

# Emerging Vulnerabilities and Disaster Risk Management Solutions for Multi-Hazard Resilience



**DRM@VT**  
DISASTER RISK MANAGEMENT INSTITUTE

James R. Martin, II  
Professor

World Institute for Disaster Risk Management at Virginia Tech (DRM@VT)  
Center for **Extreme Load Effects on Structures** (CELES)  
Virginia Tech

# **We'll discuss:**

- 1. Disaster trends**
- 2. New-age Disaster Resiliency Challenges**
- 3. Emerging Solutions for New Challenges**
- 4. New Research Findings**
- 5. Summary**

# Disasters

## Disaster:

- “A serious disruption of the functioning of society, causing widespread human, material, or environmental losses which **exceed** the ability of affected society to cope using only its own resources”

- The United Nations, 1992.”

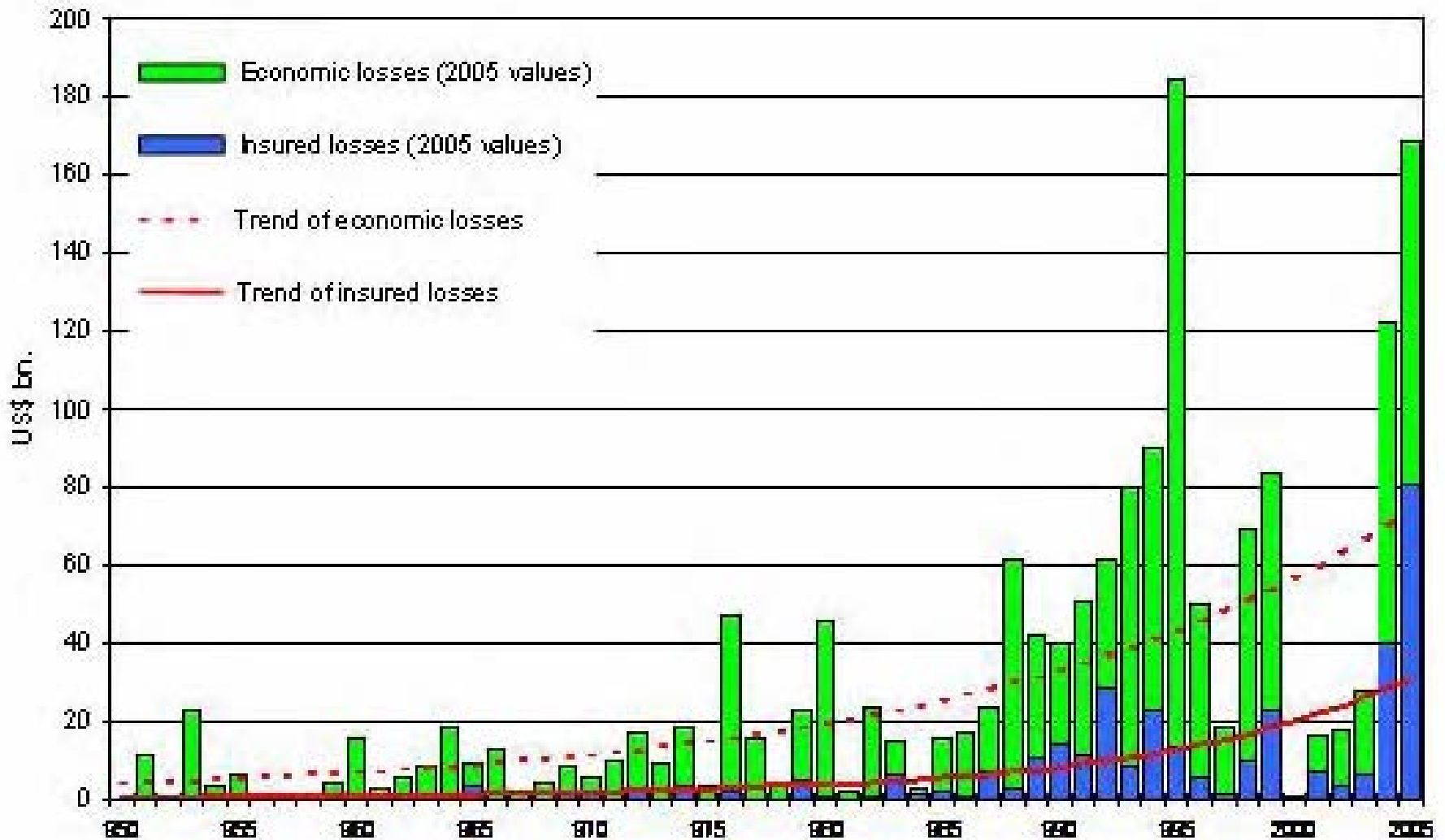
# Resilience

## Resilience:

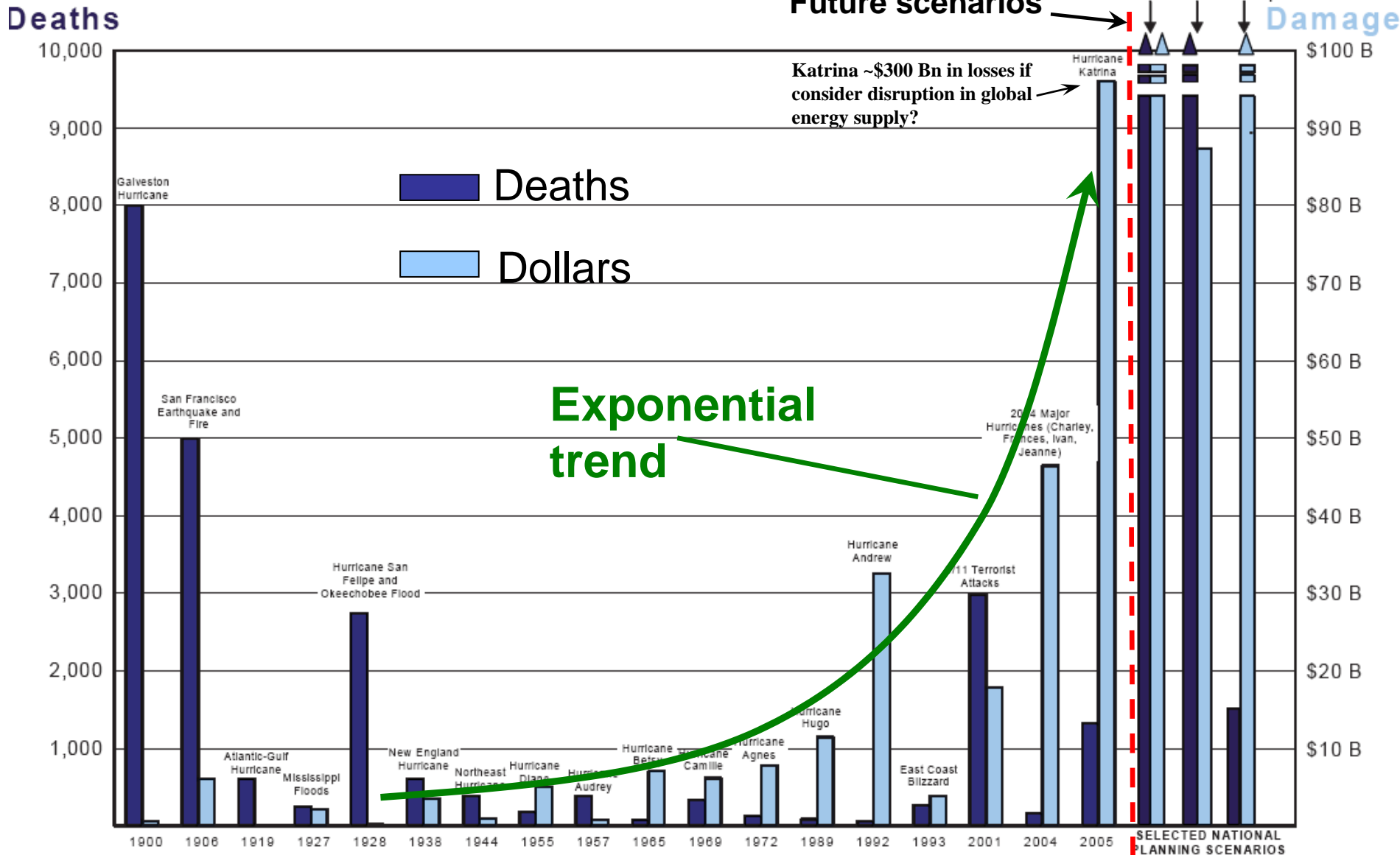
“...the community’s ability to sustain its functional processes, or fail to do so (as in Hurricane Katrina), following a major disruption.”

- involves redundancy, resourcefulness, resourcefulness, communication, and the capacity for self-organization in the face of extreme demands. **Function of many things: social capital, resources, awareness, etc.**
- is a critical subset of sustainability (economic, social, and environmental resilience)

# Global Disaster Losses Since 1950



# US Disasters Since 1900 & Future Scenarios



# Why This Dramatic Trend?:

- Poverty, population growth, **increasing development in high-risk areas** (53% US pop. along coasts), increasing wealth, aging infrastructure, poor chains of communication & responsibility, lack of gov.'t prioritization & sustainable policy, lack of education & awareness, **increasing extreme weather events** (69% of losses since 1950)
- Increasing global economic interconnectedness and interdependence; and,
- Increasing reliance on private sector to provide critical infrastructure and key resources --- **85% of the energy, banking, finance, transportation, vital human services, and telecommunications-- are provided by or operated by the private sector**— and most are highly interdependent
- Terrorism

# Summary of New 21<sup>st</sup> Century Vulnerabilities

Our risks and vulnerabilities have out-evolved us:

- They have migrated from **well-studied risks to those with a higher level of surprise and unpredictability;**
- With an **increasingly interdependent** world, globalization of social and economic activities have led to a globalization of risk
- Local accidents within a single firm or industry have been replaced by **large-scale cascading events or threats that transcend traditional frontiers, firms, and industries and mix interests from the public and private sectors** with potential losses vastly exceeding the capacities of insurance frameworks.



# 21st Century Resiliency Challenges

- Solutions too complex for one entity to solve (i.e. gov't.)
- Large hierarchal organizations increasingly ineffective (spiders) at addressing new challenges
- Inadequate preparedness at all levels of government and society with new threats
- **Solutions, like the problems, must also transcend, traditional expertise, jurisdictional boundaries** (in other words, they must be new)
- High level of interdependency among key players underappreciated;
- Katrina example: \$80 bill. direct loss, but \$300 bill. loss if global energy disruption considered; also levee risk evolved over time- need sustainable solution

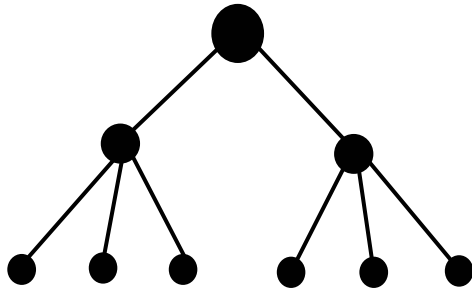
# Response to These New Challenges

- Multi-organizational Alliances and Partnerships (**MOAPS**) “leaderless” networks of stakeholders and peers (starfish) are **organically** forming to meet resiliency challenges
- **Leadership is being redefined**
- This is a **global phenomenon** that is occurring locally
- Most MOAPS have formed in dynamic fields such as information technology (i.e., wikis), business and finance, etc. -- driven by the need for mutual survival through partnership for innovation due to **rapid, hard-to-predict changes** in core business (i.e. Kodak)
- Since 9/11, 2004 Tsunami, and Katrina, starfish appearing in disaster-related fields

# Resiliency of “Leaderless” MOAPS

**“Spider”**

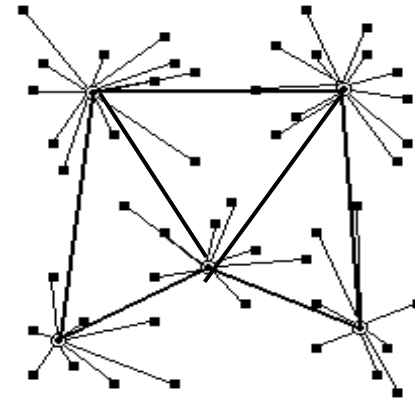
**Centralized**



**i.e., Montezuma,  
FEMA/DHS**

**“Starfish”**

**Decentralized**



**i.e., Apaches,  
AHC, Hokies  
United**

**Often becomes stronger when attacked  
(much more resilient, as w/ terrorist network)**

# MOAPS and Community Resilience

- Recognize that all major disasters are really just a collection of many small localized disasters
- Key actions— preparedness, response, recovery, reconstruction, and mitigation— are local community issues
- Community MOAPS offer an effective approach; they exist at cutting edge of disasters, can typically share information, respond, and adapt faster, and be sustained over time
- **Case study:** Bam Iran EQ 2003; int'l rescuers arrived 72 hours after EQ; pulled 30 folks out alive at cost of \$1 million per life. **If local teams were trained and enabled, cost would have been about \$0.50 per life**

# Current VT Research Questions

- How can MOAPS be grown and sustained?
- What should be the role of government?
- How can knowledge from successful MOAPS be transferred to other regions to spawn new sustainable MOAPS? (more difficult to do than it appears)
- What commonalities have been present for successful MOAPS? What lessons are there from failed MOAPS?

# Excellent Examples of Successful MOAPS

- All-Hazards Consortium (AHC) – 9 states, federal and local government, 100's of private sector members
- Pacific Northwest Economic Regional Forum (PNWER) – 5 states, 2 Canadian Provinces; 100's of private & public sector members, multi-national
- Chicago First – regional consortium of key players in most diverse financial region in US
- Hokies United – student-led network that responded to 4/16 shooting tragedy at VT
- SAHANA (international on-line community)

# Commonalities of Successful MOAPS

- They typically formed around a central theme or defining event (i.e., 9/11), and enabled by simple communication platform (i.e., Internet)
- Sometimes made use of existing “networks” to begin
- They have **common, overlapping** interests-- usually they all have a problem they cannot solve
- Groups stayed problem-focused—action not just activity
- They are typically envisioned, started, and nurtured by a “champion” w/ good **leadership and networking** skills who **moved aside once momentum was established**;
- Champion was not coercive— different kind of leadership
- Champion “**connected the dots**” but **did not become a “dot”**; growth driven mostly organically

# Commonalities of successful MOAPS

- They have no strong tie to their “identity”– again **problem driven**– and they did not institutionalize themselves too early
- Feeling by members that they are a part of something larger than themselves
- Feeling of equity among all members- boundaries between national, region, local government and private sector eroded; relationships of all partners are **peer-to-peer**
- Shared leadership, governance; circular organizational structure
- Private sector involvement is substantial
- They often provide solutions to issues far beyond those envisioned at the time of their formation
- ***Trust is the glue that binds***





# Main Lessons for Forming Regional MOAPS

- Focus on the people, then the process, then the technology
- Find those who “own the problem”
- Appreciate the value of simple relationships between each actor **prior** to a disaster event—the plan is nothing, planning is everything—“**a disaster is no time to exchange business cards!**”\*

---

\* Brian Tishuk - Chicago First

# Ongoing VT Research Efforts

- We (i.e., government) should be focused less on “coordinating” communities and more on creating “enabling” communities—our main focus, thus:
  - Dialogues to further our understanding of MOAPS: MANA project with CNA, VT, and DHS; similar special IDRC 2-day symposium later this week
  - Complex network theory and analysis for modeling pandemic and infrastructure and social networks—using solution analogs for application to MOAPS

# Summary

- New 21st century disaster vulnerabilities present new resiliency challenges
- Organic “leaderless” networks of multi-organizational partnerships (MOAPS) forming in response— traditional boundaries transcended
- MOAPS can increase community resilience
- Research ongoing research to better understand and exploit MOAPS to build enabling, more resilient communities