

# Critical Infrastructure and Regional Resilience

*Prepared for*

*1st National Symposium on Resilient Critical Infrastructure, Resilience Week  
2014, Denver, Colorado  
August 19, 2014*

*Prepared by*

*Frédéric Petit and Julia Phillips  
Infrastructure Assurance Center, Decision & Information Sciences*

# Resilience

WHY?

- **EO 13636 and PPD-21**
- **NIPP 2013**



# Resilience



# Resilience

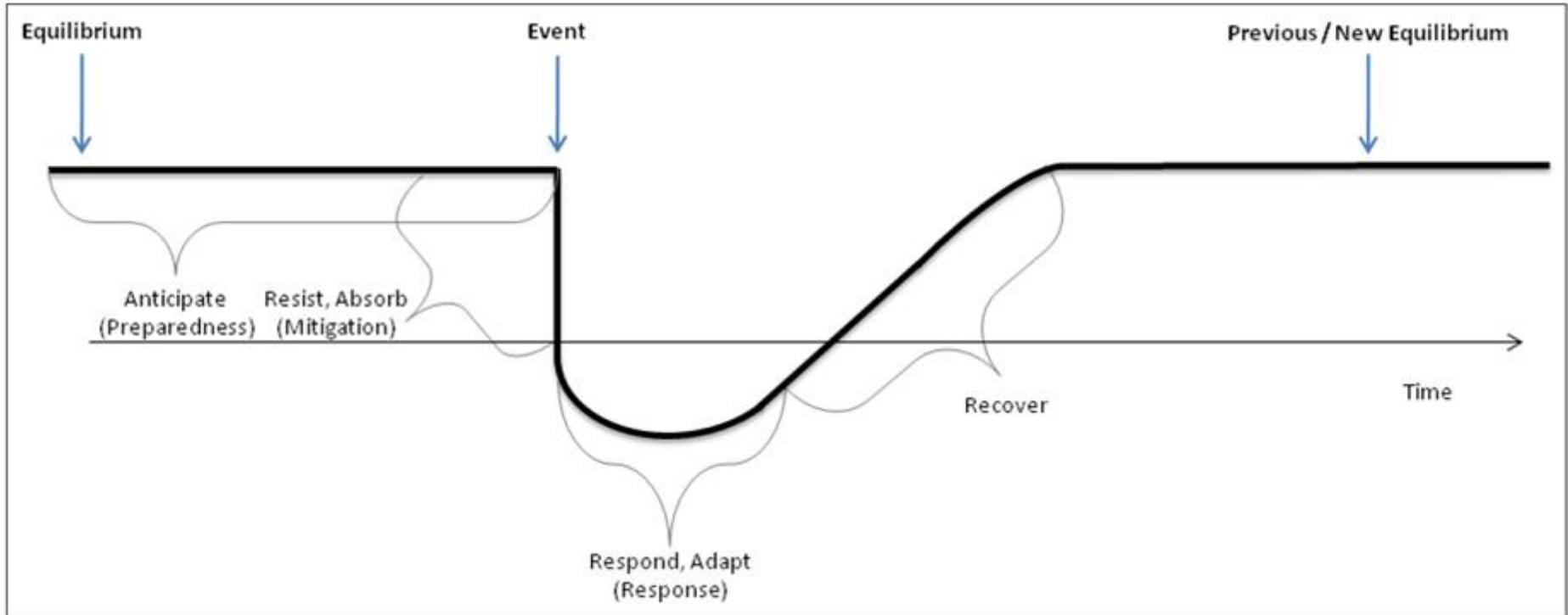
WHAT?

**Ability** of an entity (e.g., asset, organization, community, region) to **anticipate, resist, absorb, respond to, adapt to,** and **recover** from a disturbance

(Carlson et al., 2012)



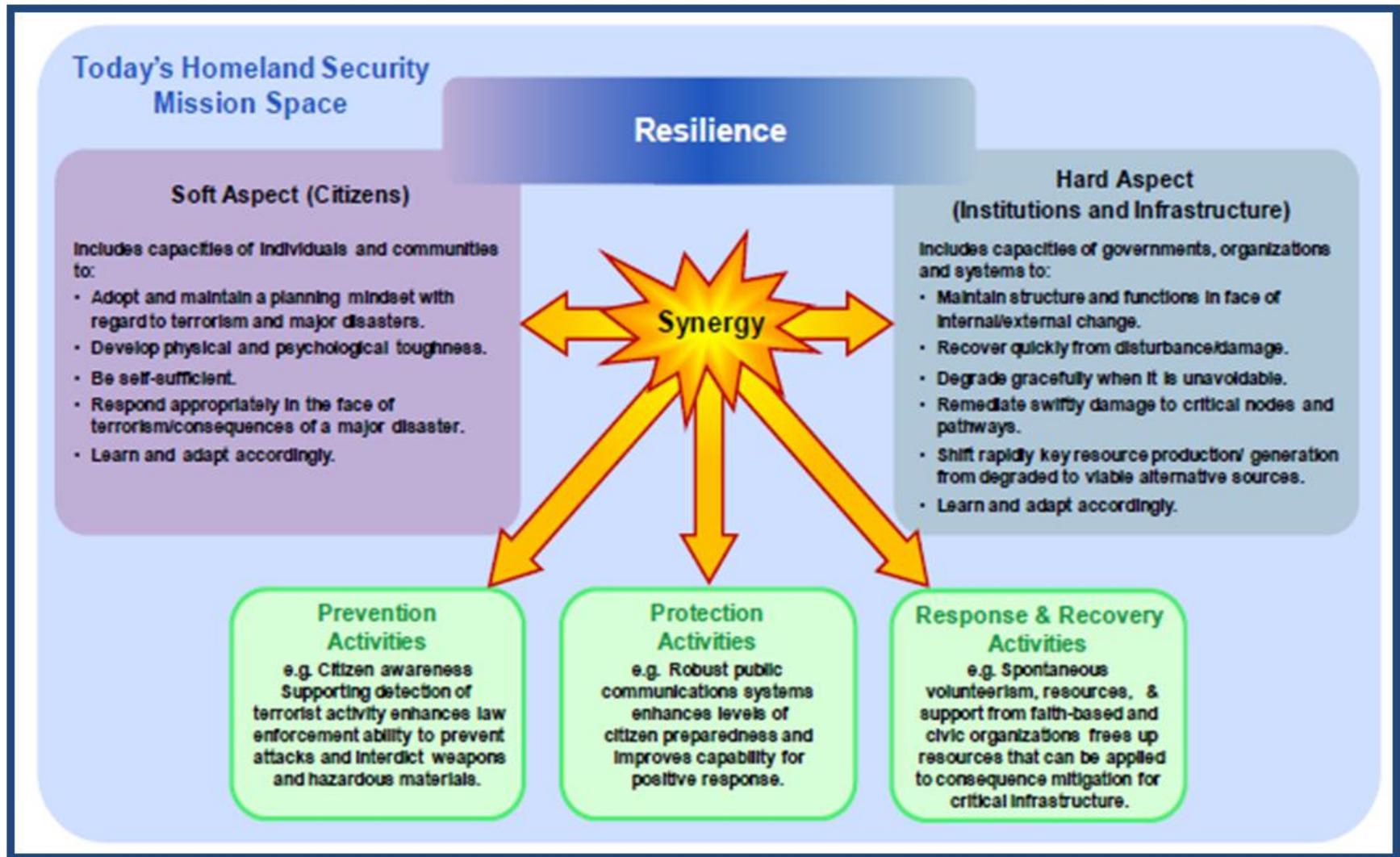
# Resilience Components



(Carlson et al., 2012)

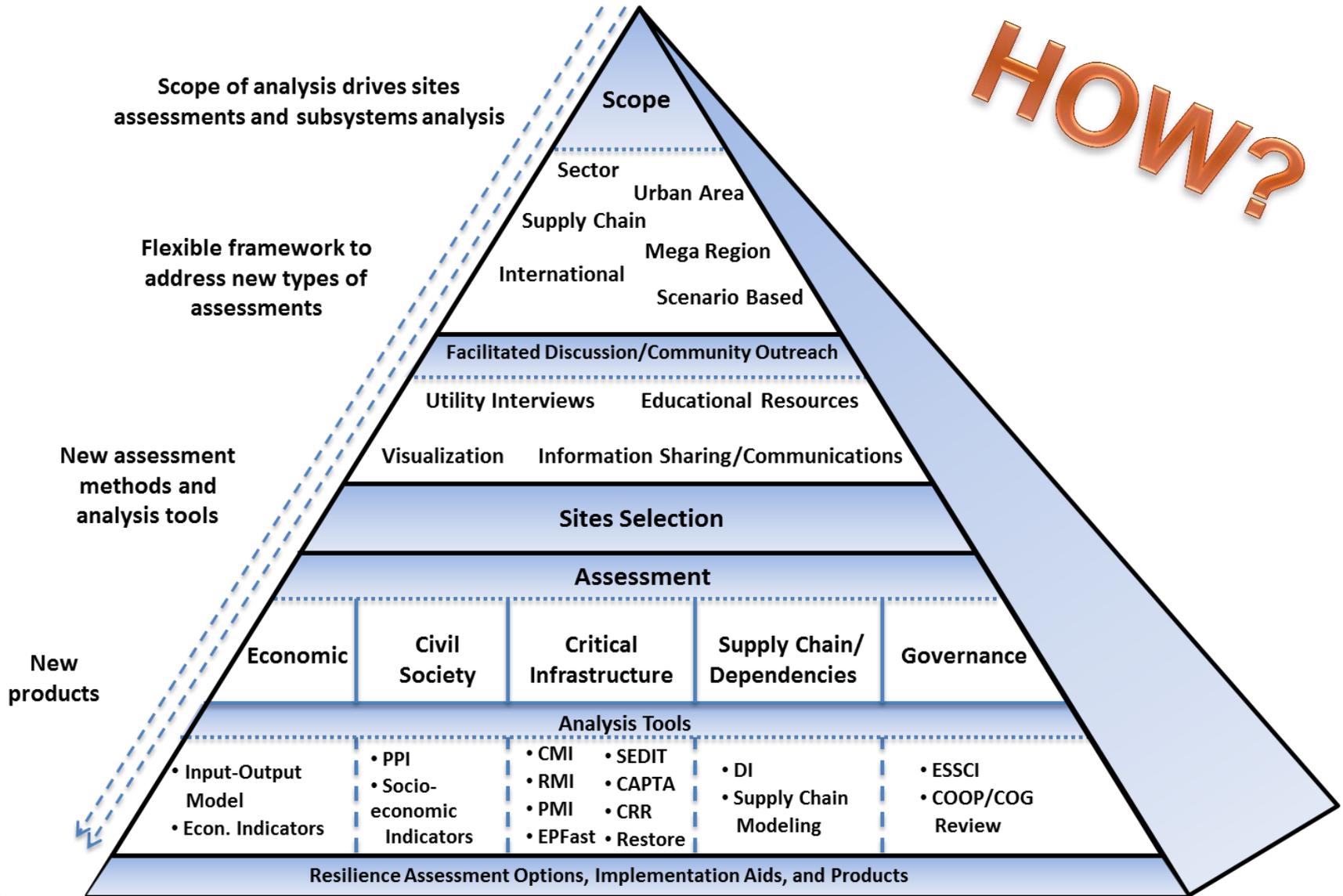


# Resilience Soft and Hard Aspects

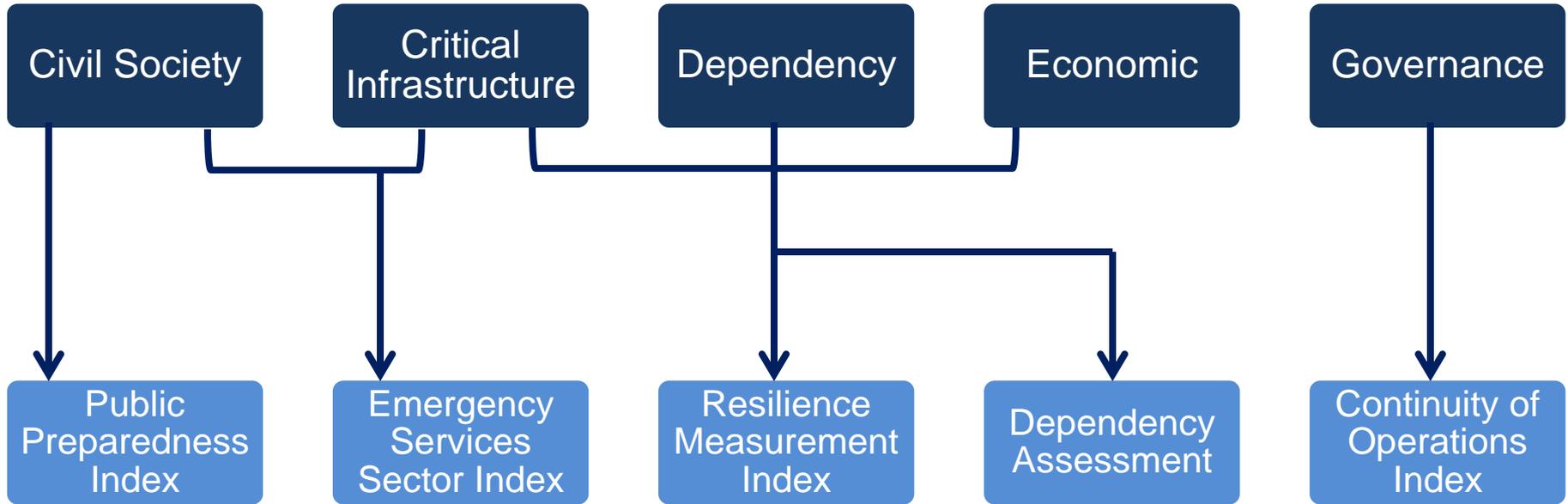


(Homeland Security Studies & Analysis Institute, 2009)

# Regional Resilience Framework



# Regional Resilience Model



# Public Preparedness Index

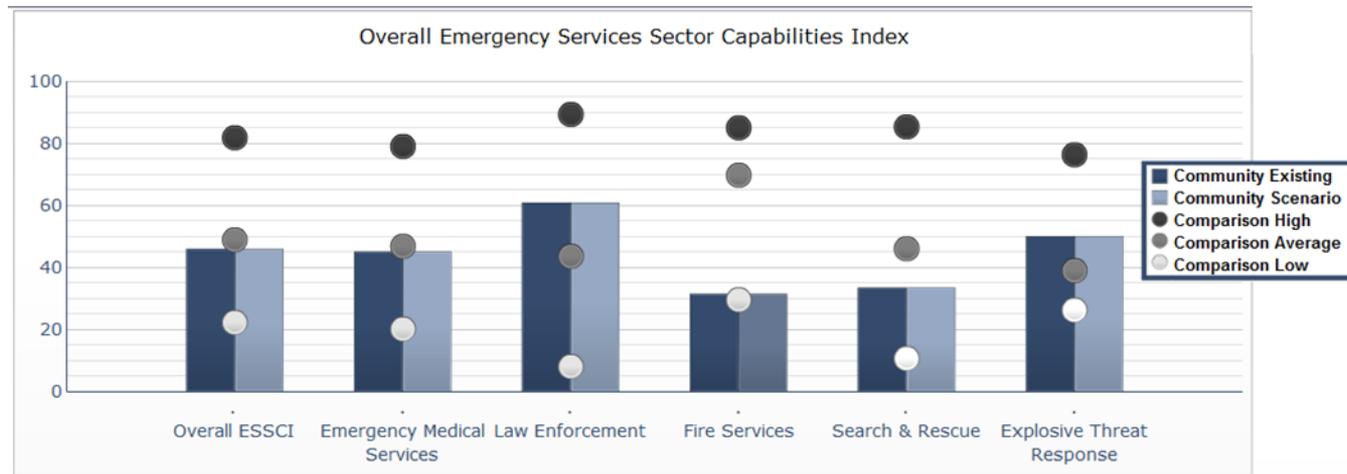
- **Measures programs and resources offered by communities to prepare citizens:**
  - Public education programs on disasters
  - Public information
  - Public health programs
  - Health care
  - Community engagement
  - Warning/notification systems
  - Evacuation resources
  - Community shelters
- Captures programs, plans, and resources that communities provide to their citizens to **increase personal preparedness**



# Emergency Services Sector Capability Index

## Major Components and Subcomponents

- a. Emergency Medical Services
- b. Law Enforcement
- c. Fire Services
- d. Search and Rescue
- e. Explosive Threat Response
- f. Hazardous Materials Response
- g. 911/Dispatch
- h. Emergency Management
- i. Coordinating Council/Committee



# Resilience Measurement Index

## Preparedness

- Awareness
- Planning

## Mitigation Measures

- Mitigating Construction
- Alternate Site
- Resources Mitigation Measures

## Response Capabilities

- Onsite Capabilities
- Offsite Capabilities
- Incident Management and Command Center Characteristics

## Recovery Mechanisms

- Restoration Agreements
- Recovery Time



# Critical Infrastructure Resilience Dashboard



Department of Homeland Security  
Office of Infrastructure Protection

## IST RMI Dashboard

Infrastructure Survey Tool Resilience Measurement Index

[Help Desk](#)  
[Print ?](#)

Overview
Preparedness
Mitigation Measures
Response Capabilities
Recovery Mechanisms
Brief Review

3. Resources Mitigation Measures | 1. Electric Power | Impact Prevention

Is external electric power required for Facility core operations (e.g., produce key services/goods)?  No  Yes

**If all electric service is lost (without considering your back-up or alternative mode), how soon would the facility be severely impacted (hours):**

0 |-----| 4 **3.00**

**Does the facility have an alternate or backup that can be used in case of loss of external source?**

No  Yes

**Are there external or internal regulations/policies that mandate the facility shut down after loss of main source?**

No  Yes

**Once electric service is lost (without considering your backup or alternative mode), what percentage of normal business functions are lost or degraded:**

None  
 1-33%  
 34-66%  
 67-99%  
 100% (Offline)

**Once electric service is lost (and considering your backup or alternative mode), what percentage of normal business functions are lost or degraded:**

None  
 1-33%  
 34-66%  
 67-99%  
 100% (Offline)

**After how long?**

0 |-----| 4 **1.00**

**Overall RMI** Components

61.00

**Mitigation Measures RMI**

65.42

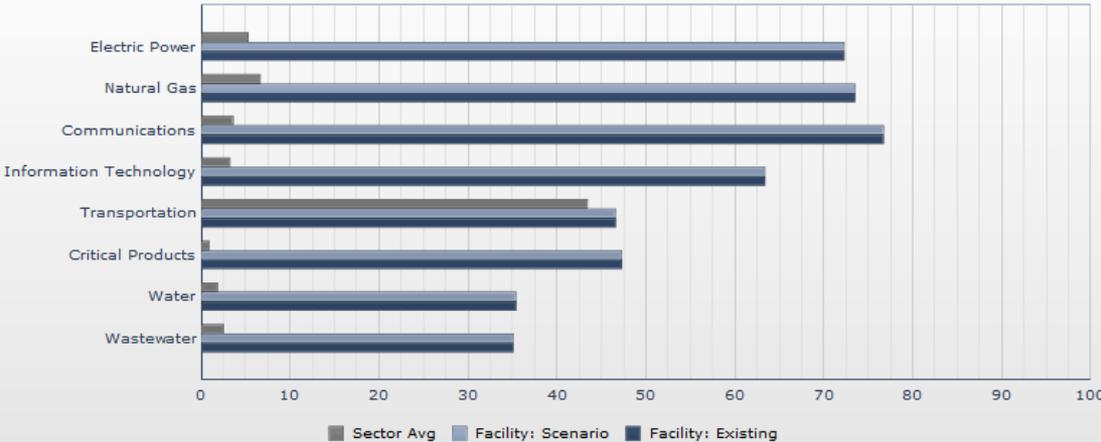
**Resources Mitigation Measures RMI**

48.71

61.14

0 100

**Resources Mitigation Measures**



Resource	Sector Avg	Facility: Scenario	Facility: Existing
Electric Power	~5	~72	~72
Natural Gas	~5	~74	~74
Communications	~5	~76	~76
Information Technology	~5	~63	~63
Transportation	~5	~45	~45
Critical Products	~5	~47	~47
Water	~5	~35	~35
Wastewater	~5	~35	~35



# Dependency Assessment

SECTOR OF INTEREST	SUPPORTING SECTOR															
	CHEMICAL	COMMERCIAL FACILITIES	COMMUNICATIONS	CRITICAL MANUFACTURING	DAMS	DEFENSE INDUSTRIAL BASE	EMERGENCY SERVICES	ENERGY	FINANCIAL SERVICES	FOOD AND AGRICULTURE	GOVERNMENT FACILITIES	HEALTHCARE AND PUBLIC HEALTH	INFORMATION TECHNOLOGY	NUCLEAR REACTORS, MATERIALS, AND WASTE	TRANSPORTATION SYSTEMS	WATER AND WASTEWATER SYSTEMS
CHEMICAL	Green	White	Green	White	White	White	White	Green	White	White	White	White	Green	White	Green	Green
COMMERCIAL FACILITIES	White	Green	White	White	White	White	White	Green	Green	Green	White	White	White	White	Green	Green
COMMUNICATIONS	White	White	Green	White	White	White	White	Green	White	White	White	White	Green	White	Green	Green
CRITICAL MANUFACTURING	Green	White	Green	Green	White	White	White	White	White	White	White	White	Green	White	Green	Green
DAMS	White	White	Green	White	Green	White	White	Green	White	White	White	White	Green	White	Green	Green
DEFENSE INDUSTRIAL BASE	White	White	Green	White	White	Green	White	White	White	White	White	White	Green	White	Green	Green
EMERGENCY SERVICES	White	White	Green	White	White	White	Green	White	White	White	White	Green	Green	White	Green	Green
ENERGY	White	White	Green	White	White	White	White	Green	White	White	White	White	Green	White	Green	Green
FINANCIAL SERVICES	White	White	Green	White	White	White	White	White	Green	White	White	White	Green	White	Green	Green
FOOD AND AGRICULTURE	Green	White	Green	White	White	White	White	Green	Green	Green	White	White	Green	White	Green	Green
GOVERNMENT FACILITIES	White	White	Green	White	White	White	White	White	White	Green	White	White	Green	White	Green	Green
HEALTHCARE AND PUBLIC HEALTH	Green	White	Green	White	White	White	White	White	White	White	Green	White	Green	White	Green	Green
INFORMATION TECHNOLOGY	White	White	Green	White	White	White	White	White	White	White	White	Green	White	White	Green	Green
NUCLEAR REACTORS, MATERIALS, AND WASTE	White	White	Green	White	White	White	White	White	White	White	White	White	Green	Green	White	Green
TRANSPORTATION SYSTEMS	White	White	Green	White	White	White	White	White	White	White	White	White	White	White	Green	Green
WATER AND WASTEWATER SYSTEMS	Green	White	Green	White	White	White	White	White	White	White	White	White	White	White	White	Green



# Continuity of Operations Index

- Plan that details how **essential functions** of an organization **will be handled during any emergency** or situation that may disrupt normal operations, leaving office facilities damaged or inaccessible.
- Objectives
  - Ensuring the **continuous performance** of an agency's essential functions/operations during an emergency;
  - **Protecting essential facilities**, equipment, records, and other assets;
  - **Reducing or mitigating disruptions** to operations;
  - **Reducing loss of life, minimizing damage and losses**; and
  - Achieving a **timely and orderly recovery** from an emergency and resumption of full service to customers.



# Summary

## WHY

- NIPP2013, PPD-21, and important **risk management component**

## WHAT

- **Soft and hard aspects**
- **Several subsystems** to be considered – Critical Infrastructure Sectors are one of them

## HOW

- Combining soft and hard aspects of resilience
- **Regional Resilience Framework** combining tools and indices

