AAK Annual Convention 2019

Building Blocks and the Built Environment

14 - 16 August • Sarova Whitesands Beach Resort

Commonwealth Association of Architects General Assembly

Title: Building Manufacturing for Climate Sustainability

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Climate Change challenges for the Built Environment and How Building Manufacturing can play a role as a mitigation measure

- What does climate sustainability mean and how can Built Environment Professionals contribute to addressing this.
- What are the current trends in building manufacturing and how they impact climate change.
- Mitigation measures that designers can taken in the specification of building materials.
- How can buildings and cities change to respond to climate sustainability.

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Buildings and land-use are responsible for a large proportion of greenhouse gas emissions

Daily loss of 800 km² of vegetation worldwide

Research source:
Technische Universität Berlin
Institute of Architecture

A Snapshot

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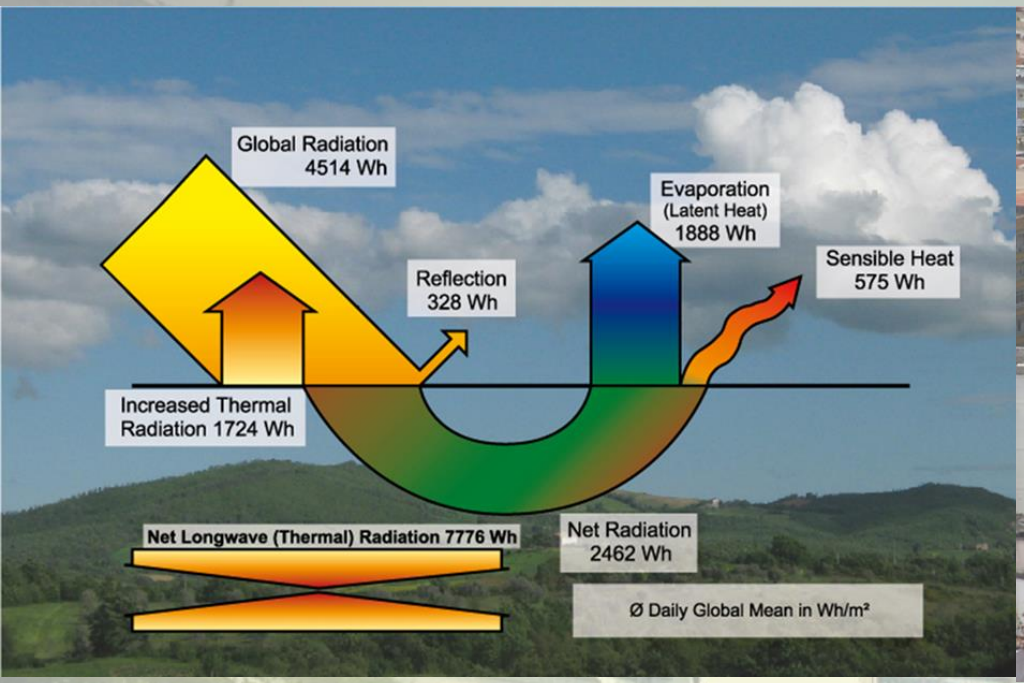
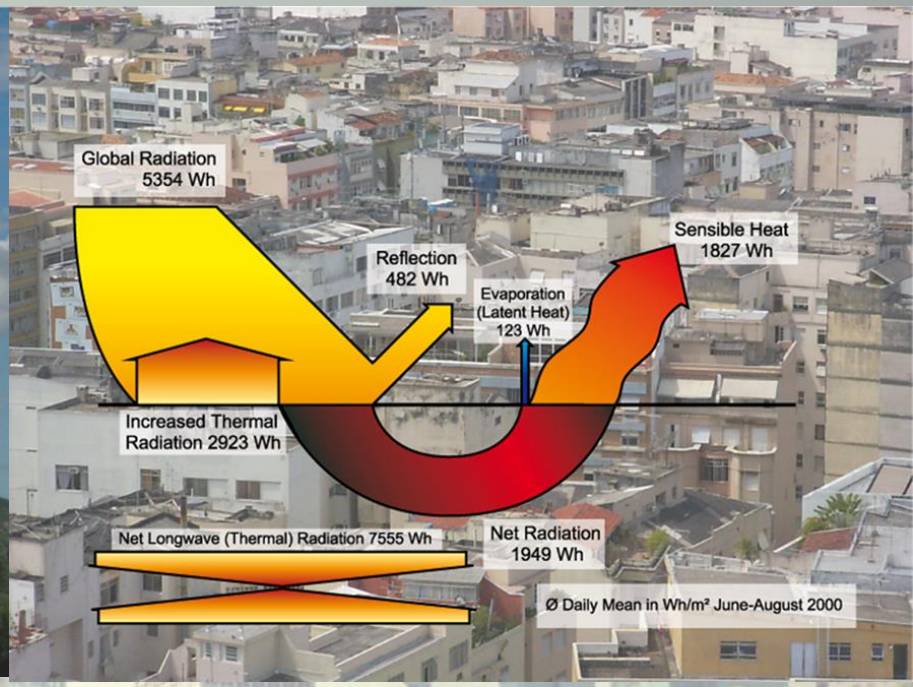
Traditional Building's Urban Heat Island Effect





Buildings, communities, cities-the hallmarks of a built environment including the resources used to create them and the energy, water, and materials needed to operate them, have a significant effect on the Climate, environment and human health.

In the United States, buildings account for:

- **14% of potable water consumption1**
- **30% of waste output**
- **40% of raw materials use2**
- **38% of carbon dioxide emissions**
- **24% to 50% of energy use**
- **72% of electricity consumption3**

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Climate Sustainability?

Sustainability and "green," often used interchangeably, are about more than just reducing environmental impacts. Sustainability means creating places that are environmentally responsible, healthful, just, equitable, and profitable. Greening the built environment means looking holistically at natural, human, and economic systems and finding solutions that support quality of life for all.

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The New Role of the Built Environment Professional:

Developers of Sustainable Neighbourhoods and Cities to address Social & Environmental Vulnerabilities in EA

How we build our cities — from the neighborhood scale upwards — is the biggest challenge of our lifetime.

It is not enough to build green building to lessen the effects that humans have on our climate. We must also prepare ourselves for the inevitable consequences of climate change on our homes, communities, and society as a whole. A lower-carbon future will not only have higher-performing buildings but also require higher-performing communities.

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Future of Construction: Your Next Building Won't Be Built—It Will Be Manufactured!

For the past decade, there has been a lot of talk about the inefficiencies of the building industry and the need to turn to manufacturing techniques.

The buildings and construction sector is a highly "local" and "fragmented" industry, with no large businesses having significant control of the value chain. Dissemination of innovation is slow, largely due to this fragmented structure.

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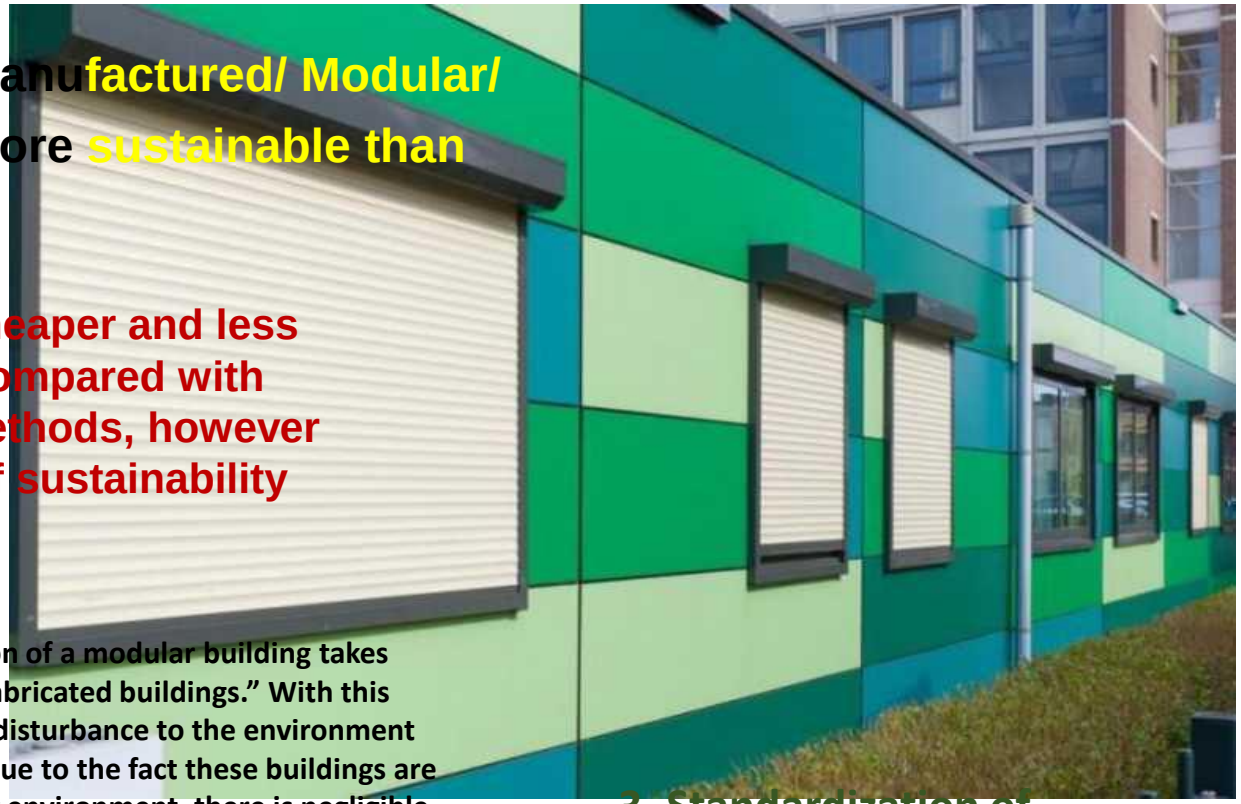
3 Quick reasons why Manufactured/ Modular/ Prefab construction is more sustainable than traditional methodology



Modular construction is cheaper and less time consuming to erect compared with traditional construction methods, however it also bring with it a raft of sustainability benefits as well.

1. Use Less Energy

Nearly 90 percent of the construction of a modular building takes place off-site, hence the term “prefabricated buildings.” With this approach, there is significantly less disturbance to the environment surrounding the construction site. Due to the fact these buildings are prefabricated in a controlled factory environment, there is negligible wastage of materials resources and highly efficient use of energy

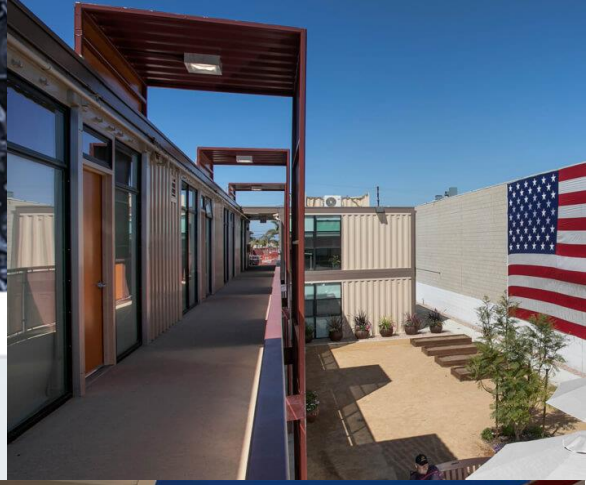
2. Recycled Materials

Technology has made it possible for us to recycle almost anything. Modular buildings are constructed with recycled (and recyclable) materials for the most part. Recycled steel, recycled wood and even recycled glass are a large part of what makes up a modular building. For instance, Mobile Modular uses 100 percent recyclable glue-less carpet tiles made from post consumer materials.

3. Standardization of Manufacturing

Modular buildings are installed with energy efficient systems for example energy efficient glass, geothermal systems, solar panels and other green features. This promotes manufacturing of other systems locally

As a result, not only is the actual construction of the building green, but the long-term running of the building also works out to be quite sustainable. Not only can modular construction reduce energy consumption during the building process by around 67 percent, it also reduces energy costs for its occupants.



Potters Lane is the first apartment building for chronically homeless veterans in the United States, made out of recycled shipping containers. Designed and manufactured for American Family Housing, an organization whose mission is to provide housing and services to support homeless and low-income families and adults.

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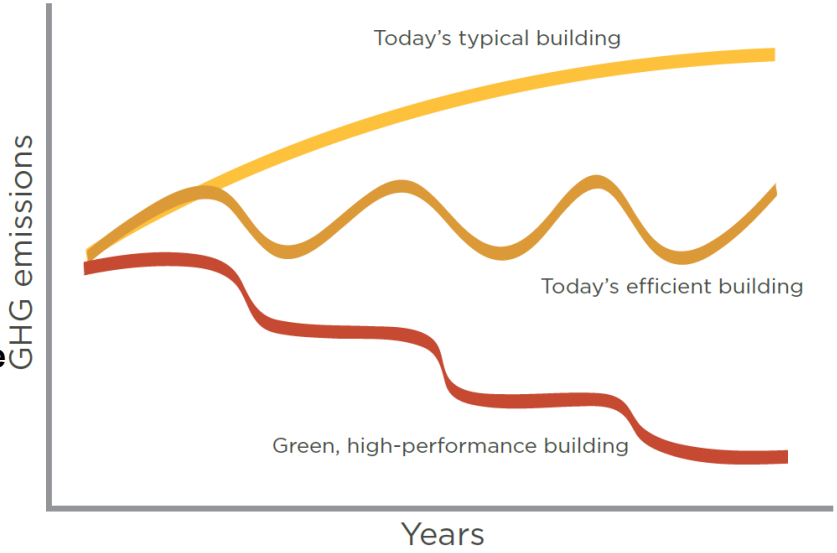
Mitigation measures that designers can take in the specification of building materials……

During both construction and operations, buildings generate large amounts of waste and use tremendous volumes of materials and resources. Therefore, there's need to encourage the selection of sustainably grown, harvested, produced, and transported products and materials



Carbon Emissions Related to Building Performance Over Time

What are the main areas of focus around materials and resources choices?

•**Conservation of material.** A building generates a large amount of waste throughout its life cycle. Meaningful waste reduction begins with eliminating the need for materials during the planning and design phases.

•**Environmentally preferable materials.** Locally harvested, sustainably grown, made from rapidly renewable materials, biodegradable, free of toxins. All these designations demonstrate awareness for sustainability.

•**Waste management and reduction.** The goal is to reduce the waste that is hauled to and disposed of in landfills or incineration facilities. During construction or renovation, materials should be recycled or reused whenever possible. During the building's daily operations, recycling, reuse, and reduction programs can curb the amount of material destined for local landfills.

APPALACHIAN MOUNTAIN CLUB, HIGHLAND LODGE AND EDUCATION CENTER

CRAWFORD NOTCH, NEW HAMPSHIRE

Completed: October 2003

Owner: Appalachian Mountain Club

Architects: Andrew Falender, Executive Director
Walter Graff, Deputy Director
Paul Cunha, Director of Facilities

Consultants: Carlone Dick LaFleche
Dennis Carlone, Architect & Master Planner
Douglas Dick, Architect
Dean Hof[illegible], Project Manager

[illegible]ngineers—Civil Engineers
[illegible] Mechanical and Plumbing Engineers
[illegible]ltants—Structural Engineers
[illegible]g—Electrical Engineers
[illegible]nable Design Advisor
[illegible]nership, Inc.—Landscape Architects & Master

[illegible], New Hampshire

[illegible]oric 26-acre site in the White Mountain

Program: Environmental Education Center and Lodge Complex including dormitory, offices, and conference spaces

Square Footage:
38,000 square feet—Highland Lodge
11,700 square feet—Thayer Hall
880 square feet—Garn Building
915 square feet—Maintenance Building
51,495 square feet—Total

Structural System:
- Steel frame is 95 percent recycled steel fabricated 45 miles from the site
- Dining room timber framing from a pier in Oregon
- Crushed existing asphalt used on new parking lot and roadway

Mechanical System:
- Biomass central boiler by Garn
- Heat recovery boilers and water heaters
- Two biodiesel backup boilers
- Low-flow toilets in Highland Lodge
- Composting toilets in Thayer Hall and railroad depot

Materials:
- Insulspan structural insulated panels (SIPs) on roof and walls
- Nu-Wool cellulose wall insulation at Thayer Hall
- Triple-glazed low-emissivity (low-E) fiberglass windows
- Thermally broken aluminum entry doors
- Polyurethane foam sealant on doors and windows
- Mineral wood sound bats
- 89 percent recycled content carpeting by Shaw
- Coated steel standing seam roofing by Integris
- Low volatile organic compound (low-VOC) paint in guest rooms
- Gypsum wall board, 95 percent recycled content

Low-maintenance landscaping—native wildflowers located outside the dining area and throughout the main site are irrigation-free and maintain the natural consistency of the White Mountains.

POCONO ENVIRONMENTAL EDUCATION/VISITOR ACTIVITY CENTER

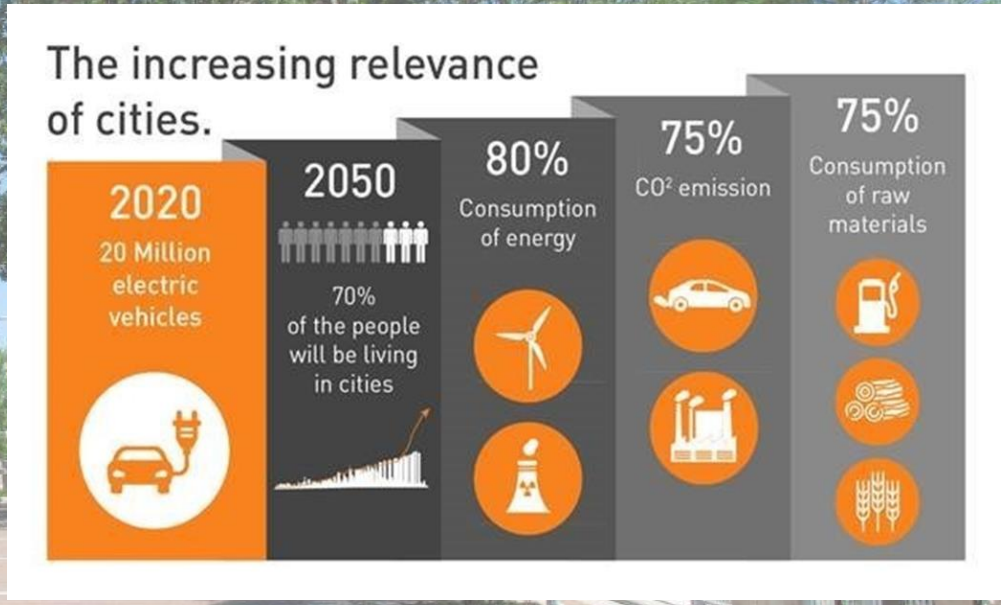
DINGMANS FERRY, PENNSYLVANIA

6

Completed:	2005
Owner:	National Park Service/Pocono Environmental Education Center
Architects:	Bohlin Cywinski Jackson Peter Q. Bohlin, FAIA—Principal for Design Allen H. Kachel, AIA LEED AP—Project Manager Wayne Stitt, AIA—Project Architect Craig Sachse, Brent Stebbins
Consultants:	McGoey, Hauser & Edsall, P.C.—Civil Engineers E.D. Pons and Associates—Structural Engineers Strunk-Albert Engineering—MEP Engineers
General Contractor:	Pride Enterprises, Inc., Norristown, Pennsylvania
Photographers:	Thomas E. Solon, AIA, Bushkill, Pennsylvania (TS) Nic Lehoux, Vancouver, British Columbia (NL)
Site:	PEEC The site is an open clearing located on the client's campus, which is predominantly native forest containing mixed oaks, various conifers, and a well-developed understory. The environmental education center is located within the Delaware Water Gap National Recreation Area, operated by the National Park Service.
Square Footage:	7,750 square feet
Sustainable Features:	• Building placement to optimize passive solar and minimize site disturbance • Passive solar cooling and ventilation • Indigenous low-maintenance landscaping • Extensive use of daylighting augmented with fluorescent motion sensor–controlled lighting • Supplemental radiant heat with a concrete floor slab thermal flywheel • Low maintenance, long-lived materials • Extensive use of reused, recycled, or recyclable materials • Extensive use of low- or zero-VOC products and finishes • Extensive use of engineered wood products • Extensive use of DOE-2 energy modeling

How can buildings and cities change to respond to climate sustainability……

It starts with cities



Buildings-Neighbourhoods-Cities committed to sustainability that links green buildings, smart infrastructure and behavior to meet ambitious sustainability goals over time.

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PRIORITIES

- ***Place***

OBJECTIVES: Strong civic engagement, preservation and celebration of culture and history, diverse and affordable housing, and accessible public spaces and services for daily needs.

- ***Prosperity***

Objective: Equitable access to quality education and career pathways, a robust employment base with increasing jobs and job quality, and entrepreneurial innovation and business start-ups.

- ***Connectivity***

OBJECTIVES: A street network that accommodates diverse ages and abilities by using multiple travel modes and shared mobility options, and a high-quality digital network providing equitable connectivity and leveraged community data.

- ***Health and Wellbeing***

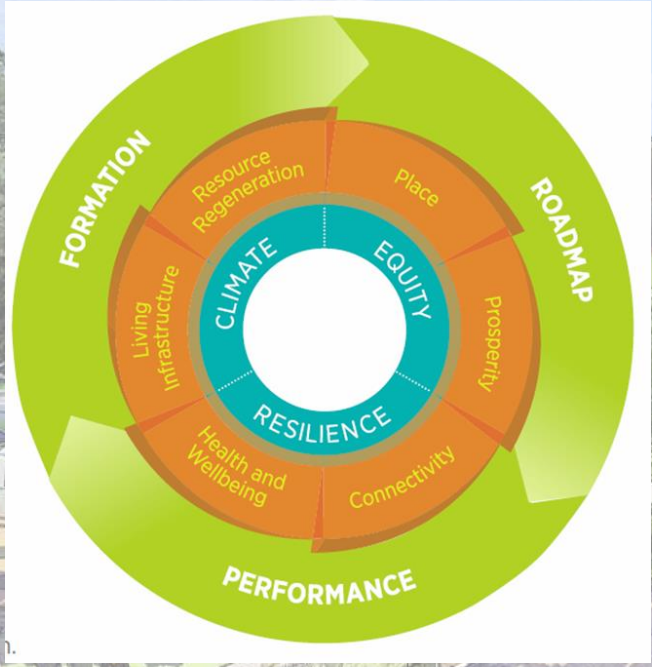
OBJECTIVES: Active living based on walkability and recreation; equitable health outcomes based on accessible, affordable health care; affordable, local, fresh food; remediated toxic environments; and strong public safety.

- ***Living Infrastructure***

Objective: Healthy soils, water, trees, and wildlife habitat; accessible nature; and natural processes integrated into the built environment.

- ***Resource Regeneration***

OBJECTIVES: More efficient water use; diversion of waste from landfills; reuse of remediated land; and the pursuit of energy efficiency, technology advancements, and renewable energy production that reduce greenhouse gas emissions.



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