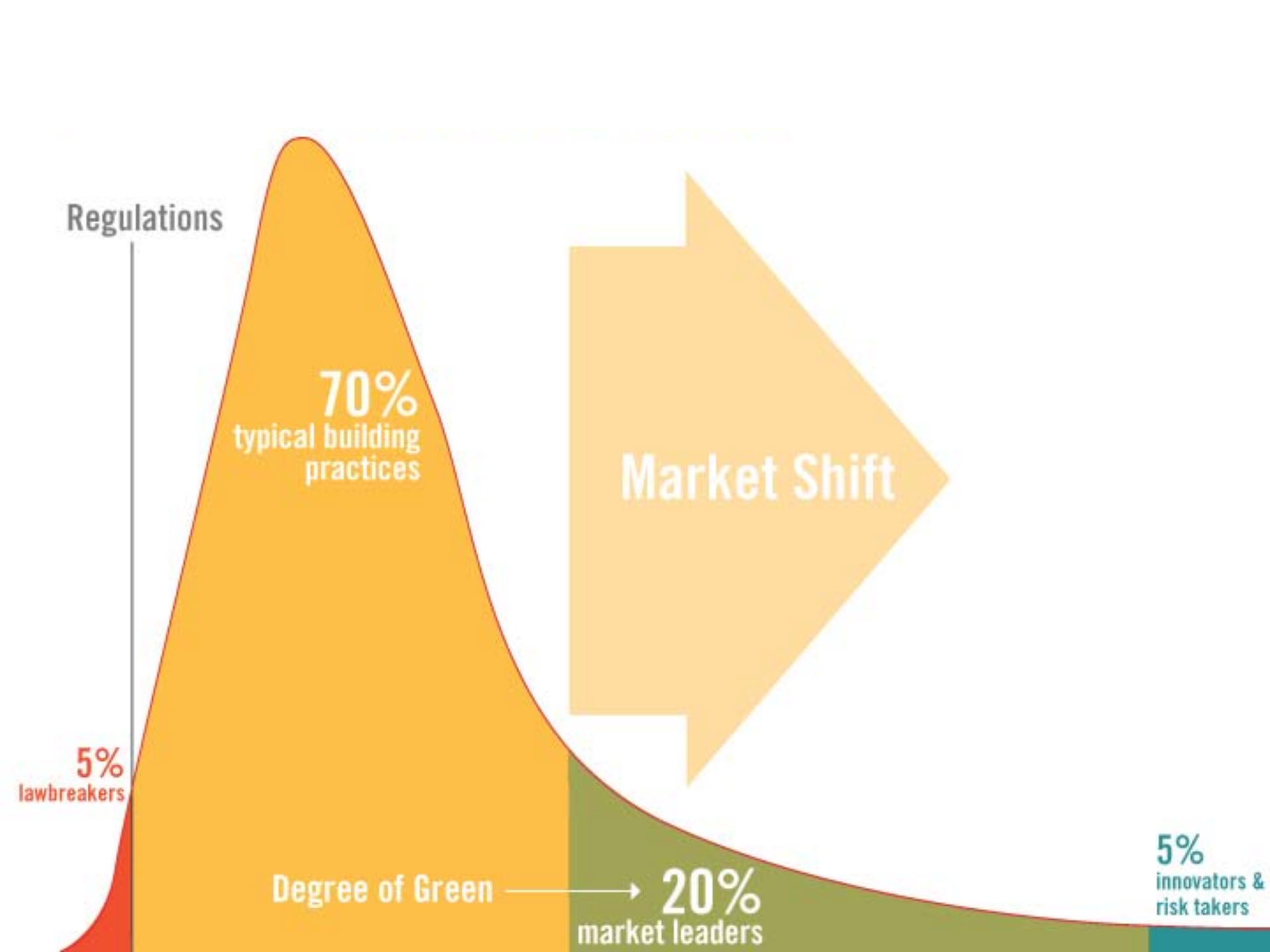
Green Building & Climate Change

Chris Pyke, Ph.D.

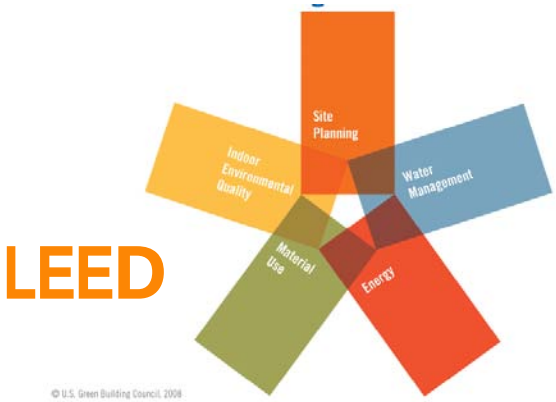
Vice President Resident

U.S. Green Building Council


Regulations
70%
typical building
practices
Market Shift
5%
lawbreakers
Degree of Green
20%
market leaders
5%
innovators &
risk takers

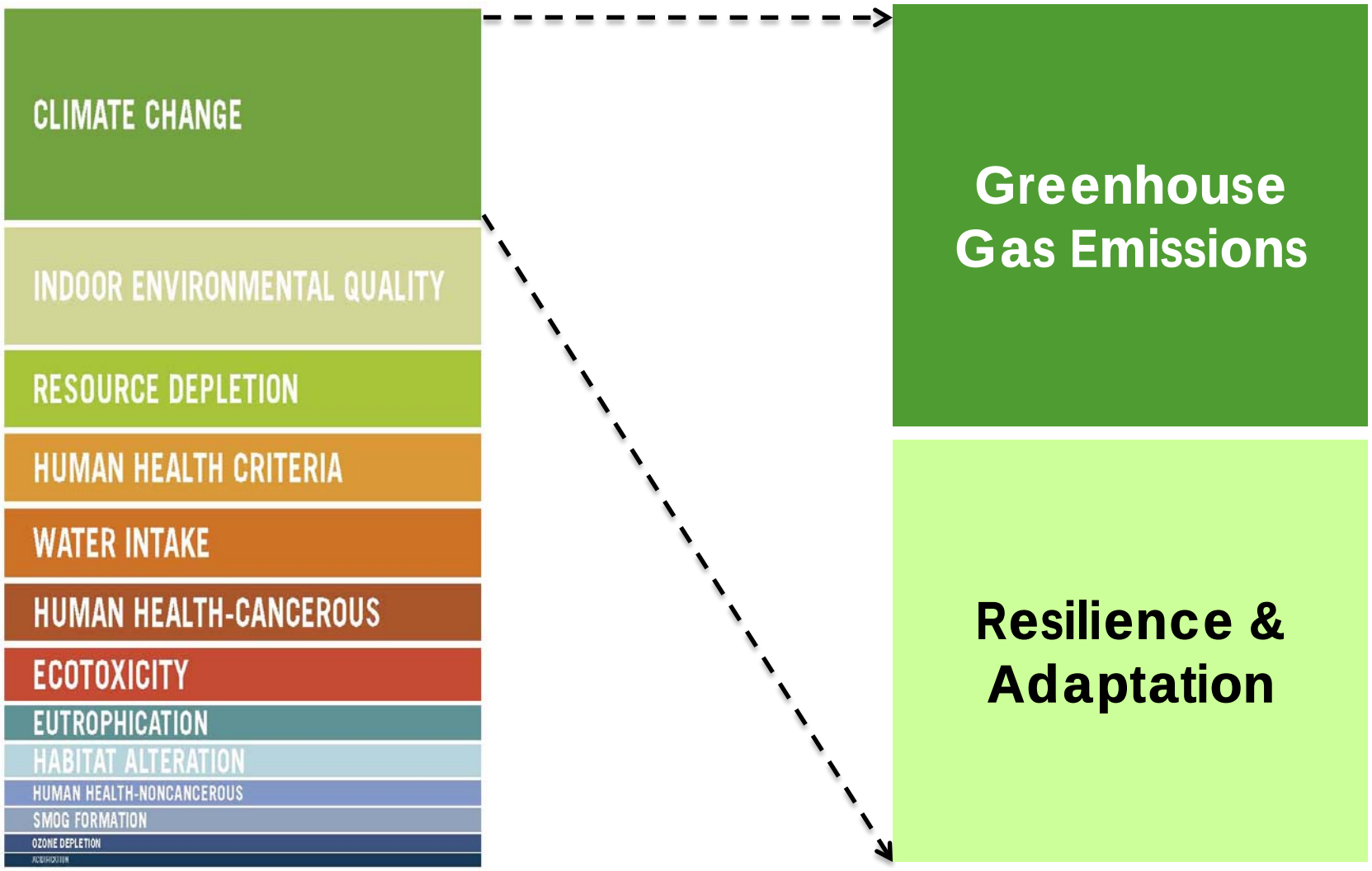
Moving the Curve

- **Professionals** with a common technical vocabulary
- **Tools** to identify strategies and define high performance
- **Processes** to document, verify, and reward leaders



Across Lifecycle

Focus on Adaptation



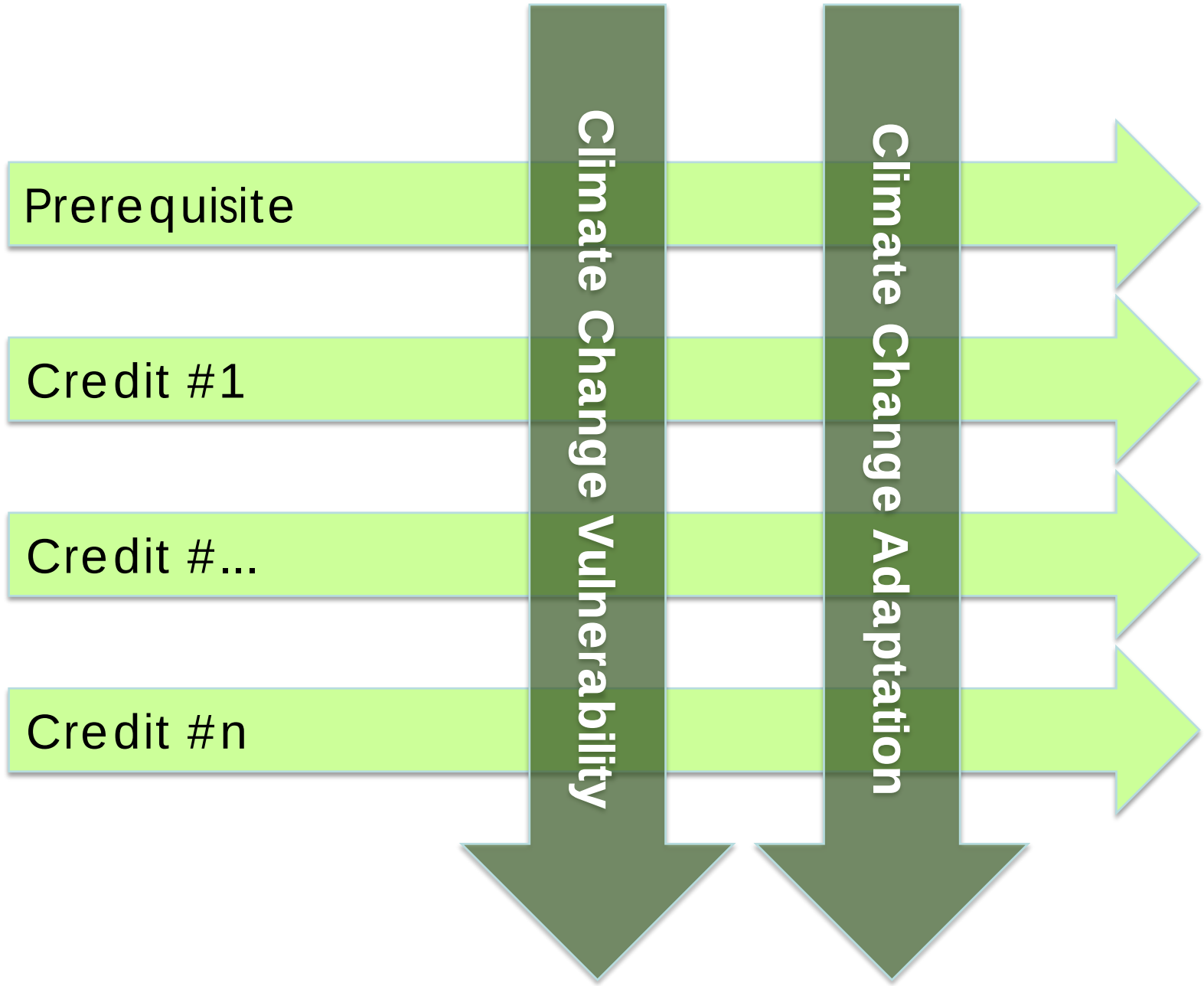
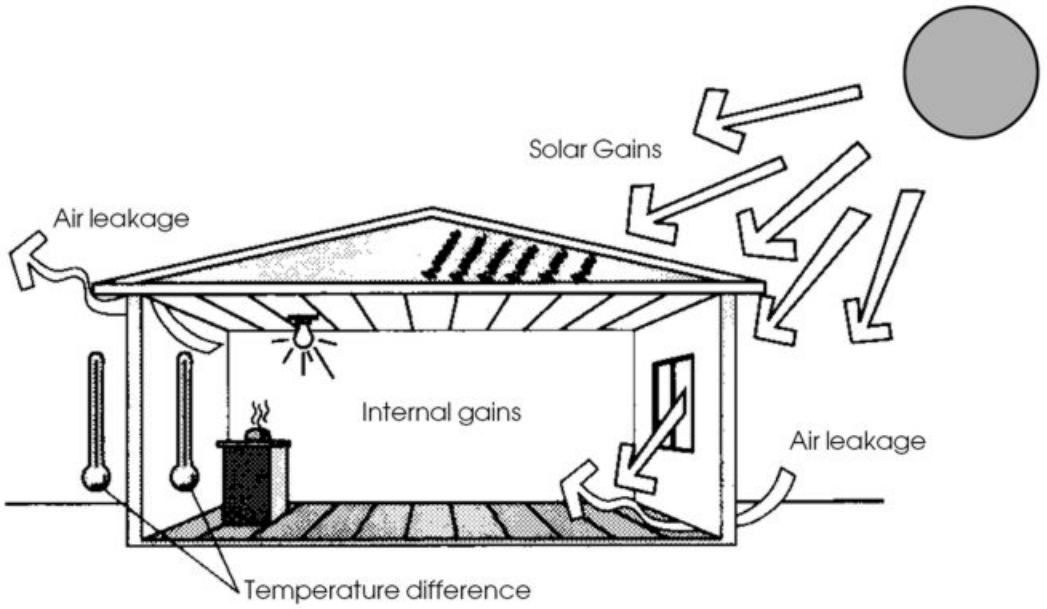

Prerequisite
Credit #1
Credit #...
Credit #n
Climate Change Vulnerability
Climate Change Adaptation

Table 1: Examples of How Climate Data Informs the Built Environment

System	Climate Considerations	Implications
HVAC & Building Energy Simulations	A building's heating and cooling system and the associated energy use is estimated using typical meteorological year (TMY) data. TMY data provides various annual climate averages based on past weather data.	Designing HVAC systems based on historic weather data will make building systems vulnerable to future changes in climate. Building energy use will increase if climate extremes become the norm. Occupants may also experience thermal discomfort.
Transportation Infrastructure	Pavement design and engineering is affected by temperature, precipitation, freezing and thawing, and solar radiation.	Climate change, including changes in temperature and precipitation trends, may reduce the life expectancy of pavement that is designed based on past climate data.
Stormwater Management	Stormwater management systems, including retention and detention ponds, are sized using past precipitation data and current definitions of 50 or 100 year storm events.	Heavy precipitation events and storms may overwhelm stormwater management systems more frequently in the future. Major storm events may cause serious flooding if stormwater systems are not designed to consider greater quantity and intensity of precipitation.
Landscape Design	Landscapes are designed with current precipitation and temperature patterns in mind as well as plant hardiness zones.	Climate change, including changes in precipitation and temperature patterns, will affect landscape design, including native plants. Climate change will also shift plant hardiness zones northward, affecting plant selection.

Incorporate Additional Cooling-Load-Avoidance Measures



From "Your Home Cooling Guide"

- Optimal bldg. orientation
- Better insulation
- Reflective roof and walls
- Low-SHGC glazings
- Exterior shading

Source: Alex Wilson, BuildingGreen LLC

Termite Ranges Extending Northward

Installing TermiMesh (stainless steel screening)

- Physical barriers
- Termite-barrier sand around foundations
- Termite-resistant materials
- Termite "bait" systems

Source: Alex Wilson, BuildingGreen LLC

Rainwater Harvesting

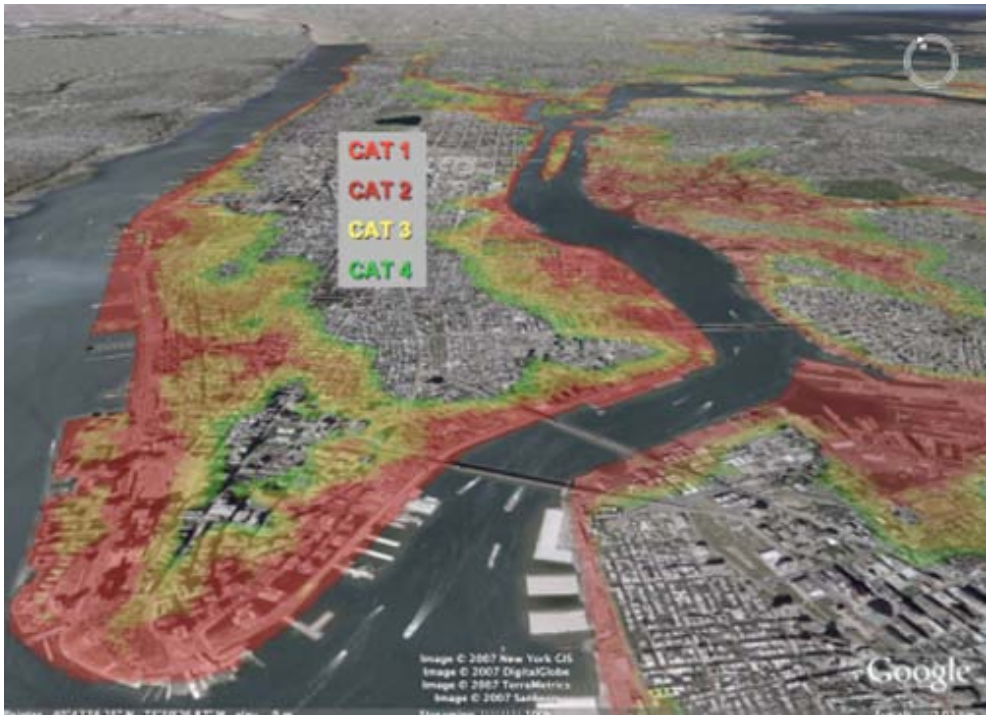
Gardener's Supply rainbarrel

Rainwater tanks at the Chesapeake Bay Foundation

Source: Alex Wilson, BuildingGreen LLC

Designing for More Intense Storms, Flooding, and Rising Seas

- Designing for extreme wind
- Avoiding (expanded) flood zones
- Increasing stormwater capacity
- Raising buildings and equipment
- Specifying materials that can survive flooding
- Installing check valves in sewer lines



Lower Manhattan - Flooding impact of Cat. 1-4 storms Klaus Jacob, Columbia Univ., March, 2008

Source: Alex Wilson, BuildingGreen LLC

Designing for Drought & Water Shortages

- Avoiding development in the driest regions
- Specifying water-efficient fixtures and appliances
- Plumbing buildings for water-conserving fixtures
- Plumbing buildings for graywater separation
- Harvesting rainwater
- Planting native vegetation

Lake Mead, October 2007, Ken Dewey photo

Objective: To provide occupants with a method to control solar heat gain, indoor air temperature, and daylight levels in response to changing exterior climatic conditions.

Description: Well-designed interior sun control and shading devices allow occupants to reduce solar heat gain while improving daylighting quality. This can lead to a reduction in interior air temperature, peak electrical demand, and annual cooling requirements. By controlling daylighting and glare, occupants can also be less reliant on electric lighting, further reducing cooling requirements and electrical demand.

Typical interior shading device systems installed in a building include Venetian blinds, adjustable louvers, or shade cloth. Fixed systems, such as light shelves, can help to redistribute daylight throughout a space without requiring occupant adjustments.

Impact Category: Temperature

Regional Priority:

Measured Effect of Strategy: Reduction of solar heat gain (W/ square meter)

Reduction of interior air temperature (degrees)

Reduction in peak electrical demand (kW)

Reduction in annual electrical energy (kWh)

Reduction of interior glare (footlamberts)

Level: No Regrets

Duration: 4-10 Years

Control: Occupant

Envelope Interior Shading Devices

LEED-ND Credit(s): GIB Credit 2 - Building Energy Efficiency

LEED-NC Credit(s): EA Credit 1 - Optimize Energy Performance

IEQ Credit 8.1 - Daylight and Views

LEED-H Credit(s): EA Credit 1 - Optimize Energy Performance

EA Credit 4 - Windows

LEED-EB Credit(s): EA Credit 1 - Optimize Energy Efficiency Performance

IEQ Credit 2.4 - Daylight and Views

Related Strategies:

1. High Performance Glazing
2. Daylighting
3. Exterior Shading Devices

Further Information:

1. Prowler, D. (2008). "Sun Control and Shading Devices" from the Whole Building Design Guide, http://www.wbdg.org/resources/suncontrol.php.
2. Kwok, A. G. and W. T. Grondzik (2007). "Light Shelves" from The Green Studio Handbook. New York, Architectural Press.
3. Lawrence Berkeley National Laboratory. (1997). "Shading Strategy" from Tips for Daylighting with Windows, http://windows.lbl.gov/daylighting/designguide/designguide.html

Expected Outputs

2011 research products include:

- A technical report
- Green building design guidelines
- Strategy database
- LEED Climate Adaptation and Resilience Index

Users will need to customize guidelines and resources for local conditions.