Building Resilience

Resilience is the ability to anticipate risk, limit impact, and bounce back rapidly in the face of turbulent change.

Community & Regional Resilience Institute (CARRI)

Foundations:
1. We can identify the threats
2. We can model the threats to predict the effects (risk)
3. We can create risk management strategies to counter the negative effects
Four Players Create a Risk Ecosystem

- Public Sector
- Private Sector
- Insurance Industry
- Citizens
Emphasis on Increased Risk

Number of Natural Catastrophes with at Least $1 Billion in Economic Loss and / or 50 Fatalities

Source: Munich Re: 2013 Natural Catastrophe Year in Review
Population Shifts to Vulnerable Regions

- In 2010, 39% of the U.S. population lived in coastal shoreline counties, which represent less than 10% of the U.S. land area.
- Population density in coastal areas expected to increase at more than three times the national average between 2010 and 2020.
Population & Industry Densities (Business Analyst) in Hurricane & Earthquake Hazard Zones
Scenario – Emergency Operations Center in Miami Beach, Florida

- Role is to coordinate all emergency preparedness and response for any emergency that may arise in Miami Beach
- Citizens depend on the support of the EOC
- Designed to withstand extreme hurricanes and be fully operational and self-contained for 168 hours (1 week)
  - Includes structural design, food, water, communications, etc.
Deaths from natural disasters decrease while frequency of events and number of affected people increase.
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Why?
- Life Safety Code has saved millions of lives, but does not address "service" interruption.
- Building resilience will save billions of dollars.

4 R’s of Resilience

- **Robustness**
  - Inherent strength, resistance

- **Redundancy**
  - System properties allowing for alternative options, choices, substitutions

- **Resourcefulness**
  - Capacity to mobilize needed resources

- **Rapidity**
  - Speed with which a disruption can be overcome
What Do You Need To Know To Start Planning?

• **Recovery Time Objective (RTO) - Criticality**
  - How long can your operations be off-line?
  - Do you have any single points of failure?
  - Is redundancy built into your production process?

• **Threat Hazard Identification and Risk Assessment (THIRA)**
  - Have you identified all of your threats?
  - What size threat do you use for planning purposes?
  - Likelihood: Probabilistic vs. Deterministic approaches
Resilient Engineering

- It is more cost-effective to build in resilience than to retrofit
- Value engineering is shortsighted and can eliminate resilience
- Resilient engineering should be based upon recovery time objective (RTO) and a design threat
Relationship Between RTO, Threat and Cost to Mitigate
Strategies and Tactics

1. Leverage existing successful programs
   A. USACE - Silver Jackets
   B. Clemson Engineers for Developing Countries (CEDC)
   C. Natural Hazard Mitigation Association (NHMA)
   D. Extension Disaster Education Network (EDEN)

2. Define best in class processes and systems
   A. Building a “Resilience body of knowledge”
   B. Execution Framework
   C. Measurement

3. Smaller communities with less capabilities / capacities

4. Identify federal / non-federal funding partner(s)

5. Run a pilot

6. Create an institutional framework

7. Develop strategy to replicate
Silver Jackets

- State-led (Voice of our Customers)
  - States set priorities for coordinated Interagency Federal support

- Interagency method of delivery
  - Collaboration across agencies / levels of government
  - Universal / Tailorable for all Agencies / Programs
  - Leverage resources: talent, data, funding

- Continuous, not project-specific

- Life-cycle risk management

- Watershed perspective
  - State teams facilitate regional, state-to-state flood risk management

As of April 2015

44 Active Interagency FRM Teams (SJ)
7 Ongoing Effort to Develop Teams
Shared Risk Management

“Driving Down the Risks with an Informed and Engaged Public”

Flood Risk Management methods include:
- Protecting areas that absorb floodwaters
- Restoring floodplains and creating habitat
- Encouraging new development in less flood-prone areas
- Achieving less runoff from developments (LID/buffers)
- Integrated watershed plans for multiple objectives
- Mitigating future development impact and weather patterns

Risk Management:

1. Initial Risk
   - Outreach: Federal / State / Local
   - Natural Storage: Federal / State / Local
   - Structural: Federal / State / Local
   - Non-Structural: Federal / State / Local
   - Contingency Plans: Federal / State / Local / Individual
   - Building Codes: State / Local
   - Zoning: Individual / NFIP
   - Insurance: Individual / NFIP

2. Residual Risk

All Stakeholders Contribute to Reducing Risk!
Typical Team Structure

- State or USACE coordinates/facilitates
- Regularly recurring meetings
- Strive for consensus
- Membership expands/contracts depending on issues (Federal, State and/or local)
- Evolves with State’s needs
- Non-binding guiding document
Silver Jackets Interagency Projects

- USACE funded projects that:
  - Support state priority in flood risk mgmt
  - Leverage partner resources
  - Demonstrate measurable benefits
  - Not a grant: USACE labor combined with partner programs

- Leveraging allows more comprehensive solutions
  - No one agency has sufficient funds or authority to manage flood risk
  - Resources are primarily ‘in-kind’ services

- 155 projects initiated in 44 states

- FY 2016 Request for Proposals ~ April 2016
Some Secrets of Effective Silver Jackets Teams

- Local champion (state-focused)
- Goal agreement
- Understand risk and consequences/ desire to mitigate
- Team dynamics
  - Flexible membership
  - Open discussion
  - Trust
  - About the Team not Turf
- Support (external and internal)
  - Networking
  - Information sharing
  - Resource sharing
- Resources
  - Organization / facilitation skills
  - Know what is available
  - Know how to leverage
  - Tools/templates (transferable and translatable)
Serving the developing world, developing those who serve.
CEDC is:

- Service-learning organization
- Students from all different backgrounds
- 2 parallel goals:
  - Develop sustainable solutions to improve the quality of life in Haiti.
  - Develop or enhance skills of students where our other courses are lacking.
63%

The percent of employers that say college graduates lack essential skills needed to succeed in today’s global economy.

- Association of American Colleges and Universities
Current Efforts

CEDC
CEDC is a student lead service learning organization that was founded in 2009 by Jeff Plumblee.

- 2-4 resident interns
- ~12 travel on breaks
- 90+ students engaged
Translational Education

Multi-discipline student group presented with problem, leverage mission planning script with solutions vetted by practitioners.

Outcomes:

• Belle Aire – Zero incidence of water borne disease since August 2012
• NGO – Low cost solutions with high impact
• Students learn by helping others
Design and installed the first chlorinated municipal water system in Haiti.

Lifting 100 GPM 1,100 feet with no electricity.
Cange Water System

Water Testing
- pH
- Chlorine
- TDS
- Turbidity
- Water usage
- UV readings
- Pressures

Real World Impacts

Raw water
September, 2012

Fountain water
September, 2012

CEDC
### Students from all five colleges

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Internationalizing Campus

- 2014 Heiskell Award Winner for Study Abroad
Outcomes

- Communication
- Teamwork
- Leadership
- Critical thinking
- Dynamic decision-making
- Lifelong learning
- Business administration
- Professional and ethical responsibility
- Globalization
Problem Statement:

1. Escalating and shifting hazards coupled with human migration are creating vulnerable population;

2. No consensus on risk mitigation processes and resilience incentives/disincentives are not defined;

3. Resilience grants, competitions and investments have ill-defined success/outcomes to measure progress.

4. Economically challenged communities are most vulnerable.
Proposed Solution

Execute pilot in economically challenged community:
- that will operationalize resilience in a community
- by engaging all sectors
- by leveraging a standardized framework based on a common language and delivered through a durable institutional framework
  - that establishes a baseline through assessments
  - that creates a prioritized action plan with metrics
  - that allows measurement of progress over time
  - that reduces lifecycle risk and cost.
ENDURE Process Steps

Efficient National Development Using Resilient Engineering

The process consists of the following steps:

1. Initial Desktop Assessment
2. Stakeholder Alignment
3. On Ground Assessment
   a. Risk Reduction
   b. Capability & Capacity Building
4. Prioritization of Activities
5. Implementation & Tracking
Initial Desktop Assessment

High-Level Vulnerability & Capability Assessment

- Transportation & Logistics Capacity
- Communications & Utility Reliability
- Economic Capacity & Resource Utilization
- Emergency Service Capabilities
- Proficient Governance
- Social Capacity & Stability
Initial Stakeholder Alignment

- Define terms to create a common vernacular
- Identify relationships between various stakeholders
- Mutual review of current & future challenges
- Common goal development
- Outline potential paths towards Resilience
- Define Key Result Areas (KRAs)
- Gather criteria for tabletop exercise
Risk Reduction

- Multi-tier threat assessment
- Vulnerability assessment
- Resilience-based gap analysis
- Mitigation project list
- Tabletop exercise and after action report
Capability & Capacity Building

- National assets and under-utilized resource inventory
- Asset network map with criticality assessment
- Gap analysis against future goals
- Asset and resource utilization study
- Outcome-driven project list
Prioritization of Activities

• Combine mitigation and capacity building project lists
• Perform multi-variable analysis via simulation
• Propose cost-optimized project scenario
• Stakeholder alignment on execution approach
• National Sustainability Strategy with metrics
• Develop integrated stakeholder master plan
• Create multi-year execution plan
• Execute projects in accordance with the Project Baseline
• Monitor metrics to validate progress towards objectives
• Reevaluate plan periodically and reassess goals
What is EDEN?

A collaborative multi-state effort by Land-Grant institutions across the country to share education resources to reduce the impact of natural and man-made disasters through:

- Interdisciplinary and multi-state research and education programs addressing disaster mitigation, preparation, response and recovery;
- Linkages with federal state and local agencies and organizations;
- Anticipation of future disaster education needs and actions;
- Timely and prompt communications and delivery of information that meets audience needs;
- Credible and reliable information

What is EDEN?
Strategies and Tactics

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