Protecting Your Real Estate THROUGH RESILIENT DESIGN

CORENET GLOBAL | Midwest Chapter

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TODAY’S AGENDA
Understanding Resilient Design
Risk Examples
The Resiliency List
Applications for Resilient Design
WHAT IS RESILIENT DESIGN?

Resilient Design pursues Buildings + Communities that are shock resistant, healthy, adaptable and regenerative through a combination of diversity, foresight and the capacity for self-organization and learning.

Perkins+Will | C3Living Design

Resiliency Dimensions:
Health & Wellbeing
Economy & Society
Infrastructure & Environment
Leadership & Strategy

Rockefeller Foundation | Community Resilience Framework
QUALITIES OF RESILIENCY

Diverse + Inclusive
Redundant + Resourceful
Adaptive + Flexible
Self-Organizing + Integrative
Cooperative + Nested
Foresight + Reflective
Healthy + Robust

Resiliency is an “Emergent” systems based Attribute.

Must have all 7.
IDEAS + BUILDINGS
That honor the broader goals of society

RESILIENCY
That Future Is Arriving, Adapt + Mitigate the Worst Impacts

SUSTAINABILITY
Our Future is at Risk, Mitigate + Adapt to Improve the future

1945 Hiroshima
1962 DDT + Silent Spring
1965 Climate Change

1973 + 1979 Oil Shocks
On-going Oil Wars
2008 Economic Shock
2012 Super Storm Sandy
IDEAS + BUILDINGS / That honor the broader goals of society

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1973 + 1979 Oil Shocks
On-going Oil Conflicts
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WHAT ARE WE ADAPTING TO?

The 5 Global (Interlocking) Megatrends:*

**Demographic + Social Change**
- Population Growth: 8 Billion by 2025

**Shifting Economic Power**
- In 2015, World’s Largest Real Economy: China

**Rapid Urbanization**
- Weekly 1.5 Million People added to Urban Population
- New York, Beijing, Shanghai, London: $8 Trillion in Future Infrastructure Needs

**Climate Change + Resource Scarcity**
- Heavy Weather, Water Crisis, Carbon Pressure on Fossil Fuel

**Technological Breakthroughs**
- “Business Strategy fit for the Digital Age”

*PWC: Price waterhouseCoopers Network Global Annual Review 2014 / Megatrends
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Rapid Urbanization
  Weekly 1.5 Million People added to Urban Population
  New York, Beijing, Shanghai, London: $8 Trillion in Future Infrastructure Needs

Climate Change + Resource Scarcity
  Heavy Weather, Water Crisis, Food, Carbon Pressure on Fossil Fuel

WHAT ARE THE RISKS?

World Economic Forum
2015 Top 5 Risks for the Decade*
In Order of Impact:

1. Water Crisis
2. Interstate Conflict
3. Failure of Climate Change Adaptation
4. Unemployment + Underemployment
5. Extreme Weather Events

*896 Global Leaders – Primarily from the Business Sector
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WHAT IS RESILIENT DESIGN?

Resilient Design pursues Buildings + Communities that are Interactively:

1 Billion Face Water Scarcity Now
3.5 Billion Face Water Scarcity by 2025

INFOGRAPHIC ON WATER - POPULAR SCIENCE
Data Visualization by Pitch Interactive; River locations courtesy The Global Runoff Data Centre, 56068 Koblenz, Germany
CLIMATE ADAPTATION

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Number Of Natural Catastrophes 1980-2013

Source: Munich Re, 2013.

Green
- Extreme Temps,
- Drought, Wildfire

Grey
- Flooding, Mass
- Movement of Water

Blue
- Tropical Storms,
- Extratropical Storms
- Convective Storms, Local Storms

Red
- Earthquakes,
- Tsunamis, Volcanos
## Adaptation Strategies For Industry Sectors Sensitive To Climate Event Risk (cont.)

<table>
<thead>
<tr>
<th>Property</th>
<th>Increased frequency and intensity of extreme weather events can affect property, notably low-lying and coastal property</th>
<th>Improved construction practices and energy efficiency programs, along with building insulation, window glazing, and shading</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Increases in bushfire frequency may raise rates of damage to buildings and structures</td>
<td>Work with planning authorities</td>
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<tr>
<td></td>
<td>Drier conditions may lead to increased ground movement and changes in groundwater</td>
<td>Better identification of at-risk locations</td>
</tr>
<tr>
<td></td>
<td>Increased rainfall and flooding may overwhelm existing infrastructure</td>
<td>Expanded rainwater harvesting</td>
</tr>
<tr>
<td>Water</td>
<td>Temperature increases may result in a reduction of surface water availability by reducing environmental storage and increasing evaporation</td>
<td>Diversification of water sources—surface and groundwater, wastewater and recycling</td>
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<td></td>
<td>Extreme demand events due to heat waves and cold snaps are becoming less predictable</td>
<td>Design modifications such as decentralizing generation</td>
</tr>
<tr>
<td>Power</td>
<td>Unseasonal temperature changes may alter established demand profiles</td>
<td>Energy efficiency and demand-side management though the use of smart grid technology</td>
</tr>
<tr>
<td></td>
<td>Low rainfall and high temperatures impair thermal power station cooling</td>
<td>Diversifying sources of energy</td>
</tr>
</tbody>
</table>

**Source:** Standard & Poor's Rating Services - Climate Change is a Global Mega-Trend For Sovereign Risk  May 15, 2014

### Extreme Weather:
- Construction Practices,
- Energy Efficiency, Insulation,
- Window Glazing, Shading

**Identify Risks by Location**

### Water:
- Rainwater Harvesting,
- Diversification of Sources – Surface, Ground, Wastewater, Recycling
- Water Efficiency

### Power:
- Decentralized Generation
- Diversified Sources
- Efficiency:
  - Demand-Side Management
  - Smart Grid Ground,

“Miami Beach will never not exist,” he says. “We may have floating residential areas…. We could convert a transportation corridor to water…. It can be done, but can we afford it?”

Bruce Mowry, Miami City Engineer
Extreme Rain EVENTS

Timeline of Minnesota’s historic mega-rain events 1866-2014

1866-1965
Four mega-rains in 100 years

Aug. 6, 1866
Killed 10 people in Fillmore County.

July 17-19, 1877
Known as the state’s greatest flash flood, in central Minnesota.

July 20-22, 1999
Extensive across northern Minnesota, killed 2 children in Duluth.

September 9-10, 1947
More than 6 inches in five hours at Hibbing.

1966-1999
Three mega-rains in 33 years

July 21-22, 1972
Nearly 11 inches in 24 hours at Ft. Ripley, state record at the time.

June 28-29 and July 1-2, 1975
Intense rain in northwestern Minnesota in two events.

July 23-24, 1987
9 inches at Minneapolis-St. Paul International Airport, a record.

2000-2014
Five mega-rains in 14 years

June 9-10, 2002
More than 12 inches in 48 hours in northern Minnesota.

Sept. 14-15, 2004
More than 10 inches in 38 hours in Faribault and Freeborn counties.

Aug. 18-29, 2007
15 inches near Hoka, state record for 24 hours.

Sept. 22-23, 2010
More than 10 inches at Amboy.

June 19-20, 2012
7 inches in two days in Duluth. St. Louis River at record level.
Extreme Rain + Flooding

January 30, 2015 Executive Order for Federal Property:

“The Flood plain shall be the elevation and flood hazard area that result from using a climate-informed science approach"

Base Flood Elevation:

- Add 2 feet - non-critical actions;
- Add 3 feet - critical actions;
- The area subject to flooding by the 0.2 percent annual chance flood (500 Year Flood);
- The elevation and flood hazard area that result from using any other method identified in an update to the FFRMS
EXTREME WEATHER

Many Risks Are Regionally Specific
Some Regions carry more Risk for Specific Issues
Minnesota: Flood, Hail, Winter Weather, Tornado, Wildfire
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50% of the World Population lives on Less than $2.50

New York Times: French Banlieues -
20% Joblessness
40% For the Young
50% No HS Diploma
Disenfranchised

Paris Attackers: From Banlieues
RESILIENCY’S POTENTIAL: A COOPERATIVE PERSPECTIVE

“Many people are looking to governments for solutions, however in practice policy actions will remain unpredictable, inconsistent and maybe reactive. So businesses must take the lead in mitigating environmental damage and tackling climate + resource challenges.”

Dennis Nally – Price waterhouse Coopers

Humanity is Maturing:
Adolescence to Adulthood

Rethink Our Social Contract w/ Each Other
Rethink Our Relationship w/ Rest of Nature
Rethink Our Perspective on Happiness

Necessity is the Mother of Invention

Plato
RESILIENT ACTION LIST
BUILDINGS + COMMUNITIES

THE RELi Committee
Perkins+Will
University of Minnesota
State of California
Impact Infrastructure
Jones Lang Lasalle
Environmental Bankers Assoc.
GE
Eaton
Deloitte
Appraisal Institute
U.S. Conference of Mayors
Underwriting for Green + Resilient Buildings, Homes & Infrastructure Bonds

Call for Public Comments + Request for Your Expertise

We are seeking written and in-person comments for the Resilient Infrastructure Underwriting Standard Amendments and Green + Resilient Underwriting Checklist. More information on the review and comment process is available at: http://resilienceasbuilt.epa.gov/reliance

What are the benefits of Consensus-based Underwriting Standards? What is the need? Green Properties are a $630Bn U.S. industry with ongoing growth. The Consensus-based Underwriting Standards’ Green Value Score covers buildings, community infrastructure, & manufacturing. They identify important Green + Resilient property attributes that increase economic value and mobilize funding for sustainability and resiliency at multiple scales. The Standards are being used for Green Property Bonds issued in 2014 and Green + Resilient Bonds in 2015. The standards also support higher credit ratings for cities by reducing cost and risk through sustainability + resiliency. They cover 60% of global economic activity throughout the supply chain.

Key Resiliency Attributes for Property, Infrastructure + Communities:
- Reduced Economic Risk to Property Value from exposure to acute Natural Disasters, Climate Change + Social Stress
- Extreme weather, tornado, drought, wildfire, earthquakes, sea level rise, terrorism + more
- Increased Property Value + Recognition through Sustainability, Ecological Wellness + Long-term Resiliency
- Energy & water efficiency, renewable power, improved indoor air, weathering + transit productivity, integrated process
- Health + Ecological Health, vitality, diversity + productivity, community connectivity, local + regional economic vitality + more

Underwriting Standards are used to raise capital for debt + equity, including bonds. Consensus standards are developed through a national vote of approval in a democratic process, and are required by regulations and rating agencies to reduce legal, technical, political and business risk and uncertainty.

Sequoyas are a good example of resiliency with amazing form, size, strength, and expansion over 2000 years.

The National Consensus Green Property Underwriting Standards are being amended to include Resiliency. Along with carbon mitigation and reduction, they will now include climate adaptation + infrastructure for communities.

A National Public Meeting for interested and affected parties is being held at Perkins+Will on September 16 at Perkins+Will (located in the World Wildlife Fund Headquarters) 1250 24th Street NW, Suite 100, Washington, DC 20037. More info: http://resilienceasbuilt.epa.gov/reliance

Public Announcement

6,500 E-mails
## Resilient Action List + Resilient Mortgage Standard

### 7 Topics

**Panoramic Approach to Planning Design**
Works Across Scales + Issues

**Acute / Short-Term Conditions**

**Maintenance + Operations**

**Hazard Preparedness, Adaptation + Mitigation**

**Long-Term Opportunities**

**Community Social + Economic Capital**

**Health, Diversity + Productivity**

**Water, Energy + Food Production**

**Material + Resource Flows**
RESILIENT ACTION LIST + RESILIENT MORTGAGE STANDARD

Builds From Existing Sustainability Knowledge
Compatible + Complimentary with:
LEED
Living Building Challenge
Resilient Mortgage + Bond Standard

Ease of Uptake - Intentionally Similar to LEED
Uses Prerequisite Approach + Credits
Innovation Section (Expanded)

Unique Areas
Hazards, Extreme Events + Adaptation
More Regional Economics + Social Cohesion
RELi / REFERENCED INDICATORS

Unique RELi Prerequisites / Credits
Hazard Preparedness, Social Cohesion, Regional Economics

ANSI Integrative Process Standard (MTS Developed)
Integrative Living Design Planning Process (University of Minnesota)

Red Cross Ready Rating Program for disaster preparedness
U.S. Small Business Administration + Prepare My Business.Org

Fortified for Safer Business Standard V1.0
Urban Green Building Resiliency Task Force, June 2013 Proposals (NYC)
EPA Vulnerable Zone Indicator System + EnviroFacts
Nuclear Regulatory Commission / Academy Of Sciences

Envision Sustainable Infrastructure Rating System V2.0
Center for Active Design
Sustainable Sites Rating System V2
LEED V4 and V2009 / NC, ND + Schools
Energy Star / 2030 Palette
RESILIENCY CASE STUDY

Spaulding Rehabilitation Center
Boston, Massachusetts

FLOODING + SEA LEVEL RISE

Ground floor elevation:
- 30” Above the 500-year Floodplain
- Accounts for Future Sea Level Rise.

Underground Parking:
- Ramp Entrance Point is High.

Critical Operations are on Higher Floors.
Ground Floor largely Open to the Public.
CASE STUDY

Spaulding Rehabilitation Center
Boston, Massachusetts

FLOODING + SEA LEVEL RISE

- Mechanical + Electrical Gear are located in the penthouse.
- Concrete Encased Vertical Electrical Mains from Utility at Grade.

Cogeneration Plant:
- 4-5 days of Fuel On-Site
- Dble. Wall 15,000 Gal Tank /Below Grade.
- Fuel Pump in Watertight Submarine Vault.
CASE STUDY

Spaulding Rehabilitation Center
Boston, Massachusetts

OPEN SPACE + STORMWATER
Green Roofs + Terraces:
• Moderates Stormwater Runoff
• Insulation / Heat-Island Cooling
• Popular Patient Amenity
• Accessible Vegetable Garden that provides some Local Food
CASE STUDY

Spaulding Rehabilitation Center
Boston, Massachusetts

SOCIAL COHESION
Ground Floor is Largely Open to Public.
• Public cafeteria-restaurant,
• Community Access to Rehab Pool
• Public bathrooms
• Publically Reservable Conferencing
CASE STUDY

Spaulding Rehabilitation Center
Boston, Massachusetts

PASSIVE SURVIVABILITY

- Screened Operable Windows in all the Patient Rooms
- Operable windows in the Various Gyms
- A high performance envelope, triple-glazed windows, exterior shading, prevent low interior temperatures/freezing and reduce overheating
CASE STUDY

Spaulding Rehabilitation Center
Boston, Massachusetts

PASSIVE SURVIVABILITY
Daylighting in Resident Rooms, Gymnasia, and Public/circulation Spaces.
• Reduced dependence on artificial lighting for shelter-in-place
• Longer Operation of Emergency Generator Fuel.
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CLIMATE ADAPTATION

![Graphs showing global temperature and CO₂ concentration over time](image)

**Observations**
- Natural and Human Factors
- Natural Factors Only

Year: 1880-2000

Global Temperature (°F)

CO₂ Concentration (ppm)
Overall Weather Related Losses And Insured Losses 1980-2013

Source: Munich Re, 2013. *Values adjusted for inflation using the Consumer Price Index (CPI) of each country.

Source: Standard & Poor’s Rating Services – Dealing with Disaster: How Companies Are Starting to Assess Their Climate Event Risks May 21, 2014