# Beyond the Storms

## Operationalizing Resilience via Modeling and Analytics

- *Who* will benefit
- *What* is the ROI
- *Where* is the value
- *How* to measure

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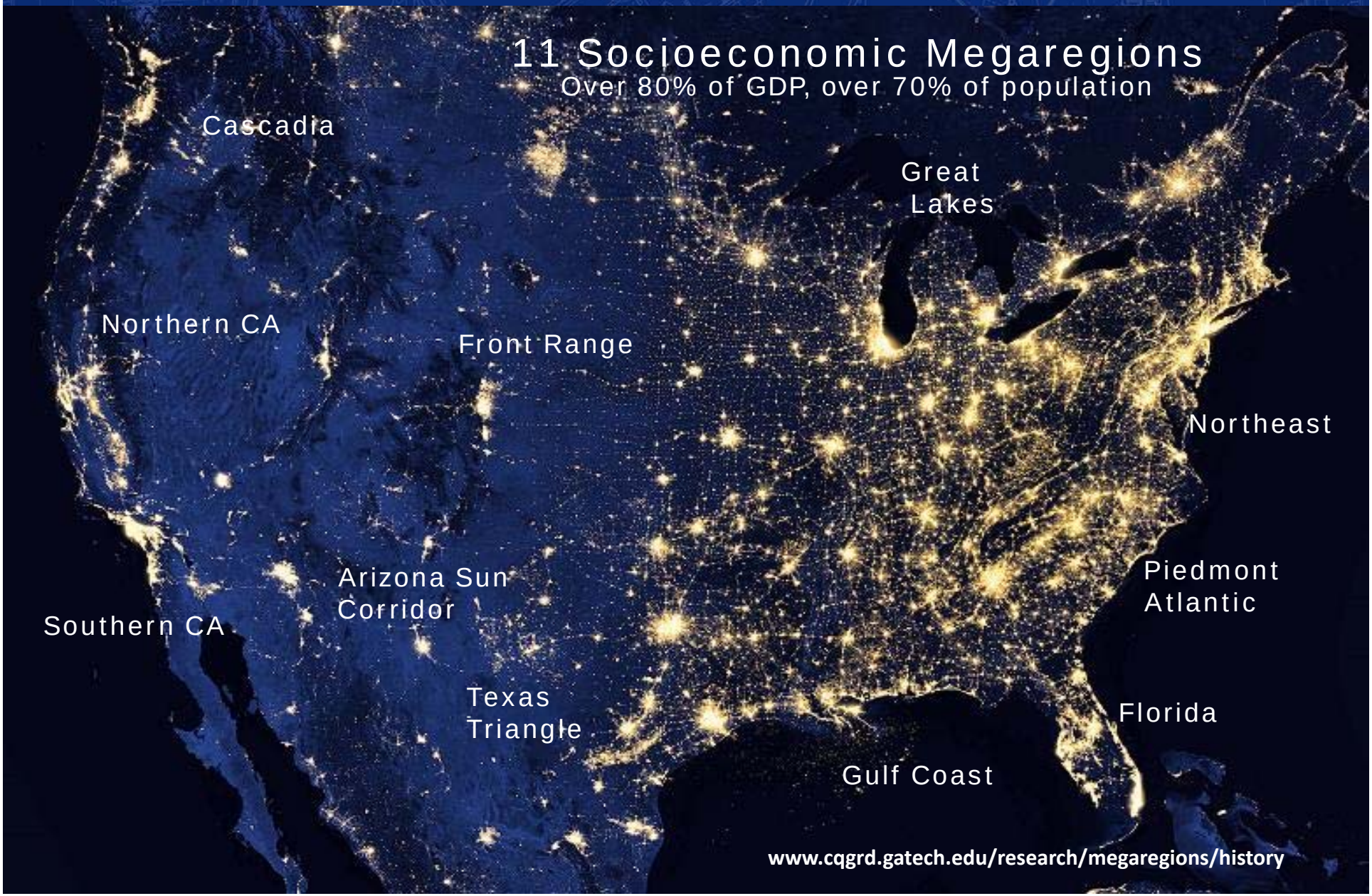
# Preparedness Challenges of 2014

## Starting assumptions

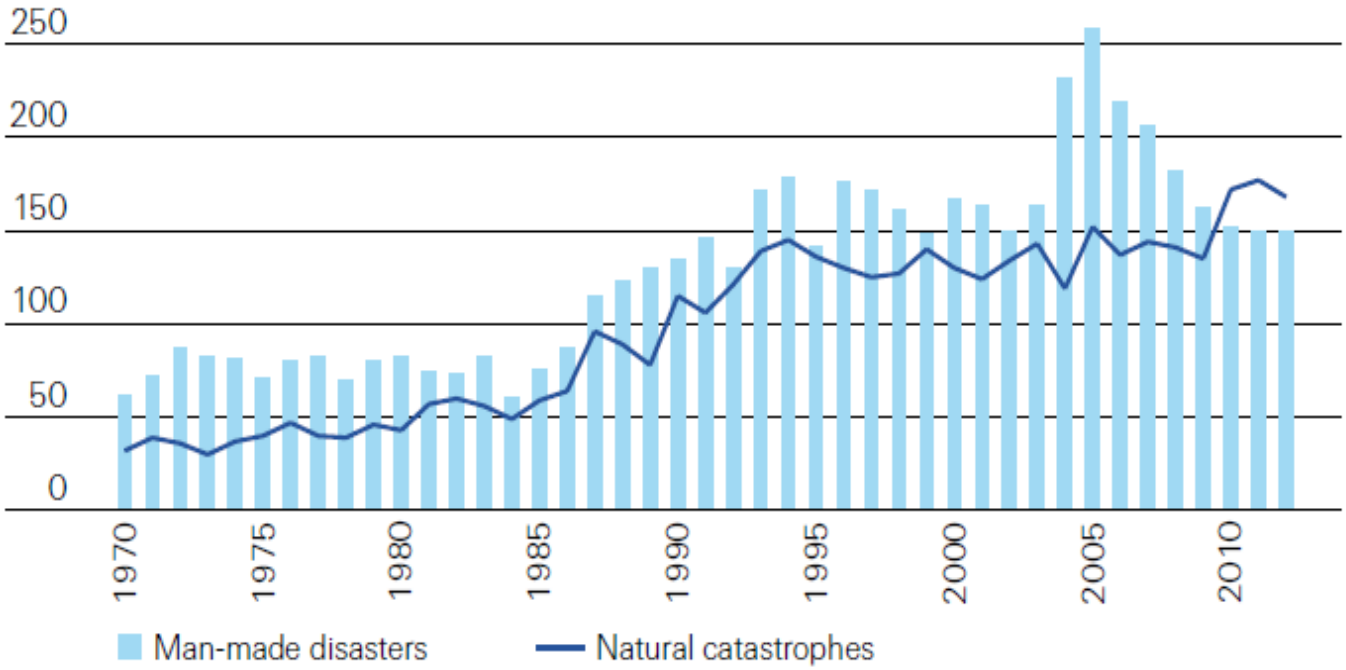
- Population and urbanization are increasing
- Disaster frequency and intensity are increasing
- Globalization increases interdependencies
- Financial resources are receding
- Economic impact and value proposition is unclear
- Risk increasing in complexity and uncertainty
- Culture of independence resists regionalization

# Population and urbanization are increasing



# Disaster frequency and intensity increasing

Disaster Frequency: 1970-2012



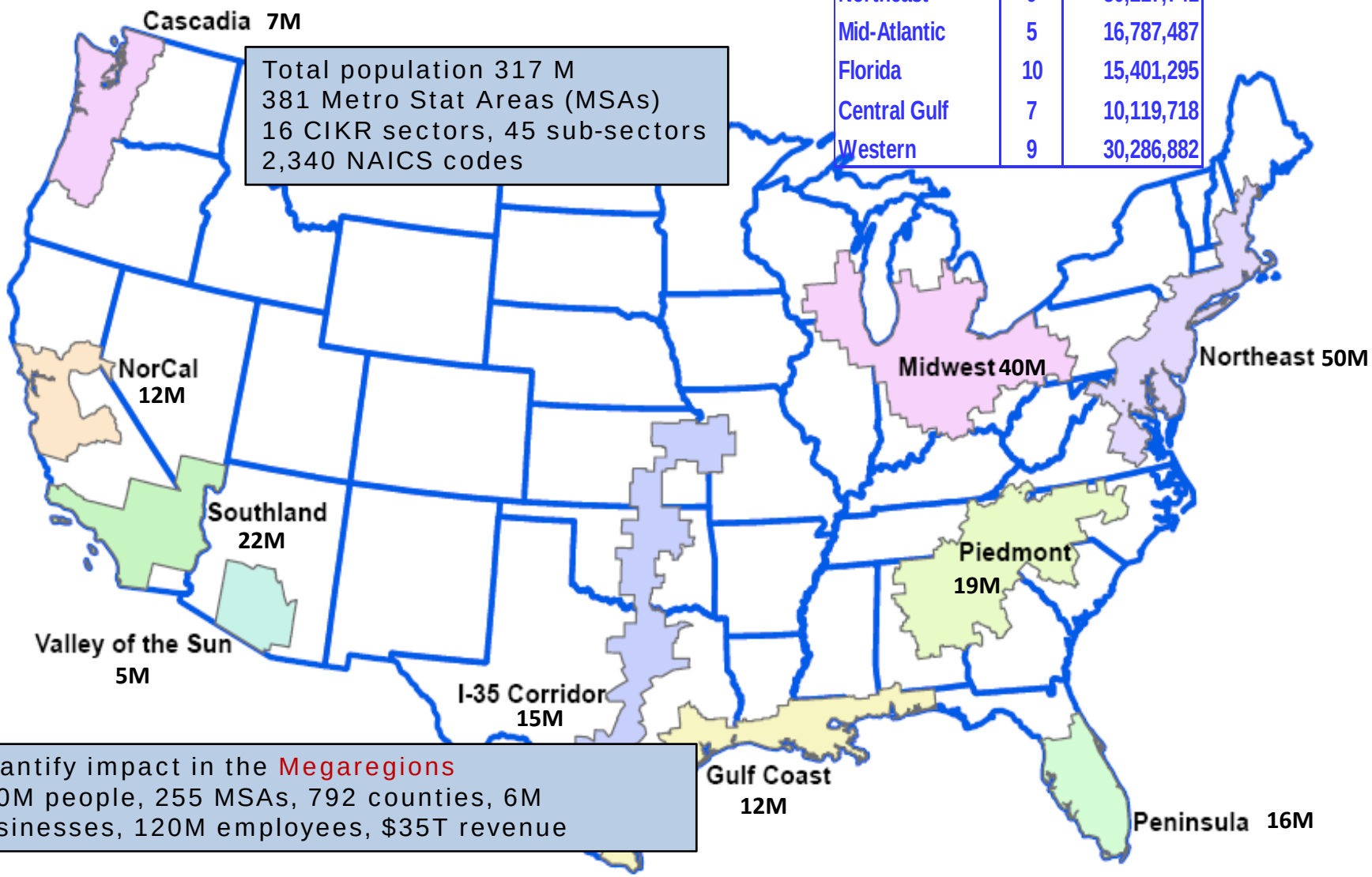

Source: Swiss Re Economic Research & Consulting

National Climate Assessment (May '14) projects increased frequency of extreme weather

# Economic Impact is Unquantified

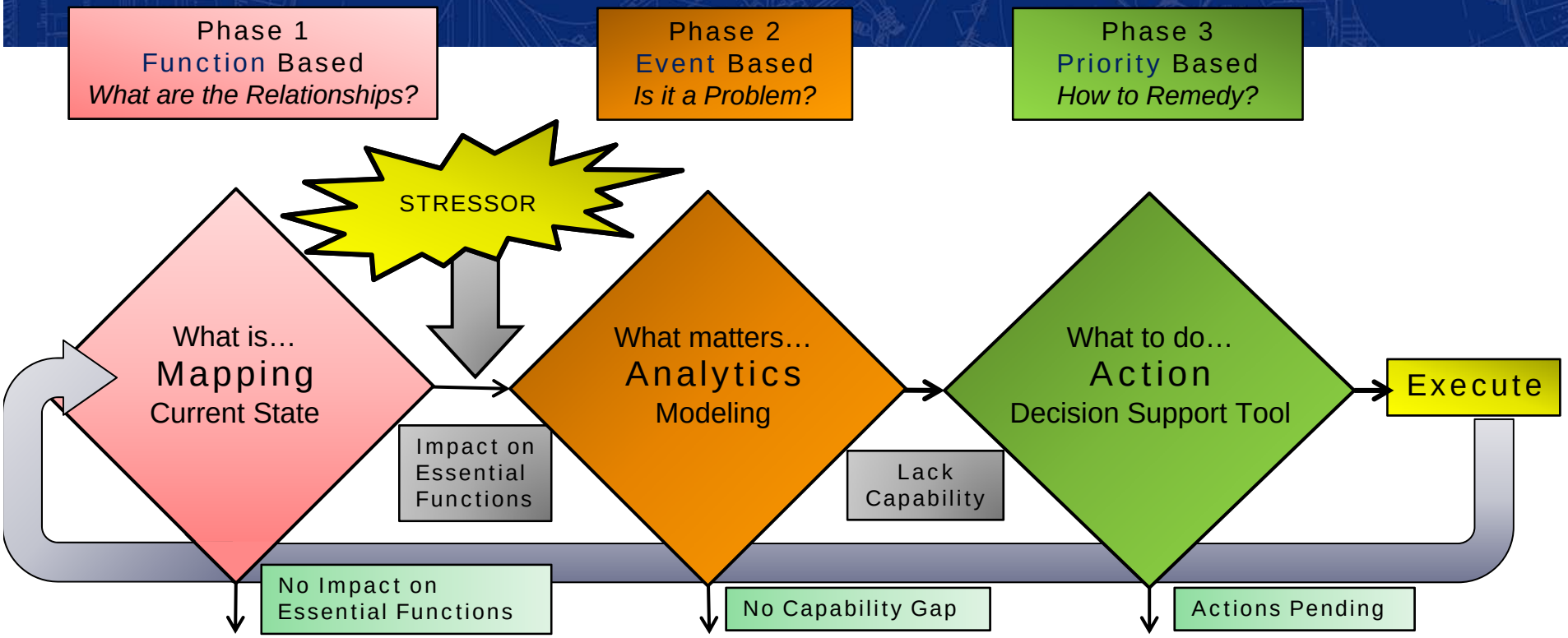
| Coastal MSAs | 40 | 102,813,123 |
|---|---|---|
| Northeast | 9 | 30,217,741 |
| Mid-Atlantic | 5 | 16,787,487 |
| Florida | 10 | 15,401,295 |
| Central Gulf | 7 | 10,119,718 |
| Western | 9 | 30,286,882 |

Total population 317 M
381 Metro Stat Areas (MSAs)
16 CIKR sectors, 45 sub-sectors
2,340 NAICS codes




Quantify impact in the Megaregions
230M people, 255 MSAs, 792 counties, 6M businesses, 120M employees, $35T revenue

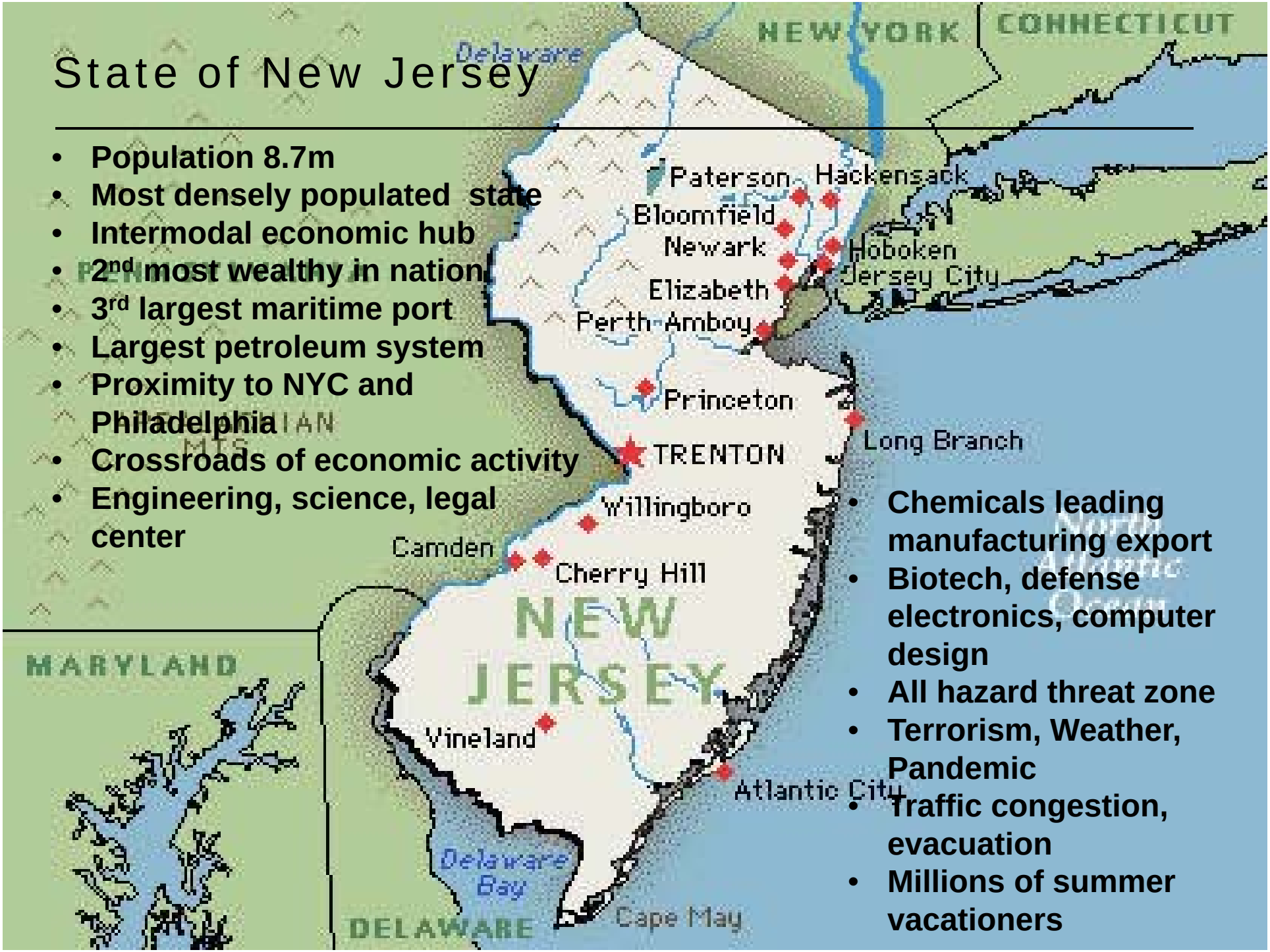
# Resilience Implementation Process (RIP)




| Connectedness | Assessment Criteria | Operationalize | Operating Variables |
|---|---|---|---|
| Physical & Virtual | Qualitative & Quantitative | Materiel & Non-materiel | |
| Dependencies | Criticality | Governance, Operations, Systems | |
| Interdependencies | Capabilities | Time, Cost, Scope | |

# State of New Jersey

- Population 8.7m
- Most densely populated state
- Intermodal economic hub
- 2nd most wealthy in nation
- 3rd largest maritime port
- Largest petroleum system
- Proximity to NYC and Philadelphia
- Crossroads of economic activity
- Engineering, science, legal center

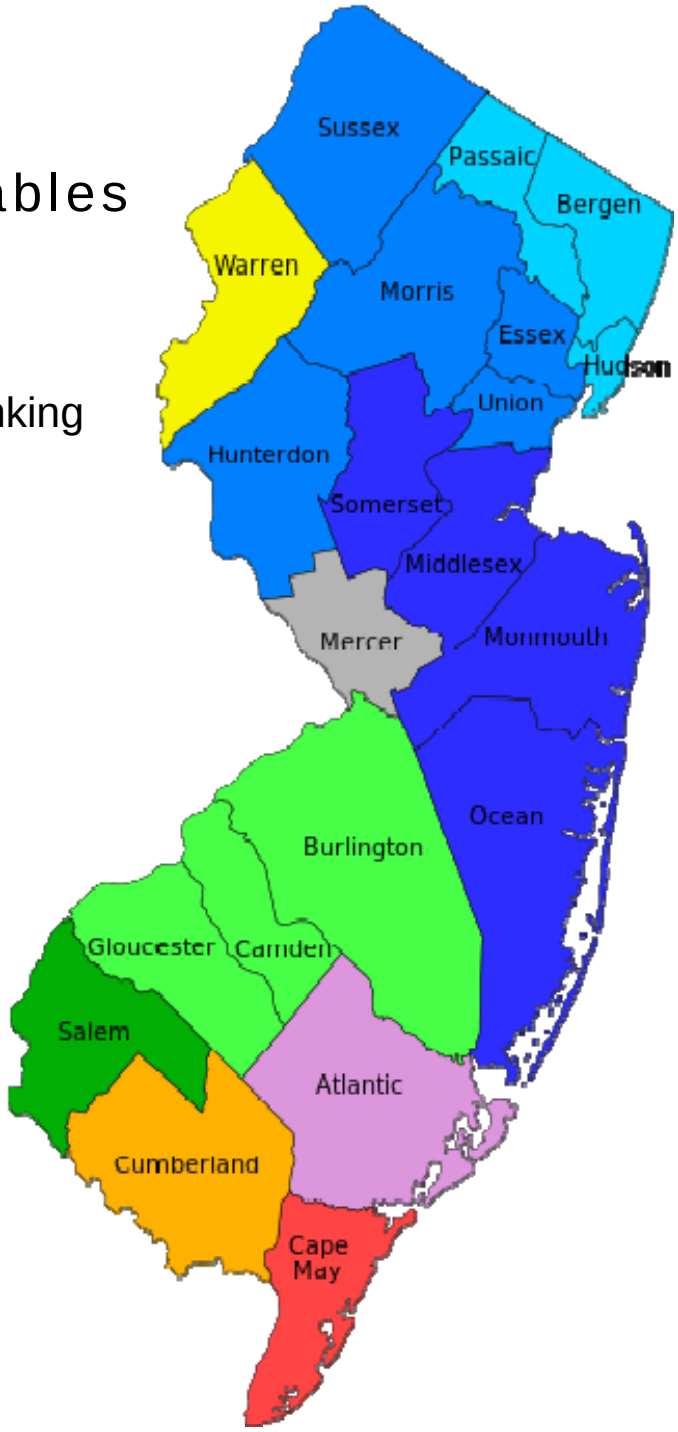



- Chemicals leading manufacturing export
- Biotech, defense electronics, computer design
- All hazard threat zone
- Terrorism, Weather, Pandemic
- Traffic congestion, evacuation
- Millions of summer vacationers

# New Jersey

## Agriculture Resilience Planning Variables

- Risk mitigation: complex adaptive system of systems
- Operational resilience: systemic adaptation to stress
- CIKR requirements: power, comms, transp, water, banking
- Research potential: UARC, R&D centers, universities
- Governance: national, regional, state, local polices
- Coordination: info-sharing across 21 counties
- Resources: potential funding to operationalize
- Economic: 12 Metropolitan Statistical Areas (MSAs)
- Land use: production decreasing since 1997
- Employment: accounts for over 300K jobs
- Regional food systems: include PA, NY, DE
- Interdependencies: Cross-linked agriculture systems
- Market analysis: increased dependence on imports
- Current state: What/where is produced in state
- Import requirements: milk, meat, produce
- Convening power: leverage existing IAC potential
- Climate change: impact on food systems
- USDA: Agriculture Management Assistance (AMA)
- NRCS: Natural Resources Conservations Service





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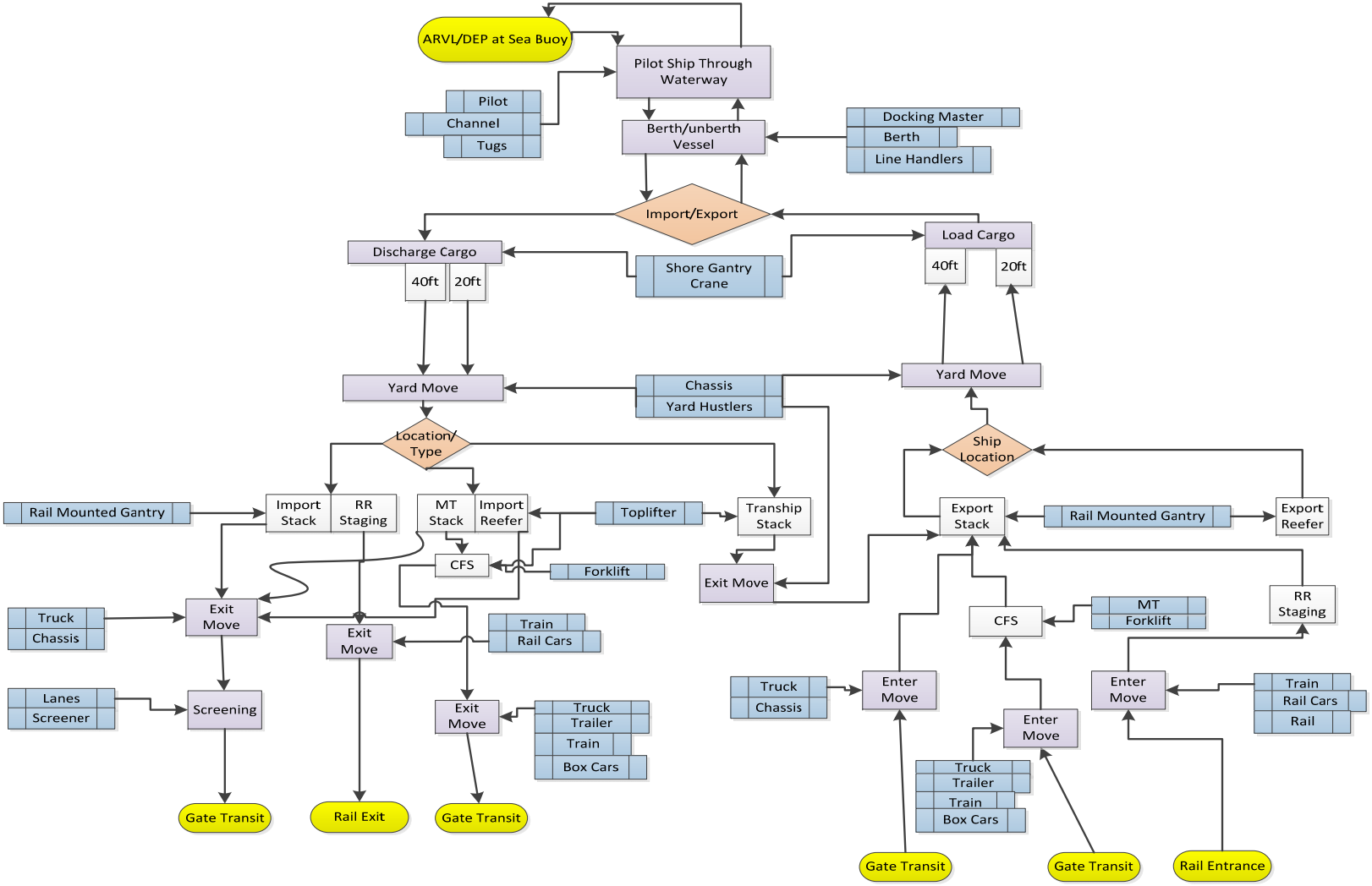
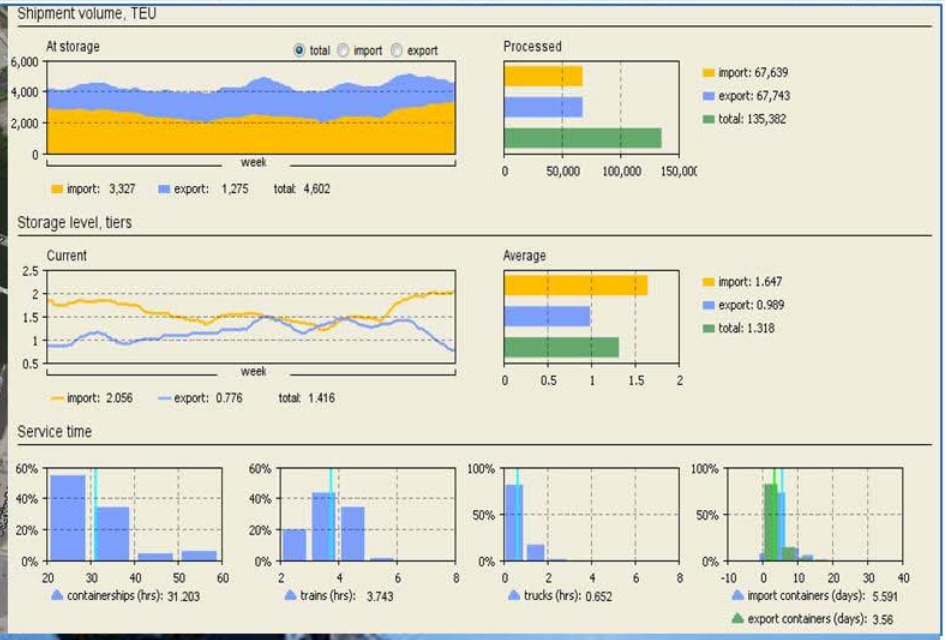
# Select a key intermodal location

## Measure operational & economic impact of resilience at a port

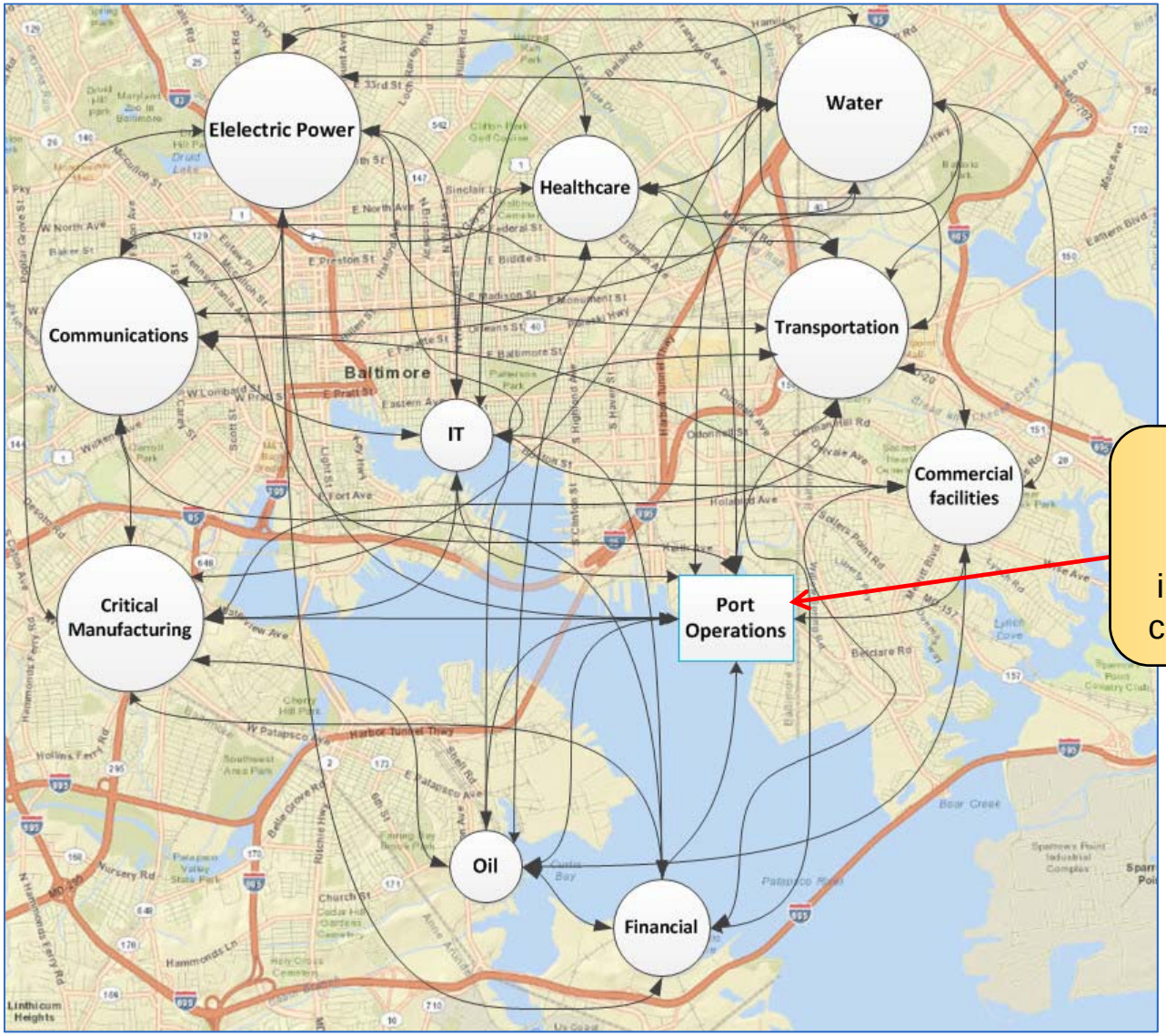
# Port Container Import/Export Flow



# Metric/Unit of Analysis: Throughput



# Expand to interdependent system of systems




Map port operations as part of an interconnected complex system

# The Value Proposition…

- Disruptive events are inevitable and to be expected from natural and man-made causes

- Resilience requires an understanding of interdependencies and cascading effects that can trigger disruptions and failures

- Resilience focuses on economic ROI by restoring capabilities that enable rapid recovery and adaptation

- Market competition is influenced by the ability of communities to withstand disasters and how rapidly they can recover

- People will invest in businesses and choose to live in parts of the country that are more resilient, and avoid areas that are less resilient and less secure