

Community Resilience and the Role Played by Critical Infrastructure

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How do we Define Resiliency? (1 of 2)

- The literature abounds with definitions for resiliency, but for the purposes of our work, resiliency is defined as:

“The ability of an entity – e.g., asset, organization, community, region – to anticipate, resist, absorb, respond to, adapt to, and recover from a disturbance from either natural or man-made events.”



How do we Define Resiliency (2 of 2)

- This definition purposely does not constrain the entity to:
 - Have to return to its original state – it can transform to a different yet functional or “better” state
 - Be unchanged at the end of the process – it can evolve as a result of the activity
 - Nor does it limit the entity’s resiliency to a particular kind of perturbation



Characteristics and Capabilities of Resilient Communities

Resilient Communities

Sustainability

A community's or society's **capacity to meet its basic needs** and those of its members.

Social Responsibility

A community or society's **will to improve quality of life** beyond basic needs.

Social Opportunity

Services and functionality that provide opportunities to **improve the quality of life** beyond the baseline.

Secure Environment

The ability to **provide** for the physical, health, food, and territorial **security of all individuals and resources** in the community or society.

These characteristics and capabilities individually and collectively “impact” resiliency.



Community Resiliency is Impacted (+/-) by the Interconnected Societal Institutions and Elements



- All 16 DHS infrastructure sectors can be mapped to this conceptual model
- Infrastructures clearly play a critical role in the resiliency of communities, both positively and negatively



An Example of the Role of Critical Infrastructures in a Resilient Community - Enhancing Public Health Systems

Resilient Communities

Sustainability

A community's or society's **capacity to meet its basic needs** and those of its members.



Social Responsibility

A community or society's **will to improve quality of life** beyond basic needs.

Goal: Double Capacity



Social Opportunity

Services and functionality that provide opportunities to **improve the quality of life** beyond the baseline.



Secure Environment

The ability to **provide** for the physical, health, food, and territorial **security of all individuals and resources** in the community or society.



Role of Infrastructures in Community Resiliency is Noted Most when Communities have been Perturbed (1 of 2)

- Critical Infrastructure plays a largely hidden role in community resiliency, and is often most noticed when absent or not operational.
- Critical Infrastructure plays a foundational role in each aspect of community resiliency and therefore, impacts are felt across the resiliency spectrum.



Role of Infrastructures in Community Resiliency is Noted Most when Communities have been Perturbed (2 of 2)

- The distributed relationship can make causes and resolutions difficult to assess, communicate, and therefore, manage.
- **Example:**
 - Riots occurred in Pakistan in 2011 over electric shortages that were blamed on the perceived incompetence of Pakistan's management of the electrical system
 - The truth was that India had reduced water flow in their shared rivers feeding their hydroelectric systems because of drought conditions




Assessing Community Resiliency to Impacts in the Critical Infrastructures

- There are several high quality methodologies for assessing Critical Infrastructures (CI) – many will be discussed this week.
- CI resiliency to **what** is critical – you can be strongly resilient to one type of perturbation and less resilient to others.
- Each aspect of CI resilience will have one or more indicators to represent the impact of the loss of CI. The indicators for each aspect can be combined to show a composite condition for that aspect of resilience.
- Compositing of the indicators then allows us to assess resiliency as a **Metric** as it demonstrates the integrative, confounding nature of CI in resiliency.



Assessing Community Resiliency to Impacts in the Critical Infrastructures - An Example

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		Enhance Societal Capacity Pillar																		
		0.53																		
		0.55				0.58						0.49				0.50				
		Humanitarian Assistance				Public Health Systems						Infrastructure				Disaster Preparedness				
		0.16		0.50	1.00	0.88	0.31		0.55		1.00	1.00	0.44	0.00	0.50	0.24	0.63	0.50	0.50	0.50
		Food Security	Short-term Shelter Non-food Items	Refugees and IDPs	Hazards Reduction	Potable Water	Sanitation	Nutrition	Health Facilities	Health Supplies & Equipment	Human Resource Capacity	Infectious Disease Management	Reproductive Health	Mental Health	Transportation Network	Telecommunications	Energy	Physical (e.g. Rivers, Waterways, Lakes, etc.)	Emergency Management	Early Warning Systems
Resiliency Characteristics																				
Sustainability - A community or society's capacity to meet its basic needs and those of its members.		0.16 H.1				0.88 P.1	0.31 P.3		0.55 P.12 P.13 P.14 P.15						0.50 I.1 I.2 I.3	0.24 I.7 I.8	0.40 I.10 I.12			
Social Responsibility - A community or society's will to improve quality of life beyond basic needs.				0.50 H.14 H.15		P.8 P.9					P.33 P.34	1.00 P.35		0.00 P.20	I.3 I.4 I.6		0.50 I.11		D.11	
Social Opportunity - Services and functionality that provide opportunities to improve the quality of life beyond the baseline.		H.6	H.7	H.8 H.9 H.10 H.11		P.10 P.6 P.11							0.44 P.19		0.50 I.15 I.16	0.25 I.13	1.00 I.14		0.50 D.8 D.9	
Secure Environment - The ability to provide for the physical, health, food, and territorial security of all individuals and resources in the community/society.				H.12 H.13	1.00 H.1 H.2 H.3 H.4	P.5 P.7		P.21 P.22 P.23	P.24 P.25	P.30 P.31 P.32	1.00 P.26 P.27	1.00			I.17 I.18 I.19	I.18 I.19	0.50 I.16	0.50 D.2 D.3 D.4 D.5 D.6 D.7	0.50 D.1 D.10	



Indicators and Metrics are Different!

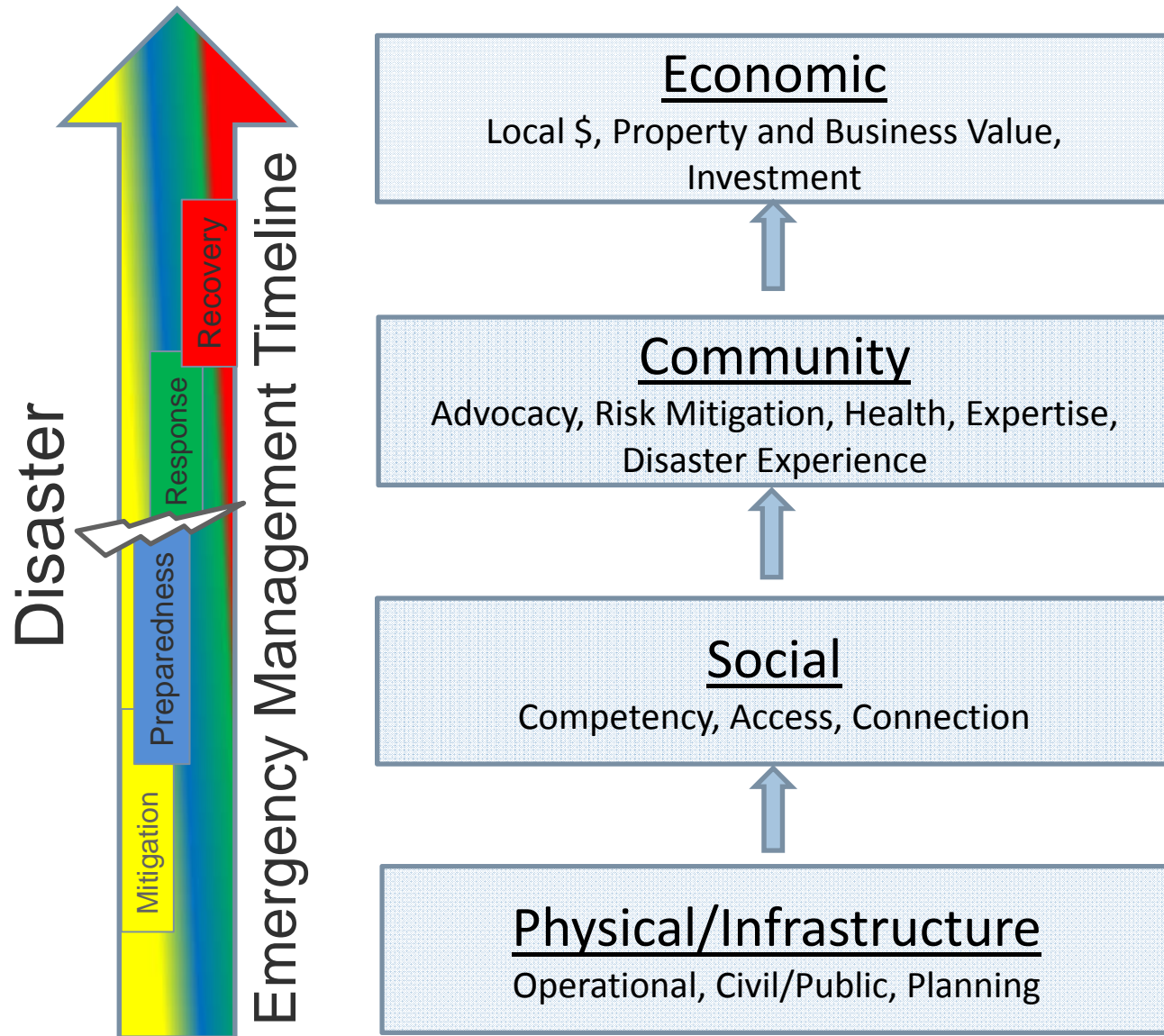
How do we know how we are doing?



- **Indicator:** Illustrates the relative position or state of a phenomenon being measured
 - What is the issue or characteristic or aspect? (apples, oranges, etc...)
- **Metric:** Provides a method to evaluate rate of change and trajectory (impact of efforts, efficacy)
 - Is the effort making things better or worse?
- Composite indicators and metrics communicate complex situations
 - Compare /benchmark



Measuring Community Resiliency Along the Emergency Management Timeline



Key Takeaways (1 of 2)

- Community Resiliency must be analyzed from a system-of-systems perspective – the interconnectedness of a community's structures can lead to unexpected feedback mechanisms and consequences.
- The role of infrastructures in contributing to community resiliency will involve factors that can be beyond the control of the infrastructure, but have impacts across the resiliency spectrum, and therefore are context driven instead of operationally driven.
- Resiliency is driven by **Context** and **Maturity** (capability).



Key Takeaways (2 of 2)

- The state of resiliency in a community is measured by **Indicators**, but the effectiveness of the actions to change the level of resiliency is measured by **metrics**
 - Compositing of indicators and metrics allows comparison
- Metrics change as maturity increases and is system-of-systems driven!



Questions?

