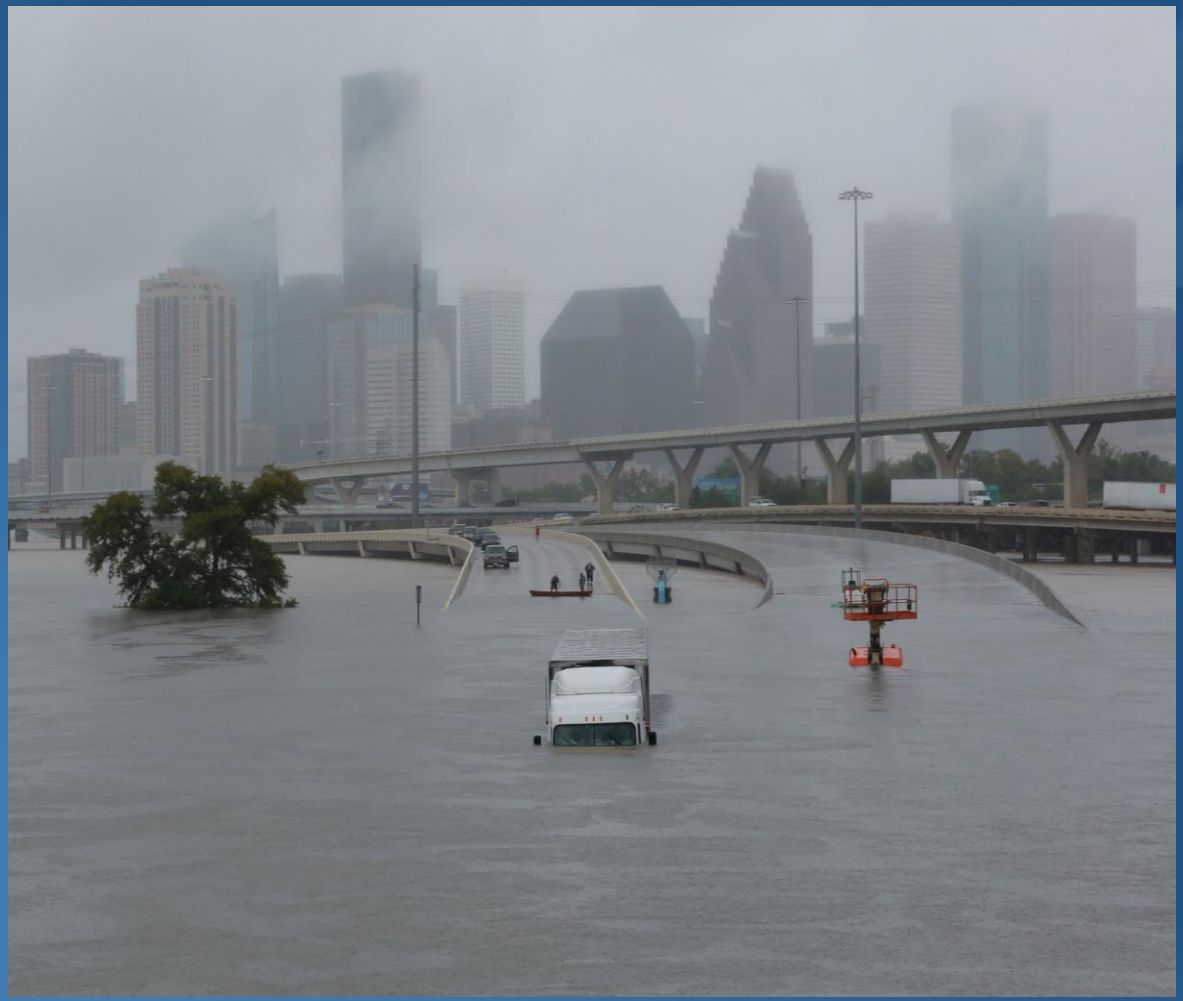
Resilient Design Can Reduce Carbon Emissions



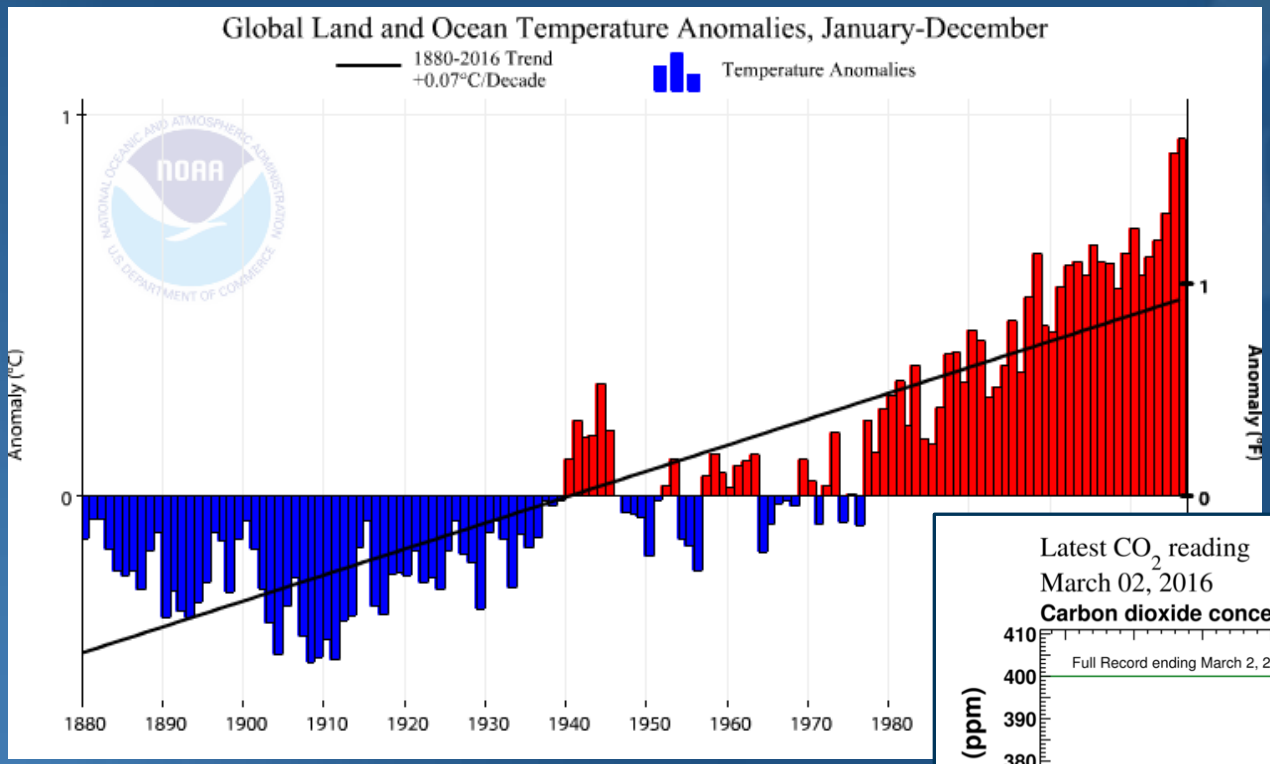
I-45 in Houston underwater on August 27, 2017
Photo: Richard Carson, Reuters

Catalysts of the Climate Economy
Burlington, VT

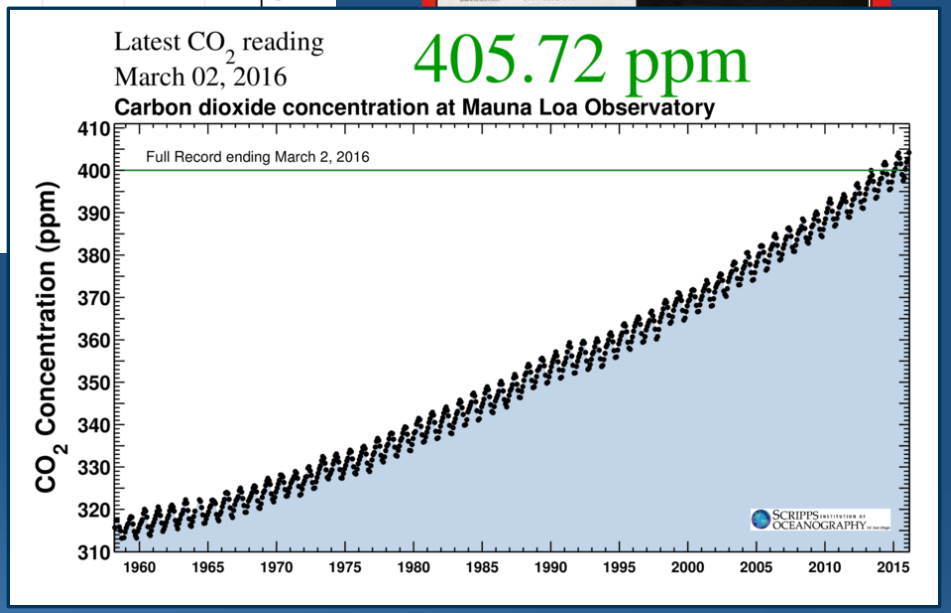
September 7, 2017

Alex Wilson, President
Resilient Design Institute
Founder, BuildingGreen

#1 - It's a new ballgame



Global temperatures 1889 – 2016
NOAA National Climate Data Center



Keeling Curve of CO_2 levels on Mauna Loa

More intense storms

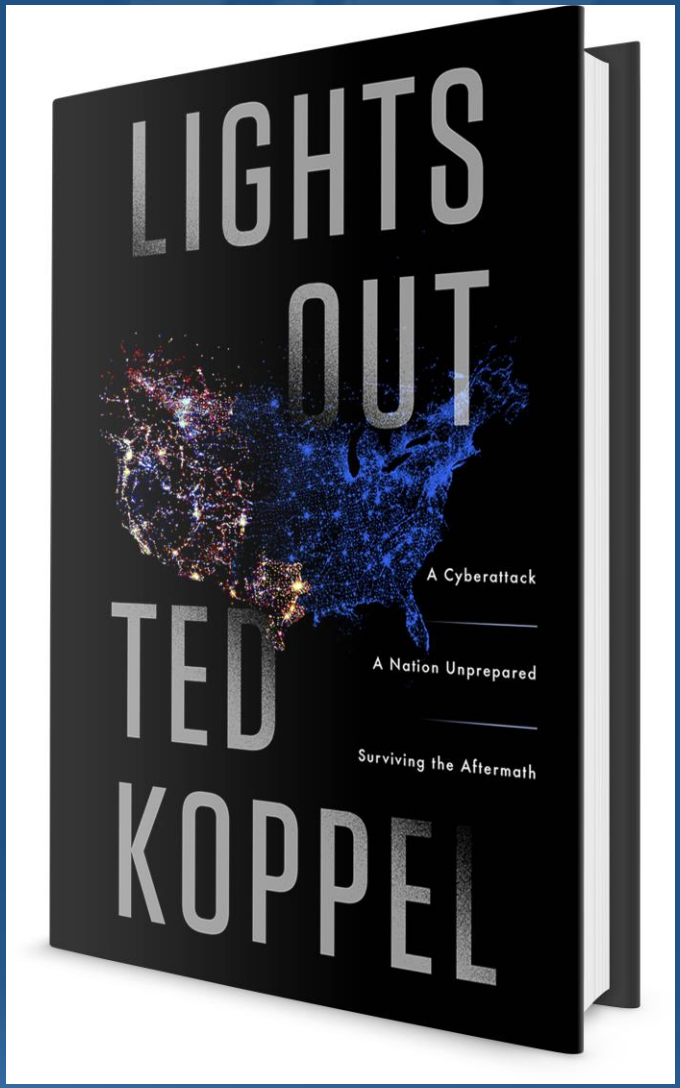
Hurricane Harvey impacts in downtown Houston, August 29, 2017, Photo: David J. Phillip, AP

Power Outages – New York City 2012

Blackout caused by Hurricane Sandy on October 29, 2012 – photo: Eric Chang

Other vulnerabilities

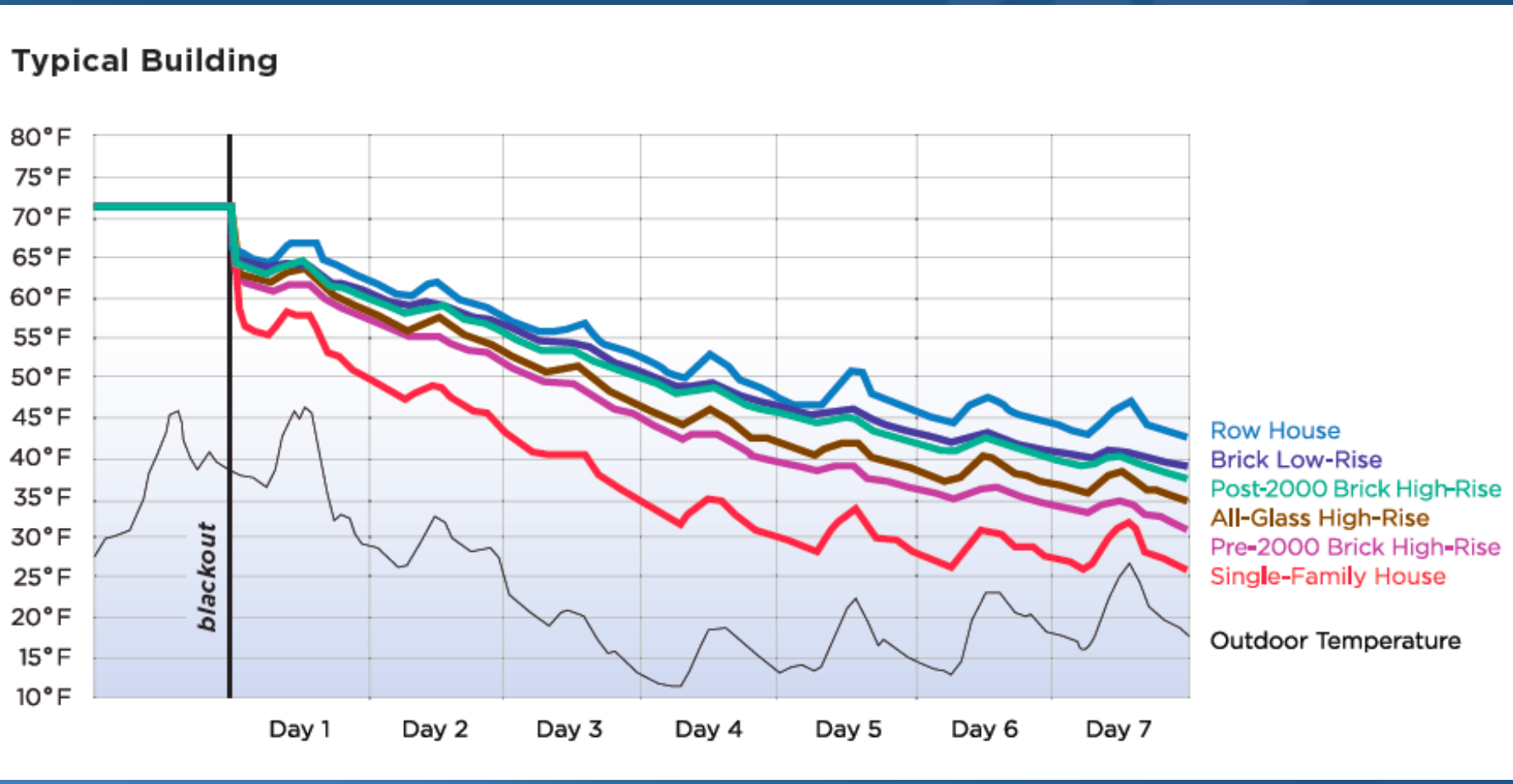
- The issue of cyberterrorism has gained a lot of interest recently
- Ted Koppel's 2016 book *Lights Out* lays out the dangers



#2 - Making buildings more resilient can reduce their carbon emissions

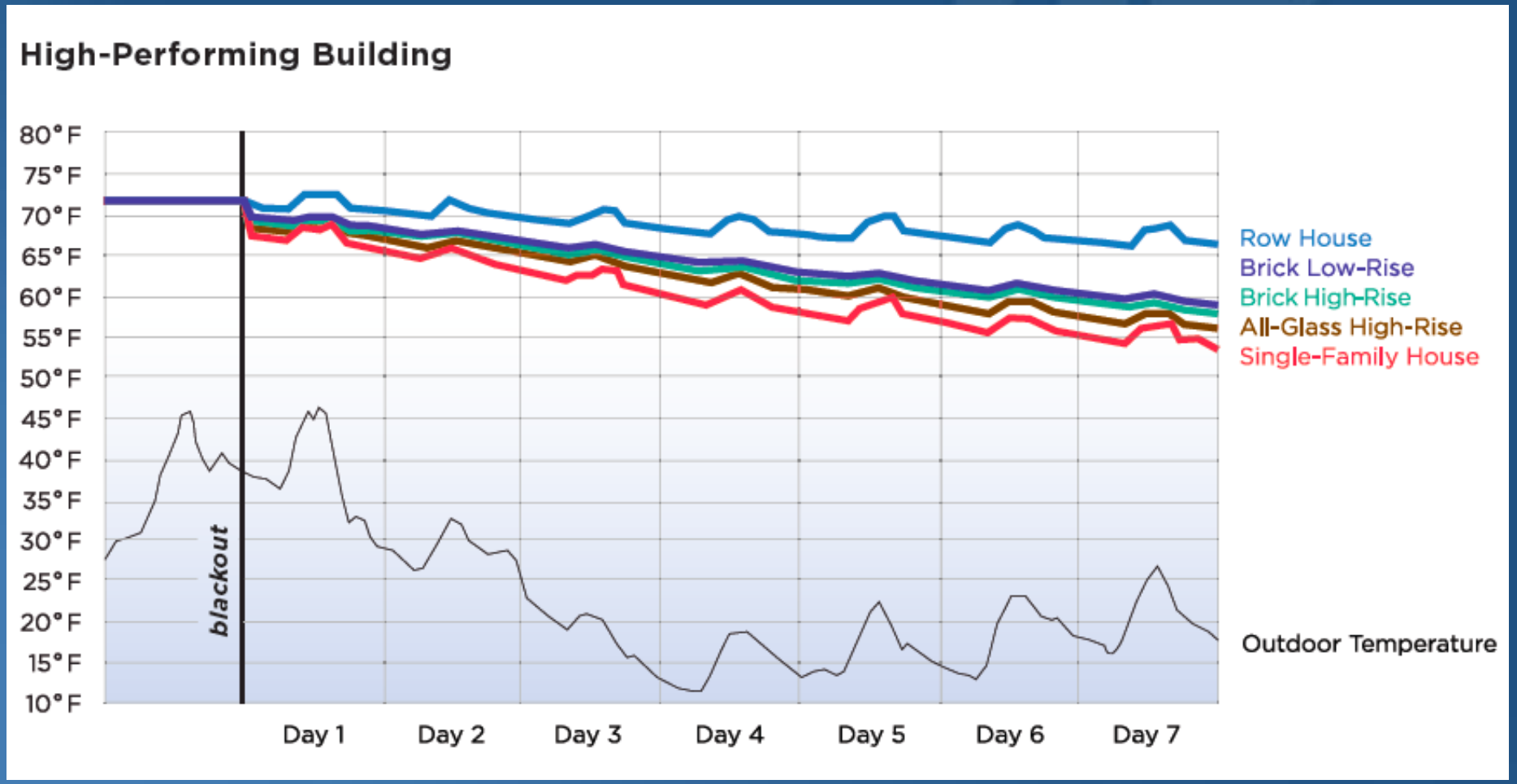
Net-zero-energy home in Dummerston, Vermont. Photo: Alex Wilson

Poorly insulated buildings do not maintain habitable temperatures if they lose power



Temperature modeling by Atelier Ten for the report "Baby It's Cold Inside," Urban Green, NYC

Well insulated buildings keep residents safer if they lose power



Temperature modeling by Atelier Ten for the report "Baby It's Cold Inside," Urban Green, NYC

Maintaining habitable temperatures

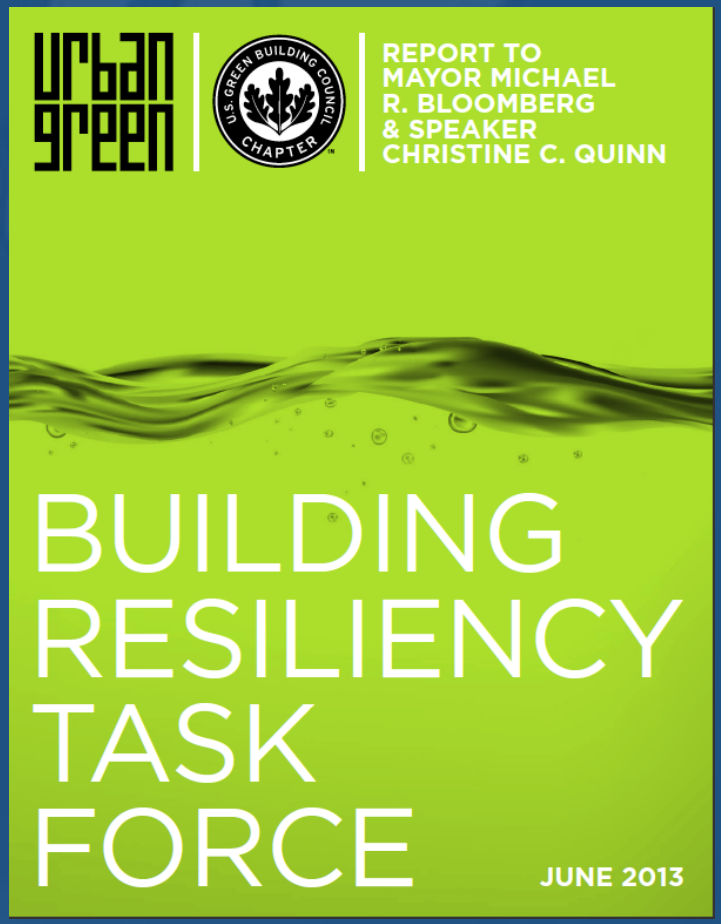
27 Maintain Habitable Temperatures Without Power

Issue: Utility failures often disable heating and cooling systems, leaving interior building temperatures dependent on whatever protection is provided by the insulation and air sealing of a building's walls, windows, and roof.

Recommendation: Extend the mandate of the Task Force through Fall 2013 to develop a multiyear strategy for ensuring that new and substantially altered buildings maintain habitable temperatures during utility failures. Clarify requirements for tightly sealing new windows and doors and upgrading roof insulation during roof replacement.

✚ further action

Recommendation from the Building Resiliency Task Force



Building Resiliency Task Force in New York City – Final Report, June, 2013

Passive survivability with bigger buildings

Spaulding Rehab Hospital, Boston - Photo: Perkins+Will

Passive survivability in a hospital

Operable windows at Spaulding Rehab - Photo: Perkins+Will

Photo: Alex Wilson

Passive survivability in a hospital

Photo: Spaulding Rehab Hospital

Photo: Alex Wilson

#3 - Resilient communities can also reduce carbon emissions

Findhorn Eco-Community in Scotland. Photo: Alex Wilson

Cascading impacts from power outages

Gas line in Woodbridge, NJ on November 1, 2012 – photo: AP

Mixed-use development

Church Street in Burlington, Vermont – photo: Wikimedia Commons

Bicycle transportation that works

Bicycling as a primary means of transportation in Copenhagen, Denmark – Photos: Alex Wilson

Local food production and food security

Eli Zabar's Vinegar Factory, East 91st Street, NYC - Photo: Jacqueline Mirell

Urban Food Production

Eli Zabar's Vinegar Factory, East 91st Street, NYC. 20,000 sf of rooftop greenhouse heated with waste heat from Zabar's bakery - Photo: The Vinegar Factory

Urban Food Production

Gotham Greens, Brooklyn, NY – photo: Gotham Greens

Urban Food Production

- Gotham Greens Greenpoint, Brooklyn
- 15,000 sf rooftop greenhouse built in 2011
- Hydroponics
- Harvested rainwater
- Powered by 60 kW onsite PV array
- Advanced energy conservation
- Produces 100 tons per year of greens

Gotham Greens, Brooklyn, NY – photo: Gotham Greens

Rooftop Aquaponics

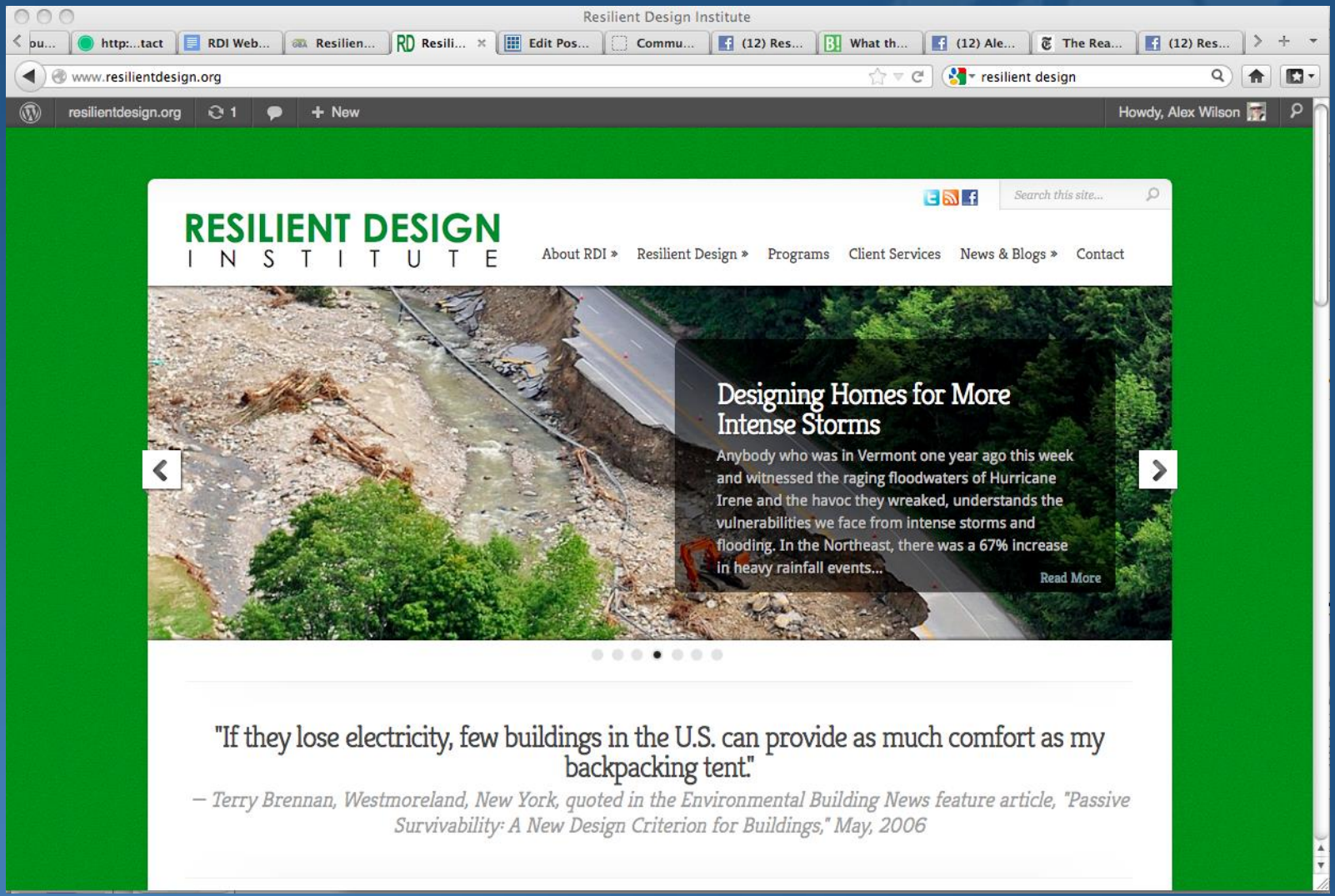
Rooftop aquaponics greenhouse in The Hague, Netherlands
Photo: Luca Lucotelli, National Geographic, Sept. 2017

Resilience as a motivator for low-carbon future

- We know how to build net-zero-energy and net-zero-carbon buildings
- We know how to plan communities that are more compact and walkable to reduce automobile use
- Some of us are doing all this because it's the right thing to do
- For others, safety can be an important motivator
- Resilient buildings and communities are safer

The Bullitt Center in Seattle – photo: Alex Wilson

Resilient Design Institute



www.resilientdesign.org