cayan
UC-San Diego, SIO

David Groves
RAND

Nancy Ander
DGS, Off. of Sustain.

Deb Niemeier
UC-Davis

James Deane
High-Speed Rail Auth.

John Andrew
DWR

Kristin Heinemeier
Realized Energy

Kyle Meng
UC-Santa Barbara

Martha Brook
CEC

Noah Diffenbaugh
Stanford

Gurdeep Bhattal
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Robert Lempert
RAND

Project Team

Keali'i Bright
Natural Resources
Agency

Elea Becker Lowe
Natural Resources
Agency

Joey Wall
Natural Resources
Agency

Guido Franco
California Energy
Commission

AB 2800 (Quirk): Scope of Assessment and Recommendations

The working group shall consider and investigate, at a minimum, the following issues:

(1) **informational and institutional barriers** to integrating climate change into infrastructure design.

(2) **critical information needs** of engineers.

(3) **selection of appropriate engineering designs** for different climate scenarios.

The *Climate-Safe Infrastructure* Webinar Series

Purpose

- Hear from others elsewhere with relevant experience and expertise.
- Hear from CSIWG members.
- Educate and engage with interested stakeholders on climate change and infrastructure issues.

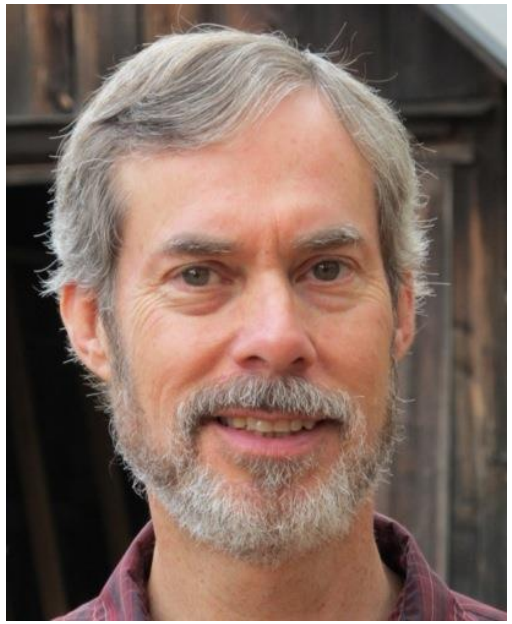
Sample of Webinar Topics

- What climate science can offer
- Various sectoral perspectives
- Processes of changing engineering standards and guidelines
- Holistic infrastructure planning and management
- Financing climate-safe infrastructure
- And others…

A Couple of Housekeeping Items

- Please type your questions for presenters into the chat box
- We will try to answer as many as possible after the presentations
- Answers to remaining questions will be posted on the website
- Thank you to USC Sea Grant!

Enabling Scientists and Engineers Working Together Effectively



Richard Moss
Columbia University

Susi Moser
Susanne Moser Research & Consulting

Alex Wilson
Resilient Design Institute
& BuildingGreen, Inc.

Accelerating Innovation of Applied Climate Science for Risk Reduction: A Role for the Sustained National Climate Assessment?

Richard H Moss
Visiting Senior Research Scientist, Earth Institute, Columbia University
for
California Climate-Safe Infrastructure Working Group
June 6, 2018

This Presentation

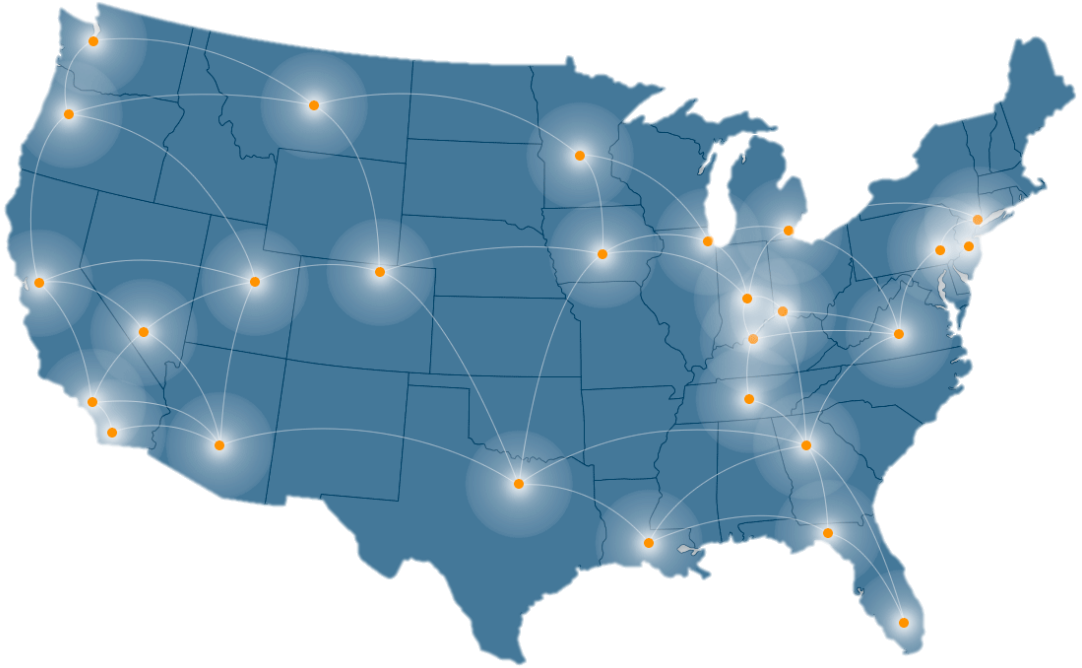
- Short background discussion of "assessment"
  - What is meant by the "sustained" assessment process?
- Advancing sustained assessment
  - Independent Advisory Committee
  - Climate assessment consortium
- Request for feedback
  - Possible working group participation in 'communities of practice'?
  - Incentives for participation?

What are Assessments?

- … synthesize and disseminate knowledge
  - Not ‘climate services’, but provide a foundation for them
- … evaluate the state of knowledge available at a point in time relevant to decisions
  - Public policy to resource management and investment
- … often are report focused but spawn other useful products

“Sustained Assessment”: An Evolving Process to Prepare the Nation for Change

- Concept: “sustained” interactions are required to build “salience, credibility, and legitimacy”
- Explored in 2013 Special Special Report on 4 “critical elements”:
  - Enduring collaborative partnerships
  - Scientific foundations
  - Programmatic infrastructure
  - Resource base and clear priorities
- Focuses on partnerships with the federal government (PREP, Resilience Dialogues, etc.)



Preparing the Nation for Change: https://tinyurl.com/ya6d2nls

Ongoing Activities to Advance the Sustained Assessment Process

- Federal government (with thanks to USGCRP/Agency staff!):
  - NCA4 report process is continuing (expected release late 2018)
  - Additional activities including Sustained Assessment Working Group, Resilience Toolkit, sustained assessment specialists, scenarios, and others
- Civil society efforts – two inter-connected components:
  - Independent Advisory Committee on Applied Climate Assessment (IAC) is developing ideas on expanded approach to sustained assessment
    - Support of NY State, Columbia University, and AMS
    - ~20 members from academia, state/local/tribal government, NGOs, and private sector
    - Will deliver recommendations (~9/18) and disband (~12/18)
  - Climate Assessment Consortium forming for long-term implementation

How the Sustained NCA Process Could Evolve

Current

- Emphasizes “state of science”
- Organized by “sector” and “region”
- Federal predominance
- Emphasizes reports

Future

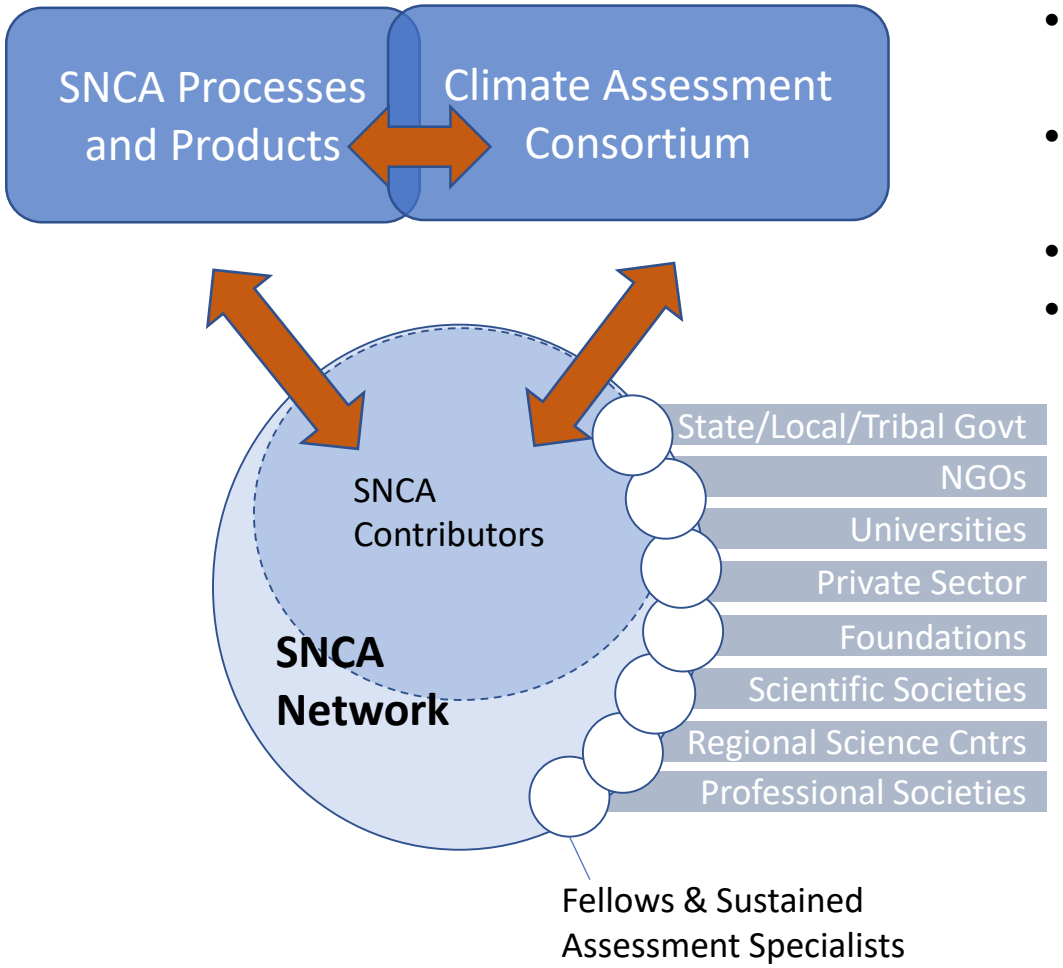
- Adds “state of practice” in implementing solutions
- Includes “implementation challenges”, e.g., updating codes, financial risk, spatial planning, engineering and architectural design
- Shared partnership with state/local and civil society interests
- More diverse products, engagement, and capacity building

IAC Report Outline

1. Introduction
2. Practitioner perspectives and needs for climate action
   - Reflect on what “users” are trying to do and what they need from the SNCA to support action
3. Assessing applied climate and adaptation science
   - Distinguish “state of science” and “state of practice” assessments (process, organization, and content)
   - Explore challenges including how to produce useful insight across individual “case studies”
4. Innovating methods: under-utilized opportunities and under-served practitioner needs
   - Topics such as cost-benefit tools, integrated geospatial/socioeconomic data, indicators, citizen science, artificial intelligence/big data, …
5. Assessment network functions, design, and governance
   - How non-federal and federal NCA stakeholders can work more effectively together to distill, curate, and disseminate knowledge that is useful to action. QC? Priority setting? …?
6. Next steps/recommendations

Civil Society, a Climate Assessment Consortium, and the Federal Science Program

- GCRA of 1990 and USGCRP
- Data and other inputs
- Reports, multimedia, other resources
- Knowledge curation and exchange
- Engagement and participation



- Engagement and participation
- Context of decision- and policy-making
- Trusted, 'honest brokers'
- Maintain and enhance sustained process

- Communities of practice
- Evaluation and "best practices"
- Knowledge for climate services and 'tailoring'
- Technical inputs

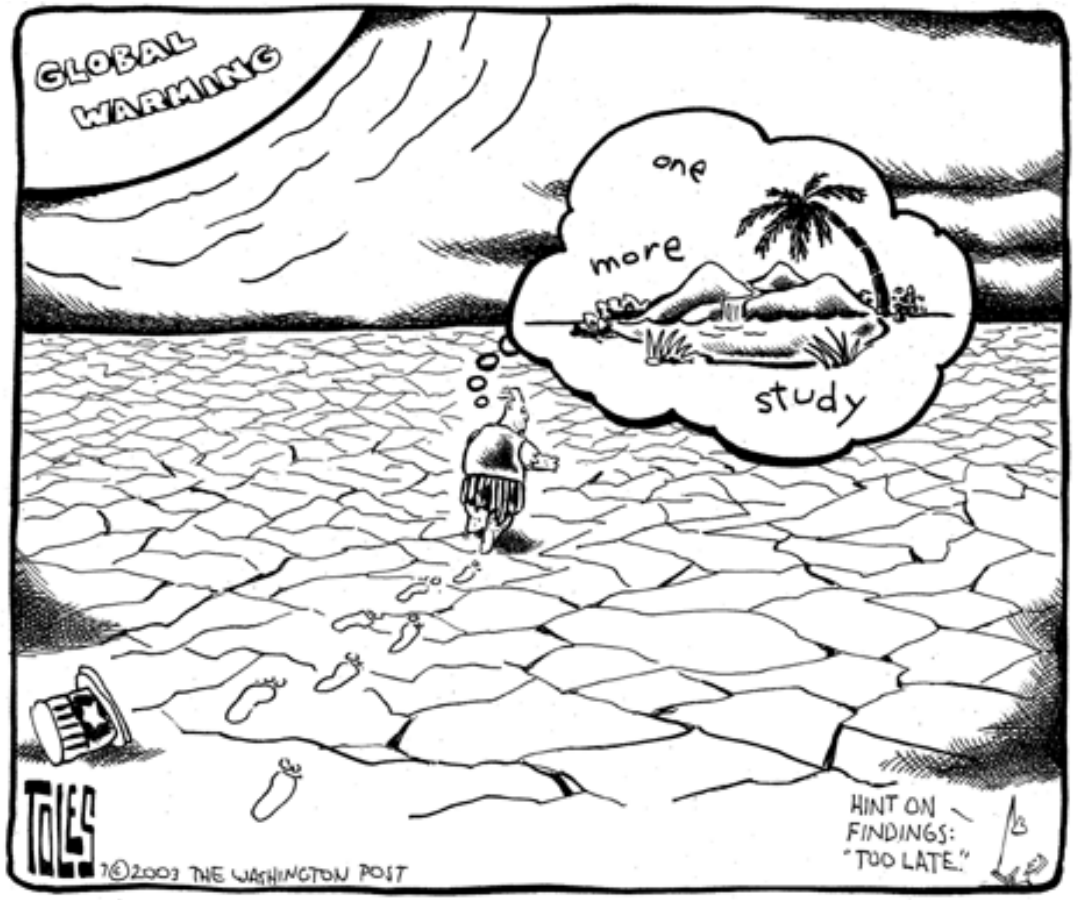
Communities of Practice – “Infrastructure” as Example?

- Much progress in critical elements of “sustained assessment” is in co-production developed in civil society, state/local levels
  - E.g., ASCE and other professional societies; AGU/TEX; AB2800; USDN indicators and resilience hubs; ASAP; AMS attribution studies; …
- We are exploring possible benefits of using the NCA process to form ‘communities of practice’ drawn from these groups, relevant climate scientists, adaptation professionals/climate service providers, and users
  - Example areas: climate-ready infrastructures (specific types); managing coastal change; incorporate climate into financial risk; facility siting (approach to aggregating challenges is itself an issue for further exploration)
  - Topics to explore: adequacy of framing, ‘fit’ of climate and related information, approaches for ‘translation’ to decision/implementation metrics, monitoring, …

Feedback?

- What are your thoughts about the sustained NCA process?
- Is it possible and productive to aggregate individual instances of recurring adaptation challenges (e.g., design of specific infrastructures, updated codes and standards) to conduct comparative assessments and develop ‘good practice’ insights?
  - Typology of use?
  - What can we learn?
  - Pitfalls to avoid?
- Would it be of interest to the AB2800 WG (and/or groups you have engaged with) to participate in well-framed communities of practice?
  - How could you contribute?
  - What would you hope to gain? What would incentivize your participation?
- Note: opportunity to review draft IAC report (July/August timeframe) and participate in assessment consortium process (see email address next slide)

Thank you!



Contact:

Richard Moss
rmoss@climateassessment.org

For more information: info@climateassessment.org

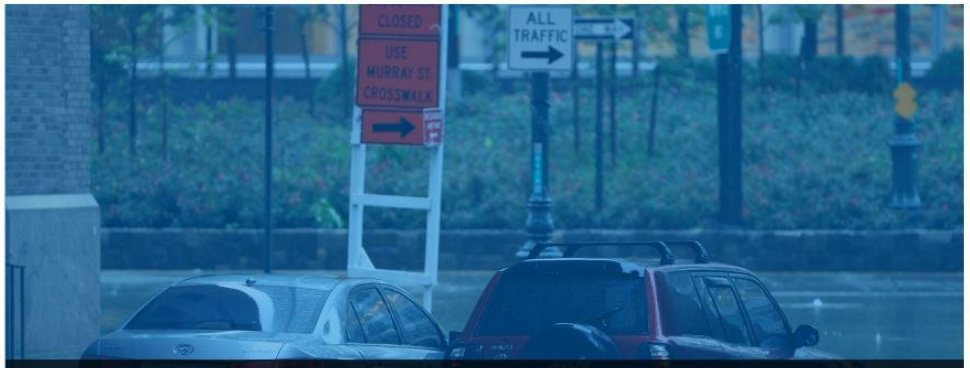
Climate-Safe Infrastructure Working Group Webinar Series
June 8, 2018

TOWARD MORE EFFECTIVE ENGAGEMENT OF SCIENTISTS AND ENGINEERS

The Role of Formal and Informal Education

Susi Moser, Ph.D.
Susanne Moser Research & Consulting

THERANDBLOG



COMMENTARY *(Inside Science)* February 22, 2016

Why Engineers Need to Be Thinking About Climate Change

Cars stranded in flood waters from Hurricane Irene in lower Manhattan, August 28, 2011 Photo by Mike Segar/Reuters

by Kenneth Kuhn

Why Engineering Will Be Vital in a Changing Climate

Smithsonian Secretary G. Wayne Clough offers personal insights on the realities of climate change and the best ways for society to adapt

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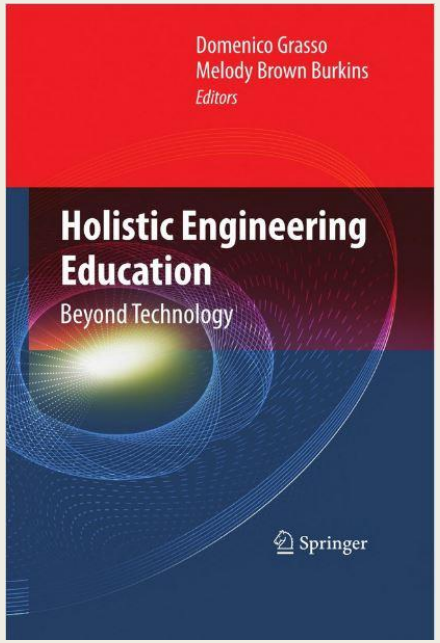
Climate Change: A Call to Action for Engineering & Design Professionals

By: Adam Efird

Climate change. It's happening. Those of us in the engineering, design, and infrastructure industry have never before been presented with such a grand opportunity to affect economies and society like we are now. The scientific community has been telling us for some time now that the way we behave must change immediately if we are to prevent climate change from becoming catastrophic. It's time for the infrastructure industry to fully embrace the crucial role we can play in moving society from discussion to action. It's time for us to demonstrate leadership.



ASCE
AMERICAN SOCIETY OF CIVIL ENGINEERS

CLIMATE CHANGE CONTINUING EDUCATION

SHARE

TAKE ADVANTAGE OF OUR WIDE RANGE OF CONTINUING EDUCATION OPPORTUNITIES

Earn CEUs/PDHs and stay up-to-date on the latest in civil engineering.

Engineering Education Is Changing

- From a focus on technical problems and technical competencies

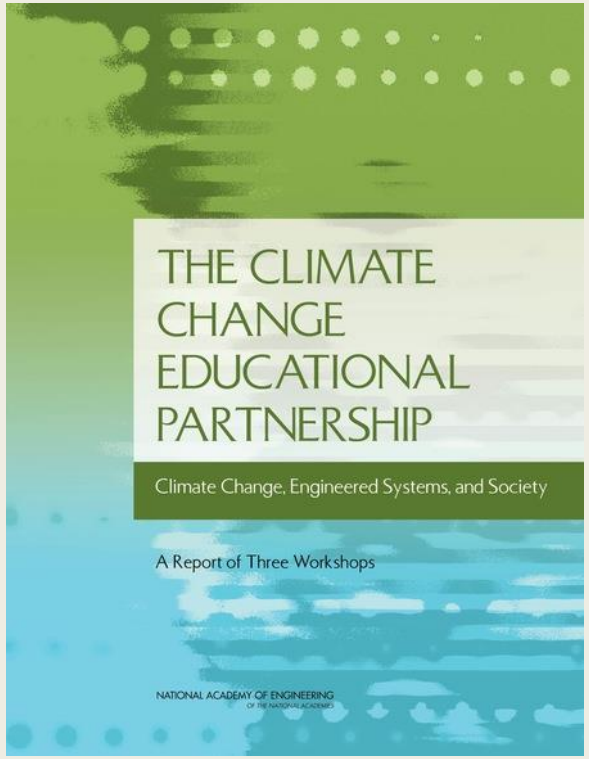
- To a focus on sustainability problems requiring an integrated, adaptive and participatory approach.
  - *Recognition of sustainability and climate change challenges*
  - *Shift toward systems thinking emphasis*
  - *Necessity to develop and teach new methods, tools and competencies*
  - *Consideration of epistemology to deal with different kinds of knowledge and high levels of uncertainties*

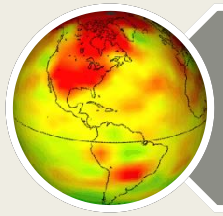
- Engineering Education Research (EER) established as a field of inquiry since 2000s
- European EER finds it easier to educate about complex systems and train “the whole person”, while North American EER is more empirical than theoretical and upholds disciplinary boundaries more strongly

Sources: Borrego and Bernhard (2013), *JEE;* Halbe et al. (2015), *Journal of Cleaner Production*

A NASEM Workshop Series on Engineering Education and Climate Change

(2010-2014)





Climate

Engineering

Society

CEES Center for Engineering Ethics & Society

Arizona State University

University of Virginia

School of Mines 1874 Colorado

Museum of Science

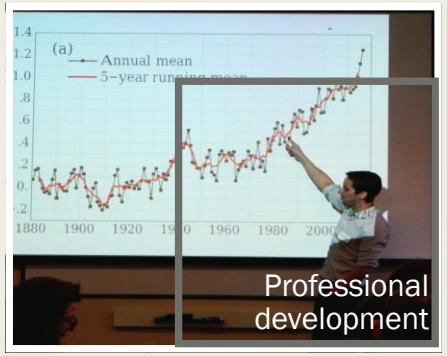
Two Key Gaps in Engineering Curricula

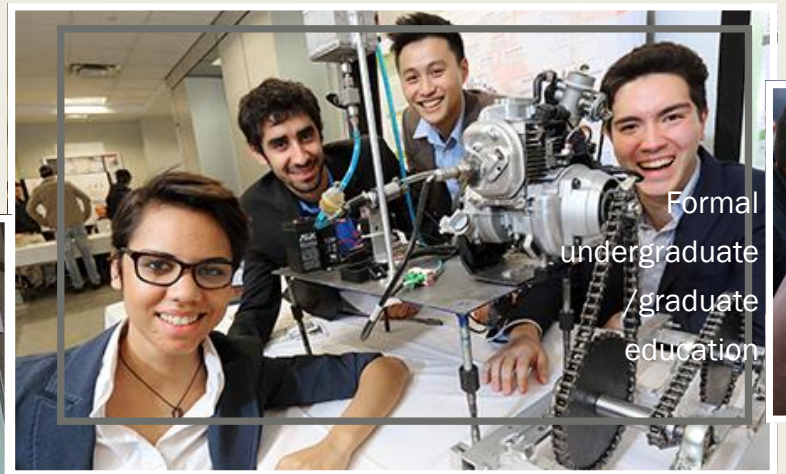
- Climate change remains largely absent in engineering curricula (except renewables engineering)
- Few, if any materials, fully engage the integration of climate, society and engineering

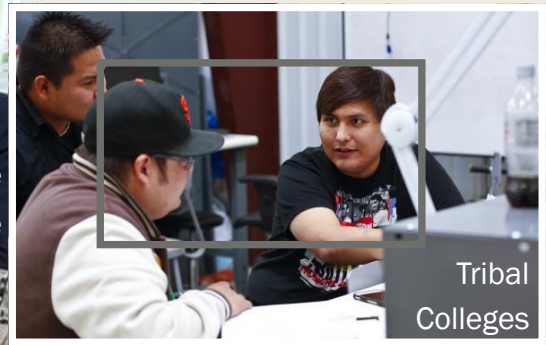
- Needs/ways to promote:
  - *New case studies*
  - *Specialized courses & training*
  - *Courses into which climate change is fully integrated*
  - *Degrees*
  - *Modules*
  - *Exhibits*
  - *Extracurricular activities /service learning*
  - *Prizes*
  - *Institutes, Forums etc.*

Sources: https://www.nap.edu/catalog/18957/the-climate-change-educational-partnership-climate-change-engineered-systems-and

The Earlier We Start…
The Broader We Think…







NAS Report Recommendations

- Focus on youth, adults and professionals
- Identify and create integrated learning resources around key infrastructure vulnerabilities
- Design resources using latest insights into effective learning/teaching methods (active, engaged pedagogy)
- Establish networks of professional and online educational networks to expand educational opportunities
- Cross-cutting: Develop partnerships (professional societies, education experts, private sector, professionals, schools, colleges and universities) to accomplish the above

Borgen Magazine

Source: https://www.nap.edu/catalog/18957/the-climate-change-educational-partnership-climate-change-engineered-systems-and

Building Engineering Competencies for a Changing World

- "Hard" engineering skills
  - an ability to **apply knowledge of mathematics, science, and engineering**
  - an ability to **design and conduct experiments**, as well as to **analyze and interpret data**;
  - an **ability to design a system, component, or process** to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability;
  - an **ability to identify, formulate, and solve engineering problems**; and
  - an **ability to use the techniques, skills, and modern engineering tools** necessary for engineering practice.

- "Professional" skills
  - an ability to **communicate** effectively;
  - an ability to **function on multi-disciplinary teams**;
  - an understanding of **professional and ethical responsibility**;
  - the broad education necessary to understand the **impact of engineering solutions in a global, economic, environmental, and societal context**;
  - a recognition of the need for, and an ability to engage in **life-long learning**; and
  - a **knowledge of contemporary issues.**

Sources: Schuman et al. (2013), *JEE;* American Society for Engineering Education's (ASEE) (1994) Engineering Education for a Changing World

Will Educating Engineers Be Enough?

- Societal decisions about climate change will involve a wide range of experts, decision-makers in various sectors and different publics
- Climate scientists are not usually trained in effective engagement, human concerns, ecology, governance
- Social scientists are not usually trained in engagement with publics or with physical / natural / engineering scientists
- Practitioners do not usually get trained in effective public engagement, not fluid in multiple sciences/disciplines
- None (engineers, scientists and practitioners) are sufficiently trained in matters of finance, law etc.

In Conclusion: California's Role

- The first step is taken: recognition of what is at stake
- Incentivize a rapid and substantial expansion of **end-to-end**, multidisciplinary climate change research, education and application **programs**.
- **Set expectations** through professional standards, qualification requirements, qualifications of those receiving state $$ etc.
  - *Build technical competencies in all sciences (incl. social sciences) and among decision makers.*
  - *Build professional competencies (as described above) in all the sciences.*
- **Expand and institutionalize the state's decision support capabilities**, including a professional development pipeline of well-trained professionals.
- **Provide leadership, model in every sector, and set expectations for serious engagement of the public** in the development and debate of comprehensive climate risk management strategies with well-informed, rigorous debate of trade-offs.

Thank you!

Susi Moser
Susanne Moser Research & Consulting

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Achieving Engagement with Resilient Design

California Climate-Safe Infrastructure Working Group

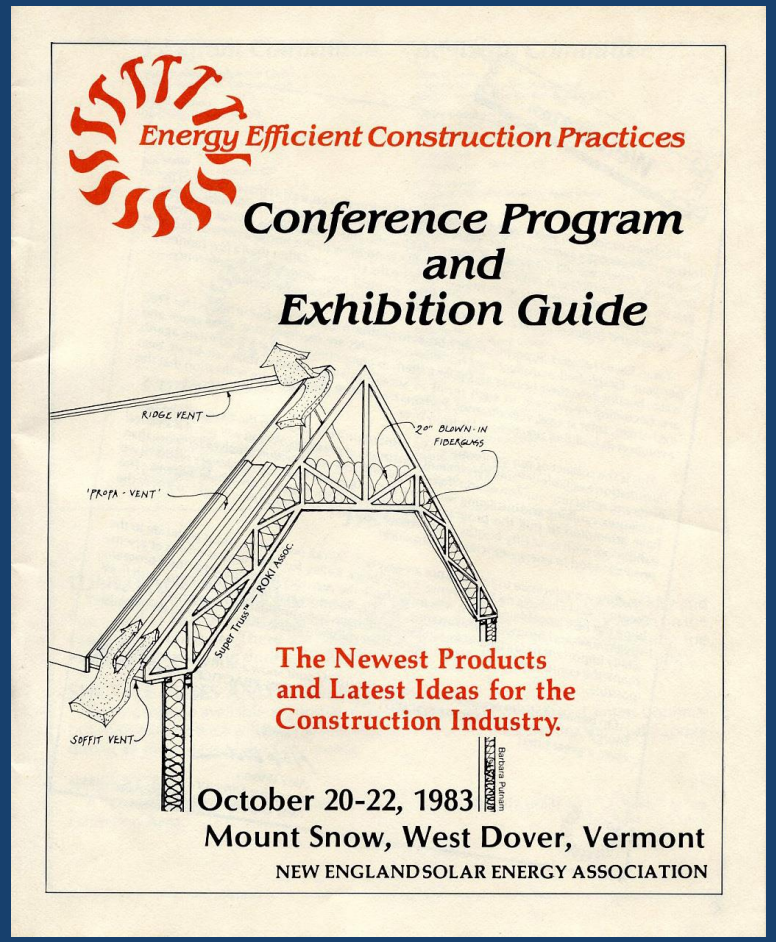
Webinar - June 6, 2018

Alex Wilson, President
Resilient Design Institute
Founder, BuildingGreen

Santa Rosa wildfire, October 10, 2017 - Photo: California Highway Dept.

Evolution of a resilience focus

Solar greenhouse workshop in the 1970s.
Photo: New Mexico Solar Energy Assoc.



Energy Efficient Construction Practices

Conference Program and Exhibition Guide

The Newest Products and Latest Ideas for the Construction Industry.

Barbara Putnam

October 20-22, 1983

Mount Snow, West Dover, Vermont

NEW ENGLAND SOLAR ENERGY ASSOCIATION

Program from 1983 NESEA conf

ISSN #1062-3957

Environmental Building News™

A Bimonthly Newsletter on Environmentally Sustainable Design and Construction

Volume 1, Number 1 — July/August 1992

Welcome to *Environmental Building News*

Buildings have a tremendous impact on the environment. In North America, buildings and the building industry account for about 30% of carbon dioxide emissions, 35-40% of ozone depletion, 20-30% of municipal solid waste, vast quantities of natural resource consumption, and dramatic loss of open space each year. What can we do about it? How can you and I as builders, designers, and others involved in the building industry have an impact in turning the tide on this environmental destruction?

The challenges we face in bringing greater environmental sustainability into the building industry seem tremendous—indeed we need to be careful not to feel discouraged. Yet the opportunities, too, are tremendous. There is so much room for improvement that the strides we can make as an industry are huge.

Environmental Building News seeks to be a voice in the transition to environmentally sustainable building practices. In the pages of EBN we will expose the faults in our current practices, but more importantly, we will present the options we have for turning things around. We will provide a wide range of information on environmentally sustainable design and construction—from leading-edge case studies of sustainable design that will stimulate your creative juices, to hands-on construction details that will help you integrate these ideas into your daily work.

In each issue of EBN we will provide one or two in-depth feature articles—like the pieces on rigid foam insulation and site-work in this issue. In these articles we will try to probe deeply into an issue—getting into more detail than is found in most newsletters. Also in each issue, you will find information on new products and materials, news about environmental trends that relate to construction, reviews of pertinent publications and events, and a regular reader's forum.

Now here's where we need your help. We want *Environmental Building News* to be *your* publication. We want to direct it to your needs and interests. To do this we need to hear from you. Send us your thoughts, your opinions, your suggestions of what we should cover. If you are using construction details that you feel particularly good about, or if you come across interesting new products or materials, let us know about them. Also keep an eye out for information resources that would benefit EBN readers: conferences, seminars, books, periodicals, obscure technical publications...we'll review these materials and pass the information on to our readers.

Finally, thank you. Launching a new publication is a bit scary. When we mailed our first promotion a little over a month ago, we really had no idea what the response would be. We have found tremendous interest. While that makes us feel good about the prospects for EBN succeeding, more importantly it gives us a sense of optimism about meeting the broader challenges we face. We've heard from dozens of builders and architects that the time is right for this publication. Let's hope that the time is also right for a major shift within the building industry toward environmental sustainability.

Rigid Foam Insulation and the Environment

Ozone depletion and global warming are two of our most serious environmental problems—and foam insulation materials containing CFCs (chlorofluorocarbons) contribute significantly to *both* of these problems. The environmentally concerned builder or designer should make it a highest priority to avoid them. Even many of the non-CFC alternatives that manufacturers are now switching to are still damaging to the environment—though less so than CFCs. This article takes a detailed look at various types of foam insulation materials—how the materials are produced, what their environmental impacts are, and what the alternatives available to you are.

Rigid foam has played an important role in the energy-efficient construction revolution we have witnessed since the mid-70s, permitting wall and roof R-values to be boosted dramatically with only minimal increases in wall thickness. The foam has such a significant effect in part because it covers the framing members, thus reducing the thermal bridging that occurs through framing members when only cavity-fill insulation is used. The increasing popularity of foam-core stress-skin panels—some of which are produced with CFC-based foams—for use in both timber frame and structural panel (frameless) buildings is further increas-

(continued on page 11)

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Energy Source Directory
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Feature Articles:
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4 Protecting the Building Site

printed on recycled paper

Our first issue of Environmental Building News in 1992

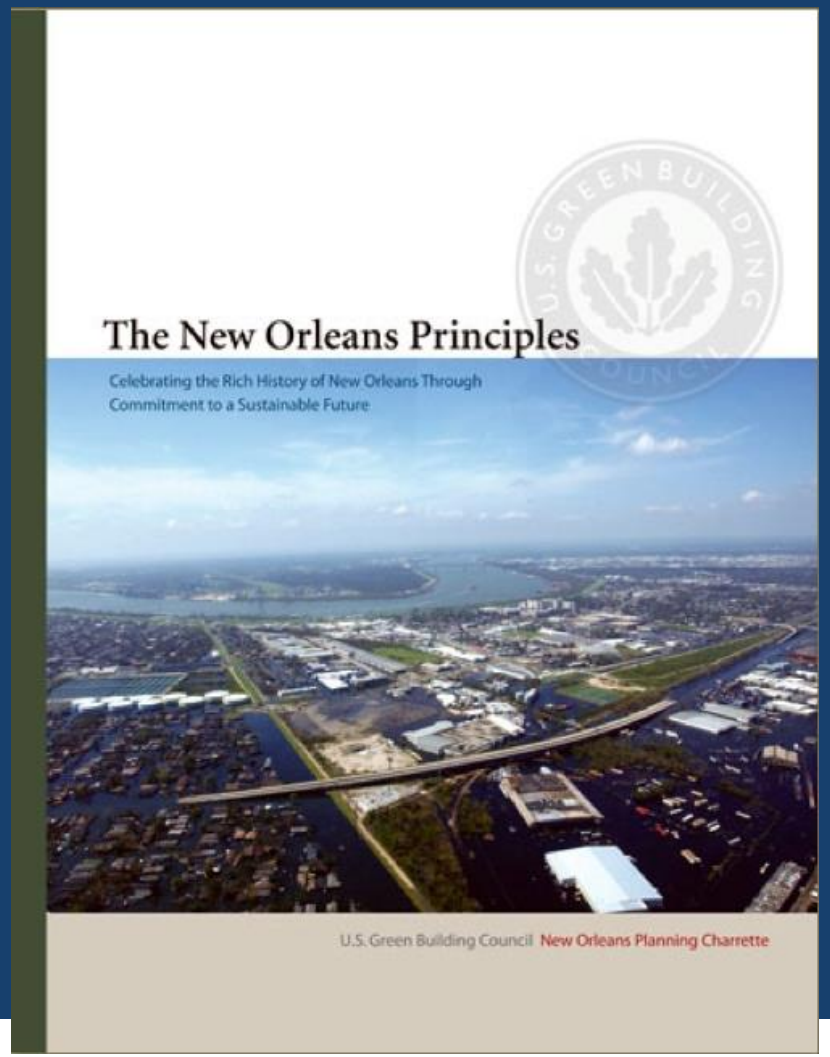
Resilience as a motivator

Flooding in New Orleans from Hurricane Katrina, 2005. Photo: FEMA

Charrette on Gulf Coast reconstruction in the fall of 2005. Photo: Alex Wilson

Resilience as a motivator

- We're not making rapid enough progress in solving climate change
- Life-safety can be a greater motivator than "doing the right thing"
- Potential to appeal across the political divide
- Achieving passive survivability in buildings requires high levels of energy efficiency and passive design
- These buildings can be close to carbon-neutral—adaptation *and* mitigation
- Resilient Design Institute founded in 2012



8 • Provide for passive survivability

Homes, schools, public buildings, and neighborhoods should be designed and built or rebuilt to serve as livable refuges in the event of crisis or breakdown of energy, water, and sewer systems.

The New Orleans Principles

Putting resilient design into practice – Spaulding

Spaulding Rehab Hospital
on Boston Harbor in Charlestown, MA
Photos: Perkins+Will

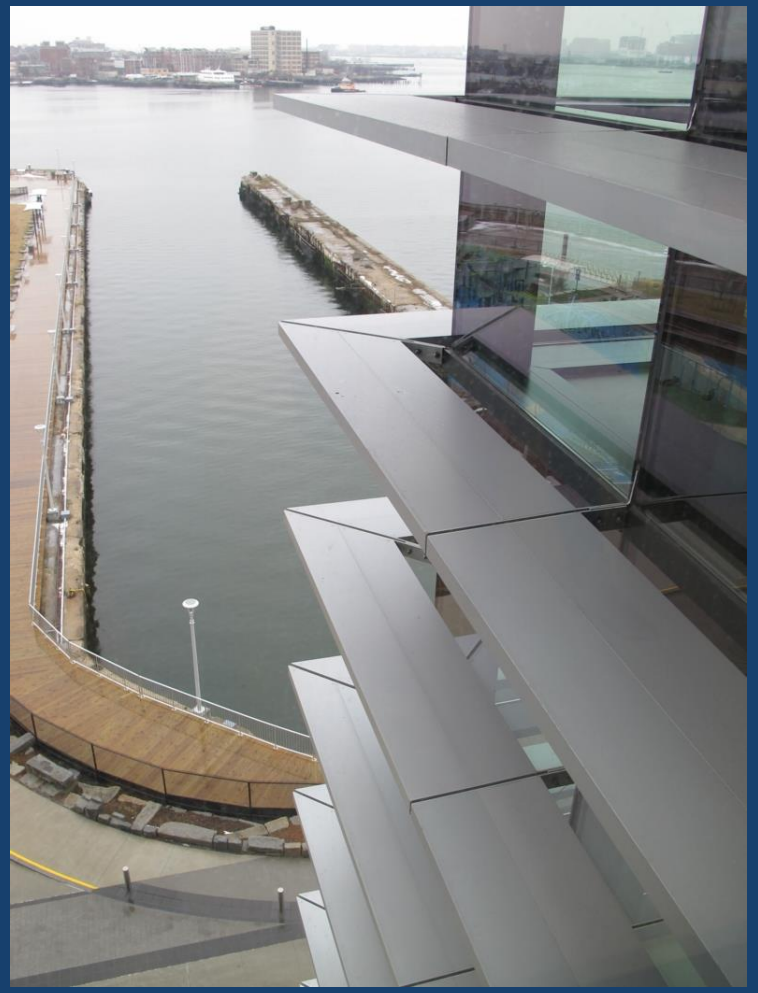
Putting resilient design into practice – Spaulding

Photo: Spaulding Rehab Hospital

Photo: Alex Wilson

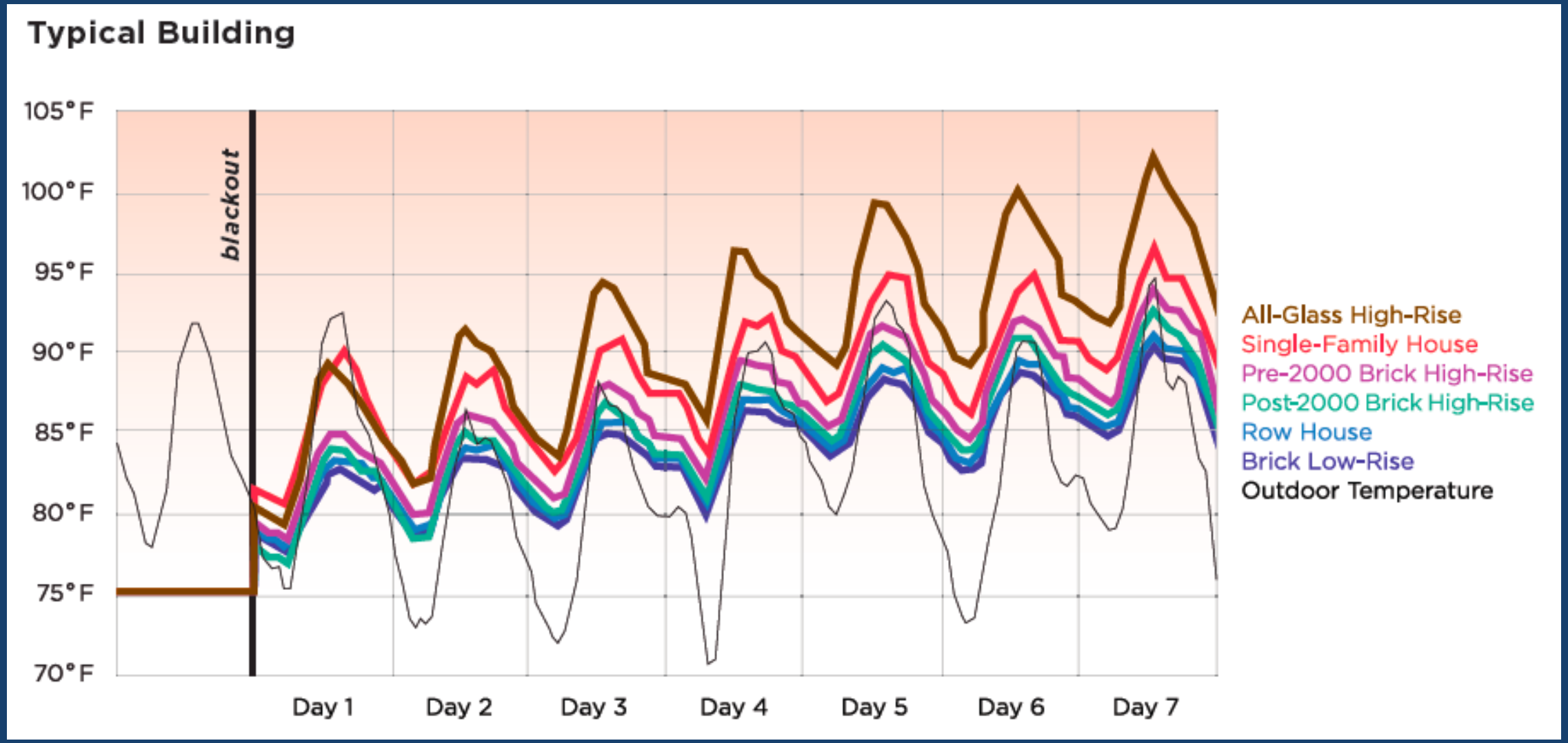
Putting resilient design into practice – Spaulding

Operable windows at Spaulding Rehab - Photo: Perkins+Will



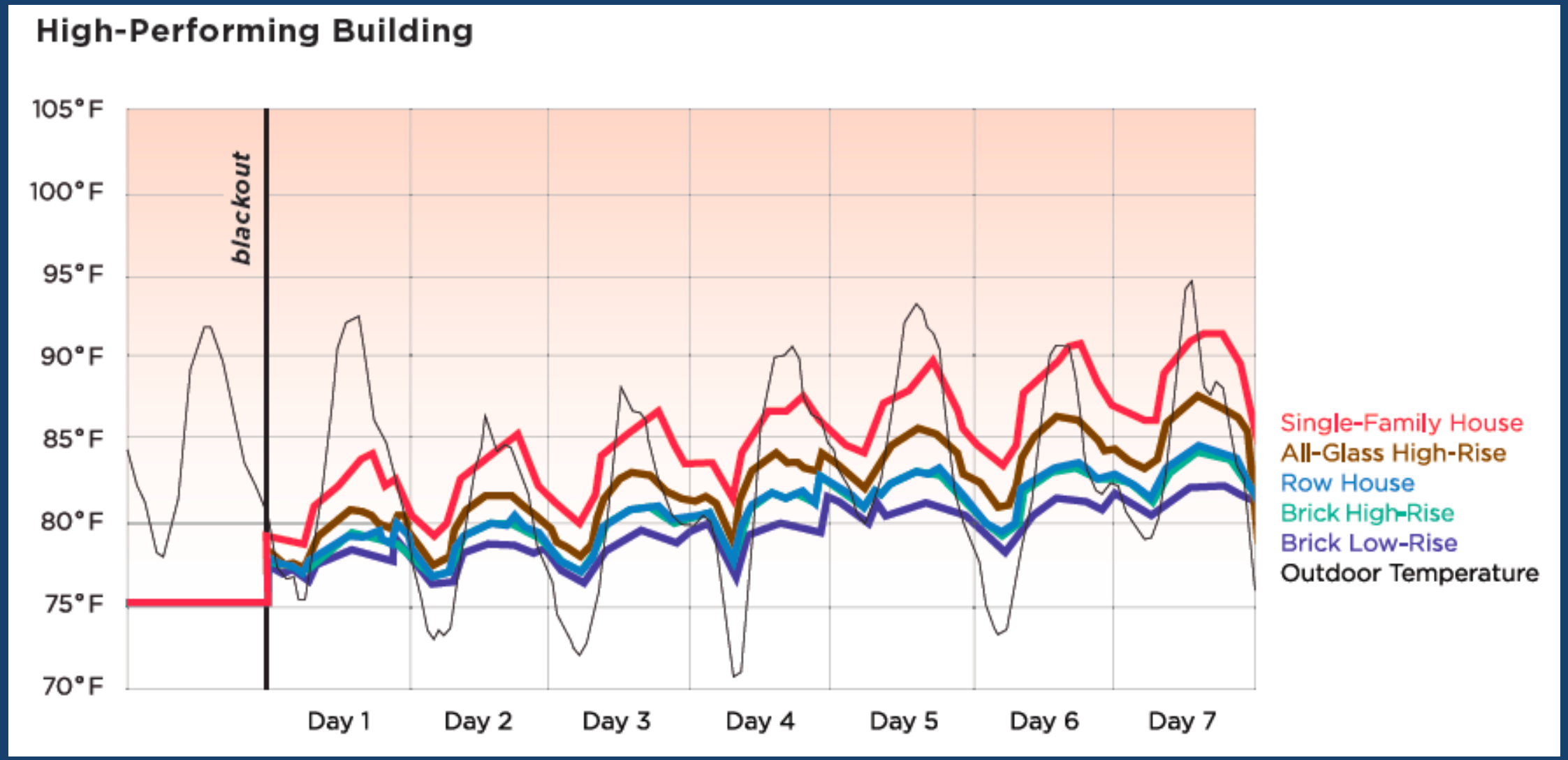
Operable window (above) and exterior shading (right)
Photos: Alex Wilson

Drift Temperatures During Power Outages – Summer



Temperature Modeling: Atelier Ten, New York City in "Baby It's Cold Inside," Urban Green Council

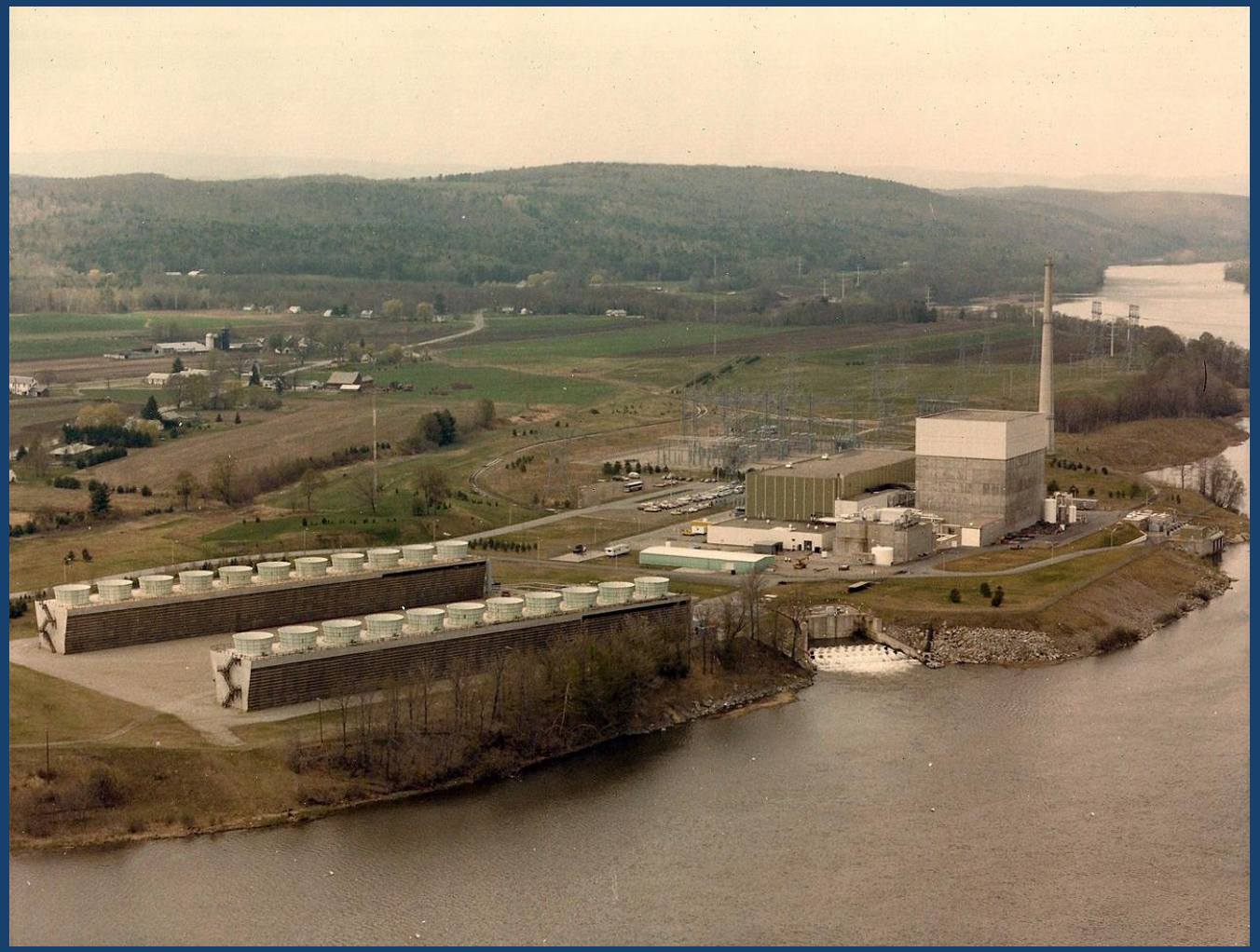
Drift Temperatures During Power Outages – Summer



Temperature Modeling: Atelier Ten, New York City in "Baby It's Cold Inside," Urban Green Council

Effecting change: the Ecovation Hub in New England

- Tri-state region centered in Brattleboro, Vermont faced with the economic challenge of losing a major employer
- Vermont Yankee Nuclear Power Plant, which closed in 2014, employed 600 workers, with a median wage of $105,000 per year
- A local initiative, the Ecovation Hub, has been working to spur economic growth within the "clean economy"
- Mapping local and regional assets, identifying business opportunities, creating business plan templates, attracting young people to the area



Vermont Yankee Nuclear Power Plant in Vernon, VT closed in 2014
Photo: Nuclear Regulatory Commission; Wikimedia Commons

Effecting change: Vermont Climate Economy Initiative

- Along with the threat of climate change are opportunities
- The Vermont Council on Rural Development is working to advance a climate economy in Vermont

Catalysts of the Climate Economy Summit in Burlington, Vermont in September, 2017. Speakers included Paul Hawken and Jigar Shah. Photos: Vermont Council on Rural Development

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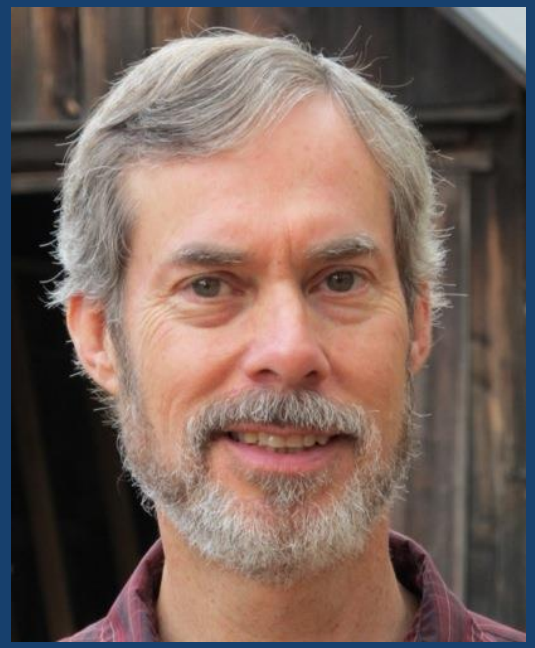

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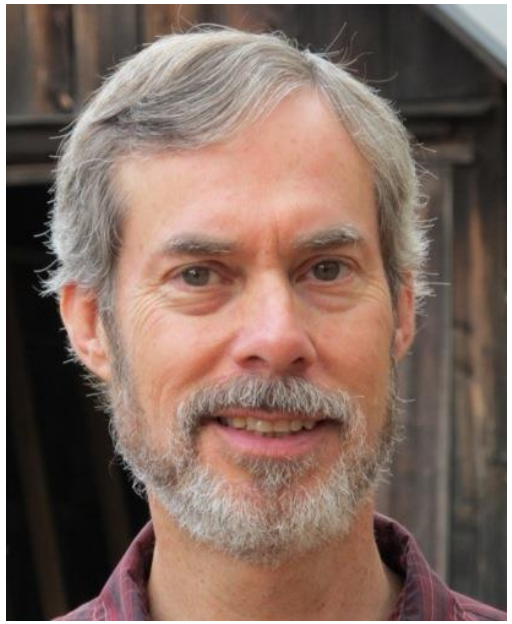
Enabling Scientists and Engineers Working Together Effectively



Richard Moss
Columbia University

Susi Moser
Susanne Moser Research & Consulting

Alex Wilson
Resilient Design Institute
& BuildingGreen, Inc.

Thank you!

- The ***Climate-Safe Infrastructure*** Webinar Series continues at least through July 2018
- Upcoming webinars:
  - Tools Supporting Climate-Safe Infrastructure Design – June 8
  - Monitoring Performance – Working Toward Success – June 11
  - Financing the Future, Part 3 – late June
  - Talking Climate Change with Engineers – July 10 or 12
  - Track webinars and progress of CSIWG at: http://resources.ca.gov/climate/climate-safe-infrastructure-working-group/
- Questions: Joey Wall - Joseph.Wall@resources.ca.gov