

International Resilience Symposium

Meeting was held on September 3-4, at the National Institute of Standards and Technology (NIST). NIST was the sponsor for the event. Eric Holdeman, Director, Center for Regional Disaster Resilience (CRDR) attended and took the following notes from the symposium.

Establishing resilience standards requires the integration of researchers, standard setting organizations and the user community. This requires not only a United States perspective, but international involvement. Collaborate, cooperate and compete is the issue that is faced by many sectors. How do we do that in our local, state and national perspectives? "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.
Why are we not investing in resilience?

We don't recognize how unprepared we are to handle foreseeable risks and uncertainties.

- We overestimate our current capabilities to handle challenges
- We have a bias that discounts leading indicators of disruptive events in our future
- Stationarity (this is new word being used) assumptions that were embraced in the 20th Century infrastructure designs are obsolete
- Elected officials view acknowledging risks that believe that lack adequate resources to respond to, is a political liability.
- We don't have incentives to create resilience
- Are few rewards for investment—in too many cases there are actually penalties
- Routine efficiency and optimization are valued over

We don't know how to measure resilience because there is not yet consensus on how to create it.

- There are organizational or governance barriers to creating resilience.
- Infrastructures are almost always regional
- Infrastructure sectors are inherently interdependent
- Regional infrastructure sectors are vulnerable to multiple hazards

Hurricane Sandy was a "predictive surprise." Less of an Act of God. It was a knowable risk for New York City.

We need systems approaches to resilience. In NYC there are three transportation systems providing services, but in reality one system.

Resilience Centric approach

- Identify and adopt resilience design features, processes, and protocols that mitigate the risk of disruption, and speed recovery when mitigation measures fail
- Features:
 - o Cushionability

- o Resistance
- o Robustness
- o Redundancy
- o Graceful extensibility—the capacity for the infrastructure to adapt to disasters with an uncertain future risk environment.

Conclusions

- Need to distinguish between critical processes, essential function and normal function. Resilience requires bigger thinking on the scale of disasters that impact regional systems
- Resilience requires a deeper understanding of interdependencies
- Investments in resilience will not happen in the absence of political and economic incentives greater emphasis on investment in forecasting modeling and monitoring capabilities
- Innovation, inventiveness and luck will only carry you so far.

In NYC It took three days for 4,600 nursing home residents to be evacuated. This led to a displacement from regulated hospitals to community based care, home health workforce unable to accommodate the surge.

Resilience today might not look to be economically feasible today. But, for future disasters impacted by climate change may make it much more economically possible and make sense.

Check out book, Thinking Fast and Slow.

System 1 behavior: Automatically and quickly with little or no effort. Highlight importance of recent past experience. Basis for systematic judgmental biases and simplified decision rules

System 2 thinking and behavior: Individuals undertake tradeoffs implicit in benefit-cost analysis.

- Recognizes relevant...
- Not in my term in office (NIMTiO)
- Guiding principles:
- Premiums should reflect risk
- Dealing with equity and affordability issues

Book, Disaster Resilience a National Imperative

Trends:

- Significant progress over last decade and excellent work within domains
- Growing recognition of interdependencies as primary challenge
- National policy statements acknowledge that resilience is critical

Some things are not:

- Continued fragmentation and lack of synchronization of effort at all levels
- Development of overly complex tools that communities can't use
- Critical lack of incentives—failure to coherently state a business case
- Old think, too much bouncing back; too little adapting and finding opportunities

You need turbulence and change in order to seek opportunities.

Resilience Investments:

- Business
- Local governments
- DHS NIST Small businesses and families

Next steps:

- Develop incentives or penalties for communities to take action
- Partner and form networks of networks
- Change will happen and it can bring opportunities
 - o Pain is inevitable; suffering is optional
 - o Problems are best solved at the lowest level possible
 - o

Alice Hill, Senior Advisor for Preparedness and Resilience, National Security Staff. Federal documents are reflecting the term resilience. How will we make resilience become resilient? Changes are occurring that need to be included in the model of resilience. The old condition is not where we want to go with resilience. Bouncing back is not the place to be in the future. There will be bigger and stronger storms. Look at the drought in our Western States that is happening now. We need to plan for a future projection and not the past. The National Climate Assessment documents that climate change is happening now. Baltimore had 4” of rain in an hour just this past month. There is a new normal that we are facing. Decisions makers must expect to be surprised and with an increasing frequency.

Susan Cutter, Director, Hazards Research Lab, University of South Carolina. We don't have a consistent and coherent basis of funding. Therefore people go where they can get the funding. Resilience has become a popular term. Federal government adoption of the term is leading the pack with use of the term. The notion of resilience needs to help with capacity building. A resilient system is one that can adapt.

David Kaufman, Associate Administrator for Policy, Program Analysis, and International Affairs, FEMA. Disasters happen to communities. Can we try to reach people by our normal pattern of behavior? We have infrastructure operating way beyond its original design capacity.

Meir Elran, Senior Research Fellow, INSS, Tel Aviv University: 51 days experienced 100 rockets each day. The role of leadership is critical in a crisis. Social trust must be present.

Scott Graham, Mid-Atlantic Division Disaster Executive, American Red Cross. Great lessons from Katrina that were applied in Hurricane Sandy. The power of social media was evident with the wide distribution of their Hurricane App.

Responsibility is part of this issue of disasters. Other interests get in the way of people taking action to become more personally responsible. Incentive structures need to be modified. The FEMA program has been in the past to only restore to original condition and not improve the condition or resilience for a future disaster.

Everyone believes that the Federal Government is going to bail you out. No one is against resilience; they just don't want to fund it. Lots of good work being done in cylinders of excellence. The social aspect of resilience is more important than that of the physical aspect.

Panel on Infrastructure Resilience Trends

Risk to Critical Infrastructure

- More users and exceed infrastructure design capacity
- Aging infrastructure
- Water mains, bridges
- Cascading disruptions

Why are we not investing in resilience?

- Optimized for efficiency not resiliency
- Component level the design codes not made for resilience
- Climate change impacts

Imperatives:

- Ensuring flexibility by designing
- Characterize interdependencies
- There is no shortage of disasters to learn from
- Recent research and experience in climate change
- New paradigm of design
- Growing computational capacities to model complex networks across natural endangered and human systems
- CyberGIS to map infrastructures and identify risks.

There is an overuse of the term resilience. People are using it versus security or preparedness and other terms. When considering how to repair an older facility, have a rating of the resilience of the options being considered. We need to be able to quantify resilience. We need to take a system approach versus the component function. Workshop formats help to do this.

DHS, S&T

Looking forward. The past is not a good predictor for the future. We live in a crazy world. On a national side of things, we don't understand the impact of interdependencies. Cybersecurity is becoming huge. If we don't understand our relationships we can't make progress. We need to try to establish metrics for measuring resilience.

Some opportunities for the future. There has been some disciplinary work that has been done in the past. Some interdisciplinary work has been done in centers that look at earthquakes. Nonstationary: Events are very deterministic. Advancing the building code is not easily done.

We need to do a lot of education and modeling to have the decision makers understand the issues and define the "what if" scenarios. Biggest challenge in modeling is that these models are not connected. We need to have immediate access to modeling. Data is important for critical infrastructure across physical infrastructures. There is good work on interdependencies. How to share that information is something that needs to be solved. Owner operators need to see a benefit to them for them to share data.

DHS has done 55 exercises with the FBI on the largest malls in the USA. Using complex attack scenarios.

NIST presentation:

Estimated \$57B loss in damages

Community resilience.

Community needs drive functional requirements for buildings and infrastructure.

Developing a Disaster Resilience Framework. April of 2015, establishing a Disaster Resilience Standards Panel to develop Model Resilience Guidelines.

Establish types of performance goals and ways to express them

Identify existing standards, codes and best practices that address resilience

Identify gaps that must be addressed to enhance resilience

Capture regional differences in perspectives on resilience.

Deliver the Framework in April 2015. Disaster Resilience Standards Panel. Look for the document on the web, now 25%

First deliverable of the Climate Action Plan that NIST has.

Disaster Resilience Fellows at NIST. Eight people in the first year.

Disaster Resilience Center of Excellence. Enable collaborations and postdoc work.

Creating Incentives for Resilience Investments:

NYC MTA had a \$1B insurance policy for losses. They had a loss of \$5B from Sandy. The insurance industry immediately contracted due to their losses and being overly committed in the region.

Storm surge was their major hazard that would cause catastrophic damages. They were only able to replace half the insurance they had before Sandy at twice the cost. They were able to do a bond at a 1.7% risk to the investors. They were able to get \$300M at a 4.5% interest rate for a three year bond. The hazard covered is storm surge at a specific level, 8.5' at Battery Park. You have to have data in place coming from government and also know your property values.

The bulk of FEMA disaster relief funds goes to public infrastructure. Transparency drives self-correcting behavior. Thad Allen. Climate Adaptation and Mitigation are the same.

IBHS We need to get people to pay attention, Change minds, then change their behaviors and become more resilient. Hearts and minds are important. Incentives are needed. On the government side, it is a carrot and stick method. Carrots have dominated. Are there other incentives available from banks? No one does not want to be resilient. Politics are at play. Insurance is used to cover a lot of sins. Issue: The appraisal system looks only at comps, not at resilience of infrastructures.

We don't have consensus based building code standards. Increased visualization of the hazards using mapping is critical. National Climate Assessment is a key document. Perfect data does not change hearts and minds. Data as a stick doesn't always work because people react to the data differently.

FEMA is moving toward being able to build to a higher standard than what was there before. Hud \$1B program coming soon...

Key takeaways

Regional interdependence—Standards must be developed by way of local and regional communication and transparent information sharing across infrastructure sectors and blend insights from social science and engineering.

Education—Educating and engaging stakeholder's will improve both the buy-in for a quality of standards; do this via testing and feedback while at the same time creating incentives for resilience investment.

Process oriented standards—Standards that focus on desired outcomes and time are likely to be more effective and timely than prescriptive standards.

Actions—Develop residence framework for small/medium sized communities

- Adapt existing standard frameworks for a broader resilience focus. Draw on volunteers to develop, provide feedback on, and incorporate standards

Create community case studies with regional focus

- Evaluate baseline conditions and describe what it would take in terms of steps, costs, time and limitations to make the community more resilient.

Build decision support tool for stakeholders: resilience “action guide”

- Giving public officials ability to do what-ifs, visualize data, and understand consequences of decisions across sectors will support the standards development and buy-in

Creating Infrastructure Resilience Standards

Key Takeaways and Questions

Boundaries

- Can you impose broad standards on a public good, and would these be national or local standards?
- Can standards be established on things that can't be quantified?

Human element

- Creation of resilience standards must take into account the human and community level elements. Communities and individuals need to understand resilient standards before they will accept them.
- Basis for Resilience Standards—Prescriptive or not?-From an engineering perspective the creation of standards of resilience is a question of adding resilience measures into codes.

Action Steps

- Requirement for data and benchmarks
- Need to identify and test standards with the states
- Need to have a better understanding of resilience

Creating Community Resilience Standards

Observations

Is it possible to set standards for all communities?

- Can see standards for community components
- Communities have different scales, demographics; cultural norms; high income/low income, low risk/high risk, etc.
- Community resilience = more than standards for “tangible” components
- Resilience is a frame of mind
- Involves social elements as much as engineering, and other tangible elements
- Community resilience is not just an outcome, but a process—how you get there determiners where you go

If standards are possible

- Must include performance goals and behavior standards
- Should address outcomes and expectations—what the standard is designed to achieve for the community

Recommendations

- Engage community in goal setting, understanding risks, and making informed decisions about risks
- Represents shared responsibility
- Addresses community risk tolerance
- Consider setting principles of performance goals for the community
- Include behavioral standards for all hazards
- Explicitly include recognition of community-based process in establishing standards
- Include exemplars for modeling resilient behaviors for all sectors and elements of community. Look at Grand Forks flood wall—Google it.
- Consider I-12 education as important part of process

Key takeaways

- The effort should be recognized to be about defining measures to help build resilience, not about coming up with resilience standards. Understanding desired functionality is critical to developing usable and non-ambiguous standards
- To ensure desired functionality, it may be better to develop performance goals and objectives than prescriptive technical standards
- NIST's end product must answer the question, "so what?"
- To be effective, standards must be scalable in many ways. Standards must span temporal space.

Recommendations

Additional stakeholders to add to the discussion:

- Ecologists
- Emergency Responders
- Urban Planners

Incentivizing Resilience

Building social capital/civil society, recognition of shared transnational challenges'
Non-state actor engagement (NGOs, corporations, researchers)

Moving from Security to Resilience

- Risk management to resilience management
- Don't let probability drive how we approach disaster resilience. 1:10,000 or 1:20,000 chance of happening.

Establish a transnational community of practice

- Global resilience network
- Learn lessons/shared data and technical research
- Is there a way to study the successful improvisation in resource constrained areas?
- Champions

- Need for a common language
- Overcome barriers
 - restrictions to data access
 - Funding flow across borders

Key Approach resilience regionally

- Cultural appropriateness
- Relevance of incentives
- Shared trans-regional infrastructure.

Appropriate role for international institutions?

- There needs to be a consensus on what is being measured and how it is measured without creating hurdles to action
- Identifying and awareness of disincentives
- Anticipating barriers in developing incentives
 - Disincentives
 - Legislation
 - Management structures

Recognition that one size resilience standards don't fit all, but component standards can work.

Taking advantage of motivators towards incentives

- Third party facilitators
- Events (earthquakes, hurricanes, floods, etc.)
- Reputation/peer effects

Different models of incentives: Cooperative vs Government

- A stick when there are public consequences of inaction
- Considering crafting value based incentives
- -Go to the community

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