Northeastern University
Center for Resilience Studies

Understanding and Embracing the Resilience Imperative

NIST Workshop on
"Developing A Community-Centered Approach to Disaster Resilience"
Stevens Institute of Technology
Hoboken, NJ

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Community Resilience and Critical Infrastructure Resilience are National Imperatives

"The term *resilience* refers to the ability to prepare for and adapt to changing conditions and withstand and recover rapidly from disruptions. Resilience includes the ability to withstand and recover from deliberate attacks, accidents, or naturally occurring threats or incidents.*

* President Policy Directive 21 - Critical Infrastructure Security and Resilience February 12, 2013

Community Resilience and Critical Infrastructure Resilience is a Global Imperative

"The abiding strategy of our parents' generation was "containment" of communism in order to be free. The abiding strategy of our generation has to be "resilience." We will only be free to live the lives we want if we make our cities, country and planet more *resilient*."

* Tom Friedman, *The New York Times*, May 24, 2014

Major Sources of Risk to Critical Infrastructure

- More users that push or exceed infrastructure design capacity

- Aging without adequate investment in maintenance and repair

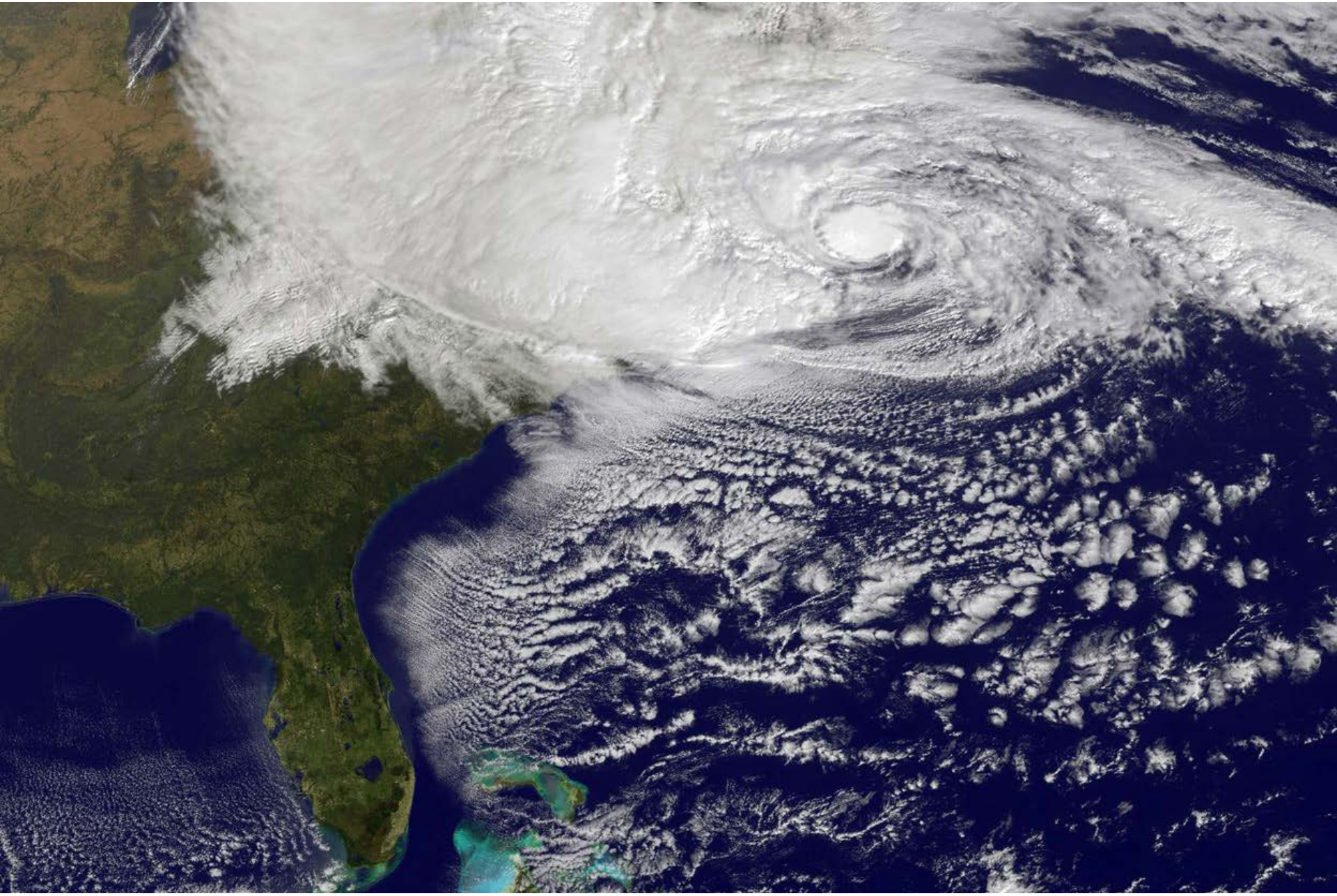
- Rising urbanization, particularly in coastal areas with substantial exposure to the effects of climate change

- External shocks from naturally occurring and man-made sources

- The absence of political will for undertaking the advanced planning and long-term investment in building, upgrading, and adequately maintaining infrastructure

REQUIRES A NEW EMPHASIS ON BOLSTERNING CRITICAL INFRASTRUCTURE RESILIENCE

Hurricane Sandy – a “predictive surprise”




WESTCHESTER COUNTY
NEW JERSEY
Hudson River
Long Island Sound
BRONX
Harlem River
MANHATTAN
Hackensack River
Passaic River
Newark Bay
East River
QUEENS
Upper New York Bay
BROOKLYN
Kill Van Kull
STATEN ISLAND
Jamaica Bay
Lower New York Bay
Rockaway
Arthur Kill
ATLANTIC OCEAN
Raritan Bay
Sandy Hook
N
Legend
Inner Harbor
Upper East River - Western LIS
Lower Bay
Jamaica Bay
0
5
10
Miles


The Drake


2 YD

Manhattan 34th St. and 1st Avenue


STEVENS
INSTITUTE OF TECHNOLOGY
THE INNOVATION UNIVERSITY
DAVIDSON LABORATORY
CENTER FOR MARITIME SYSTEMS
2012-10-29 22:15 EDT
N
HOBOKEN, NJ
Water Depth
> 8 ft
8 ft
6 ft
4 ft
2 ft
Ground

Comparative Resilience: Oct 28, 2012

Goldman Sachs Headquarters
200 West St. New York, NY

Citigroup Headquarters
388 Greenwich Street New York, NY

Goldman Sachs Headquarters
Oct 29, 2012

200 West St. HQ is dry and has electric power, but . . .

- *No employees due to disruption of transportation system.*
- *Little ability to telecommute due to region wide power outages*

The Resilience-Centric Approach (continued)

- Distinguish between *critical processes*, *essential function* & full / "normal" function
- Identify and adopt *resilience design features, processes, and protocols* that mitigate the risk of disruption, and speed recovery when mitigation measures fail.
- Resilience design options include:
  1. *Cushionability – graceful degradation of non-essential function during periods of stress*
  2. *Resistance – redirecting threat/hazard away from essential function*
  3. *Robustness – harden critical processes& essential function*
  4. *Redundancy – have spares to provide critical processes and essential function*
  5. *Graceful extensibility—the capacity for the infrastructure to adapt to deal with an uncertain future risk environment.*

PUTTING RESILIENCE INTO PRACTICE

Pre-event:

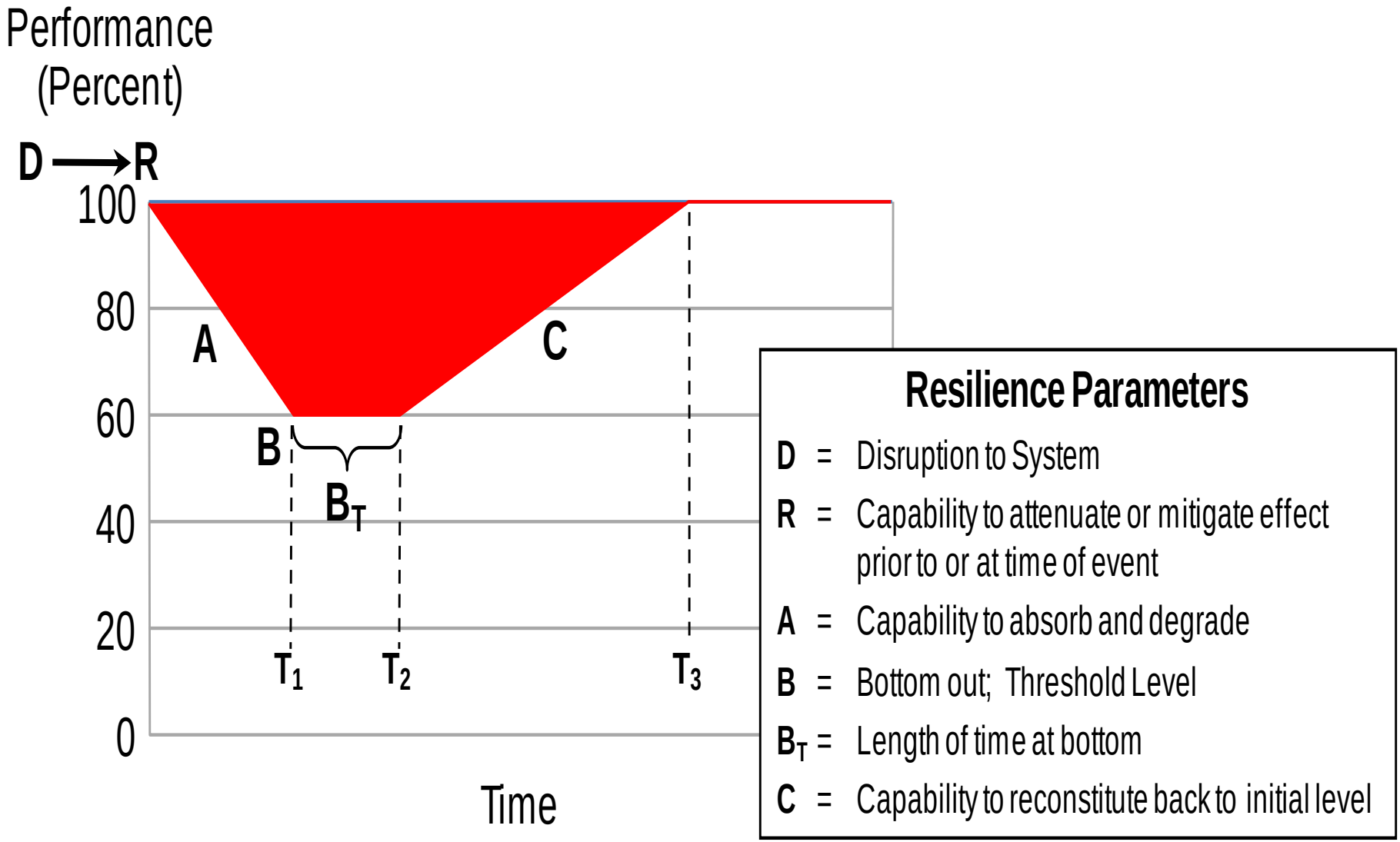
- Modeling
- Resilience Design (for predictive risk vs. experienced risk)
- Contingency planning and exercises
- Maintain Situational Awareness

During event:

Resourcefulness – decision making and actions should be done nimbly and competently so as to mitigate consequence and support rapid recovery

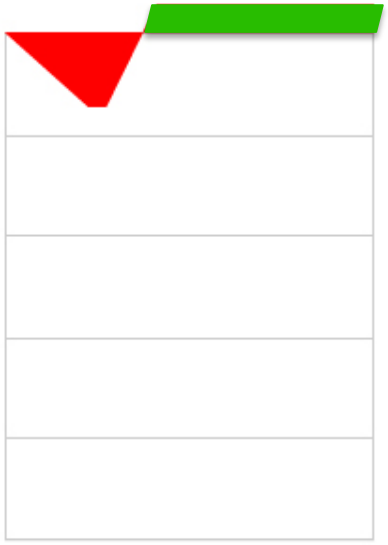
Post event:

- Restore critical processes and essential function
- Restore full / normal function
- Learn, adapt and improve resilience design

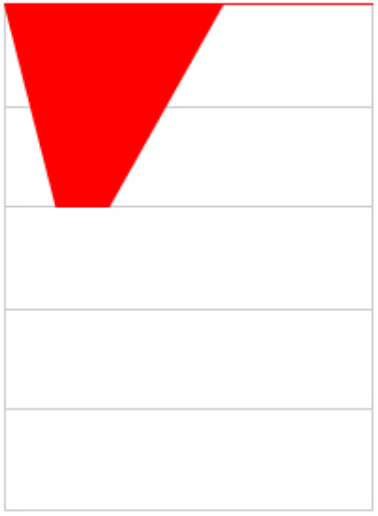


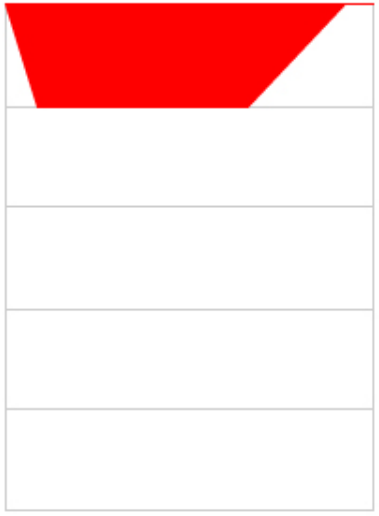
Source: J. Kahan, et. Al., *Risk and Resilience: Exploring the Relationship*, Homeland Security Studies and Analysis Institute, Nov 20, 2010 & Mary Ellen Hynes, "Extreme Loading of Physical Infrastructure" presentation at the 4th *DHS University Network Summit*, March 11, 2010;

Best (relatively small area)



Acceptable (relatively average area)





Worst (relatively large area)

Resilience as a Deterrent

Resilience Reduces Risk by Undermining Threat

Threat = Intent x Capability

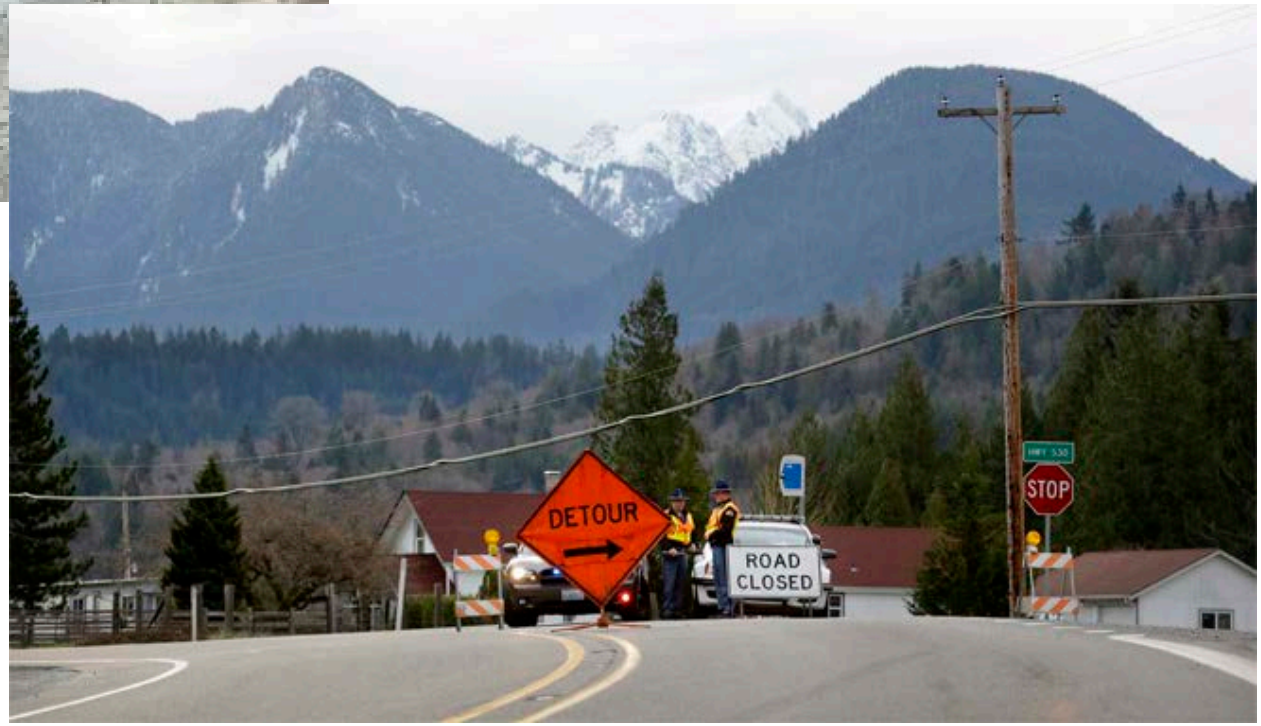
Less vulnerability translates into elevating the requirement that an adversary possess more capability to overcome safeguards

Less consequence will undermine intent; i.e., there is little motivation for carrying out an attack if it does not achieve mass destruction and disruption

The importance of harnessing the capabilities of civil society

Oso, Washington MudSlide, March 22, 2014

The “Professional Protector” Approach



Harnessing the capabilities of volunteers

CONCLUSIONS

- Resilience requires greater emphasis on and investment in forecasting, modeling, monitoring, and assessment capabilities that can support mitigation, speed response and recovery, and inform adaptation in the aftermath of disruptive incidents.
- Large-scale disasters impact regional systems and therefore require an enhanced capacity for undertaking preparedness, response, and recovery at a regional level.
- Resilience requires a deeper understanding of interdependencies and the cascading effects that a major disruption can generate.
- Companies and communities need to “bake-in” resilience into their critical systems and functions.
- When disaster’s strike, the first responders are always local and citizens are indispensible strategic assets.
- Local, regional, and national competitiveness will increasingly be defined by the level of resilience that communities and countries have to withstand, nimbly respond, and rapidly recover from shocks and disruptive events. People will chose to invest in companies and live in areas that possess resilience and gravitate away from those that do not.