

Green Design & Sustainability



Green Design & Sustainability



Presentation Outline

What? *Green Buildings & Communities: Opportunities and Challenges*

Who? *Active Researchers*

How? *Related Research Questions*

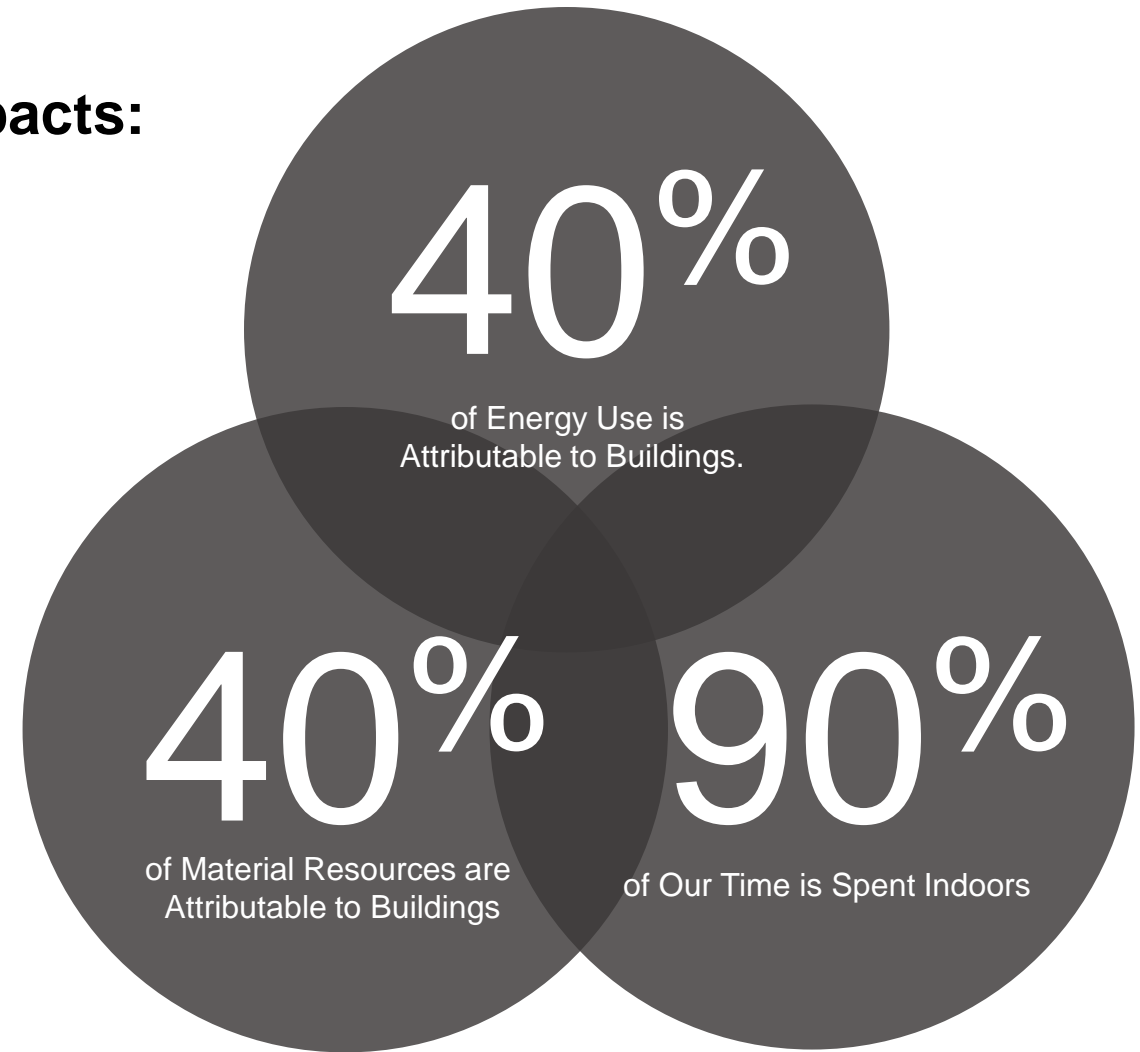
- Energy Efficiency
 - Materials
 - Water
 - Air Quality, Human Health, and Toxicity
 - Sustainable and Resilient Communities
-

Questions?



What? Green Buildings: Opportunities and Challenges

Buildings Have Global Environmental Impacts:



What? Green Buildings: Opportunities and Challenges

What is **Sustainability**?

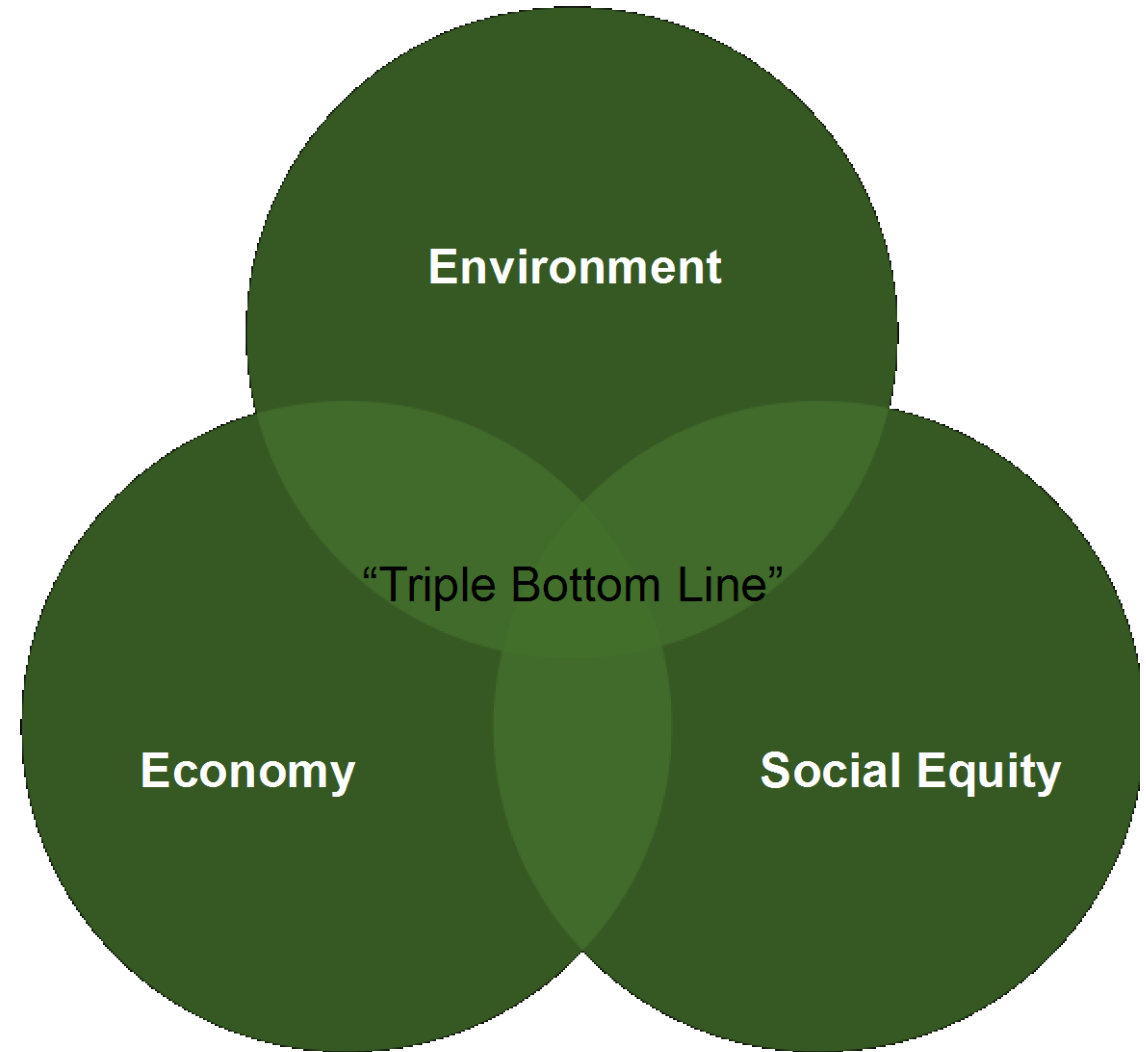
1989 Brundtland Commission:

“...to meet the needs of the present without compromising the ability of future generations to meet their own needs.”

What is **Green Building**?

US Green Building Council

“...the **using of processes that are environmentally responsible and resource-efficient** throughout a building's life-cycle: from siting to design, construction, operation, maintenance, renovation, and demolition.”



Who? Active Researchers



Quick Facts

📖 643 sustainability-related courses offered in 45 departments (24% of all courses).

👤 330 faculty engaged in sustainability-related research in over 36 departments (2/3 of all departments).

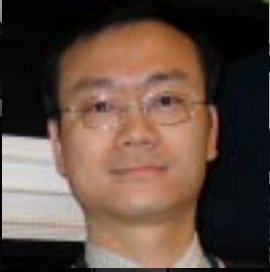
💰 \$79.9 million funded toward environmental research (among the top 10 in the nation).

✚ Hundreds of study abroad programs, alternative breaks, and other immersion opportunities in the United States and 65 other countries.

🐦 #1 worldwide in number of environmental publications, and #2 in geoscience publications.



Gregor Henze, Architectural Engineering
Pre-Cooling and Pre-Heating Strategies
to Shift Peak Energy Demand



Kyri Baker, Architectural Engineering
Grid-to-Building Communications to
Minimize Energy Usage



How much energy do
buildings consume and
how do we minimize it?

**What are the next-
generation sustainable
energy and material
technologies?**

The image features a grid of eight headshots of researchers on the left side, arranged in two columns of four. The background is a photograph of a modern building at night, with its interior lights glowing and its architectural details highlighted. The building has a large glass facade and a prominent, illuminated overhang. The overall scene is set against a dark blue sky.

Sean Shaheen, Electrical Engineering

**Organic and Hybrid Photovoltaics,
Photonics, and Bioelectronics**

Garret Miyake, Chemistry & Biochemistry

**Innovative Window Coatings to Reduce
Building Energy Consumption**



Wil Srubar, Architectural Engineering



**Biomimicry & Natural Low-Carbon Materials
(i.e., Transparent Wood)**



Abbie Liel, Structural Engineering



**Environmental Impacts of Damage that
Occur After Seismic Events**

**How much carbon is
embodied in materials
and how can we
minimize it?**

How effective are new energy policies and what are the economics governing uptake of new energy technologies?



Chrystie Burr, RASEI, Economics

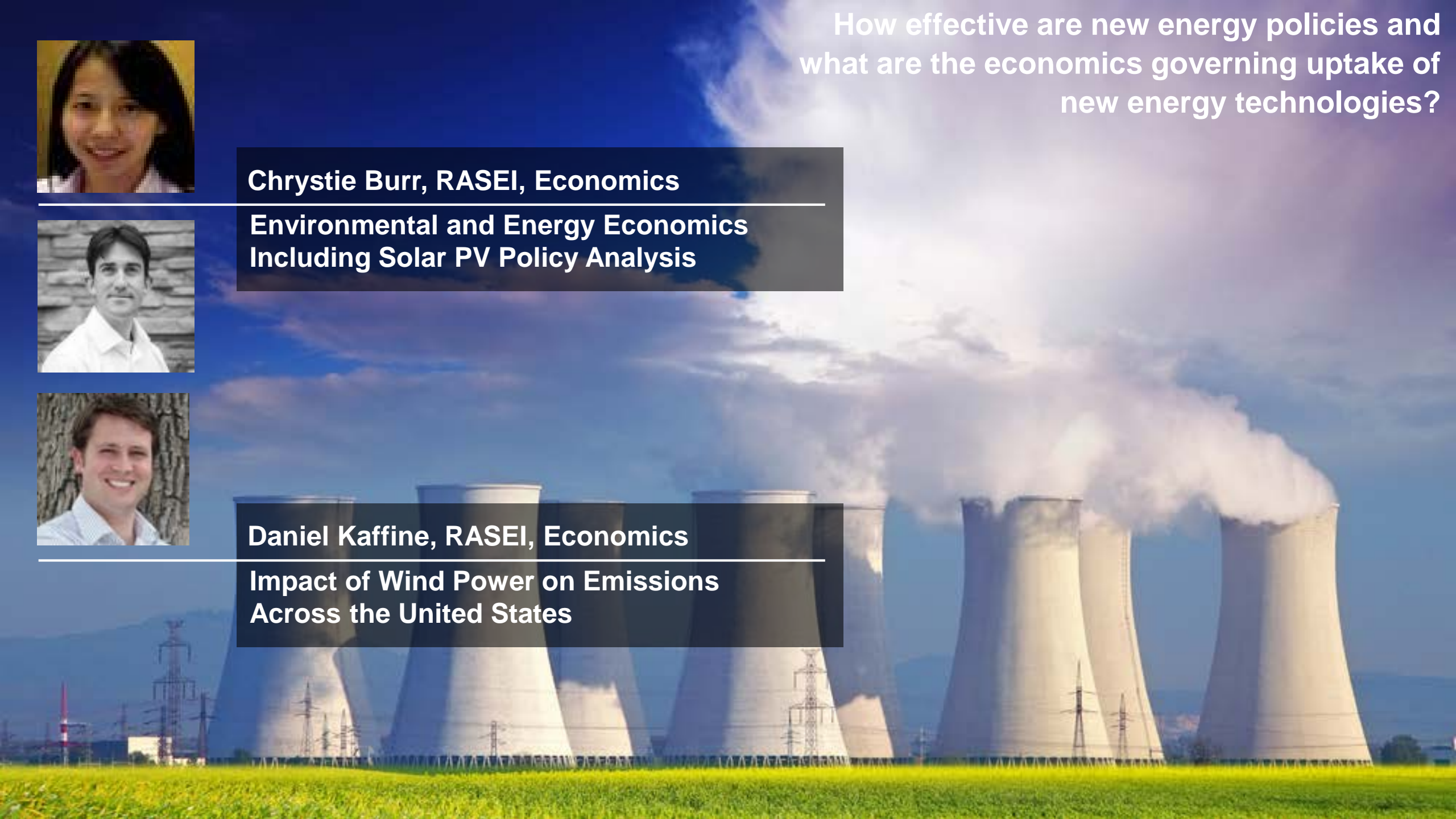


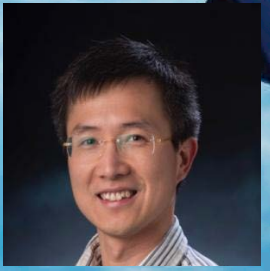
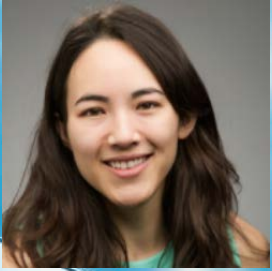
**Environmental and Energy Economics
Including Solar PV Policy Analysis**



Daniel Kaffine, RASEI, Economics

**Impact of Wind Power on Emissions
Across the United States**





How much on-site or renewable energy can be generated and how can it be efficiently integrated into the grid?

Hanh-Phuc Le, Electrical Engineering

Energy-Efficient Electronic Systems and Internet of Things (IoT)

Khurram Afridi, Electrical Engineering

Integration of Electric Vehicles and the Renewable Energy Grid



Mija Hubler, Structural Engineering

**Toxicity of Cement Particles After
Extreme Events**



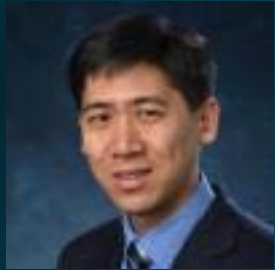
Lupita Montoya, Environmental Engineering

**Health Effects of Aerosols on Human
Health, Toxicity, and Disease**



**What effect do our materials
(aerosols, VOCs, particulates)
have on occupant comfort and
human health?**





Scott Summers, Environmental Engineering
Bio-Char Energy Sources from Human Organic Waste



Sherri Cook, Environmental Engineering
Sustainable Water Systems, Anaerobic Wastewater Treatment



How can we reuse our grey- and blackwater (and other wastes) on site?



Keith Porter, Structural Engineering

**Seismic Resilience of Buildings and
Communities**



Leah Sprain, Communication

**Community Participation in Resilience
Decision-Making**



**How does community resilience relate
to environmental, economic, and
social sustainability ?**



Paul Chinowsky, Civil Systems Engineering
Climate Change Impacts and Economics of Proactive Adaption

Amy Javernick-Will , Construction Engineering
Disaster Recovery in Developing Communities



How are our most at-risk communities adapting to climate change?

Questions?



Wil V. Srubar III, PhD
wsrubar@colorado.edu

