Overview of NaTECH: Natural Hazard Triggering Technological Disasters

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Meeting Goal

- Natural disasters often trigger technological disasters = NaTECH
  - Example = Oil and chemical spills resulting from hurricane
- Result = Stafford Act + OPA '90
  - Complicates response
- Widespread impacts to industry, commerce, communities and natural resources in coastal zone
  - Mississippi/Alabama coast has experienced NaTECH events
- Increase awareness, understanding and coordination among participating stakeholder groups and agencies for NaTECH

Meeting Objectives

- Bring together a diverse group stakeholders potentially impacted or involved in response to NaTECH events
  - Scenario = Major storm impacts Mobile + causes major oil spill
- Increase regional preparedness by identifying potential strategies for improved response, enhanced resilience, and quicker recovery when NaTECH events occur
  - Recommendations for how to achieve this

- **Natural Hazards:**
  - Earthquakes
  - Floods
  - Lightening Strikes
  - Hurricanes
  - Tsunamis
  - Landslides
- **Technological Disasters**
  - Oil Spills
  - Chemical Spills
  - Power Outages
  - Loss of Drinking Water
  - Loss of Wastewater Treatment
  - Solid Waste Accumulation

NaTECH History

- Late 1900s and early 2000s
  - World Conference on Disaster Reduction
- Leaders on NaTECH = European Union and Japan
- U.S. Lead = California
  - Northridge Earthquake 1994
- Turkey Kocaeli Earthquake 1999
  - 21 releases
  - Air, water and soil impacts

Approaches

- Laws and regulations
- Chemical storage on higher ground
- Anti-flotation mitigation for storage tanks in flood zones
- Seismic risk assessments for spill prevention
- Databases of NaTECH incidents and lessons learned
- Hazard mapping
- Land use planning

U.S. Examples

- EPA Risk Management Plans for Chemical Facilities
  - Little NaTECH focus required
- CalARP: California Accidental Release Prevention Program
  - Earthquake related releases risk assessment

Domino Effects

- Cascading events
- Missing in much planning
- Current FEMA -led "Cascadia Rising" exercise has earthquake to tsunami to technological failures focus
  - June 7- 10
  - Pacific Northwest

Key Factors in Addressing NaTECH Events

Hazardous materials	Previous identification and detection of sites that handle hazardous materials; chemical type and toxicity, release type and quantity, and, knowledge of appropriate first aid and clean up procedures and evacuation measures by both individuals (residents affected) and emergency workers (from local fire departments and industry), and their level of preparedness.

Human resources	Number of emergency workers available; skills and competencies level.
Communications	Warning systems and activation procedures; communication means such as telephones, radios, pagers, and alarm systems.
Transportation	Availability of resources such as vehicles and drivers, identification of transportation and evacuation routes, etc.
Fire services	Detection and suppression of fires and/or hazardous material releases, mobilization of personnel, equipment and supplies to support debris clearance, evacuation, and search and rescue operations.

Mitigation strategies	Adequacy of onsite and offsite mitigation measures in place.
Health and Medical	Adequate treatment and transportation of injured/exposed persons and general health concerns with respect to the hazmat release.
Population at risk	Number of people at risk; population density;
Natural disaster	Intensity of event and concurrent damage to roads, infrastructure, communication lines, power generation plants, water supply, and so on.

Factors are not different from any emergency response.
Key is multiple, concurrent responses when considering these factors.
Integrated Risk Management

New Research/Advances
Mostly Europe and Japan
Funding Opportunities

Electronic Regional Risk Atlas (ERRA)

Integrated Risk Management

BowTie Approach

(Extended) Natech risk analysis framework

We extended the existing framework in two ways.

Natural hazards
Mechanical models
Industrial facilities
Fragility curves
Physical damages
Chemical releases
Fires and explosions
Economic damages
CGE models
Human and ecological effects
Supply chain effects

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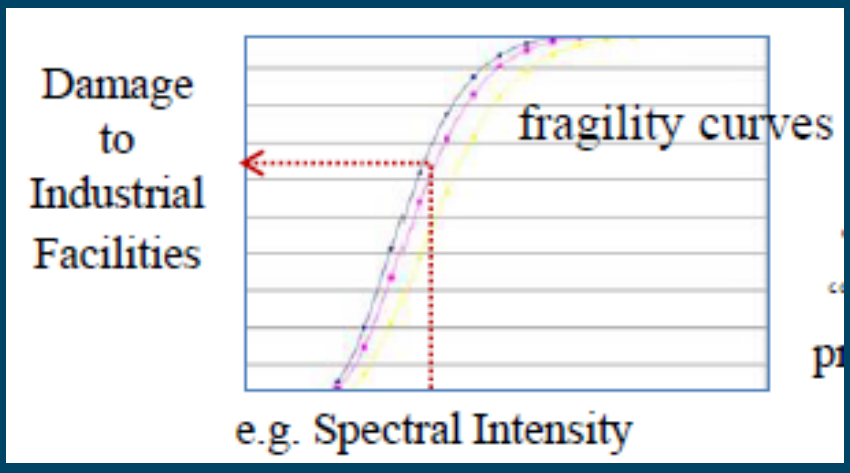

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Disastrous				Acc 1 Acc2	
Catastrophic					
Significant					
Serious					
Moderate					

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Fires and explosions → Economic damages
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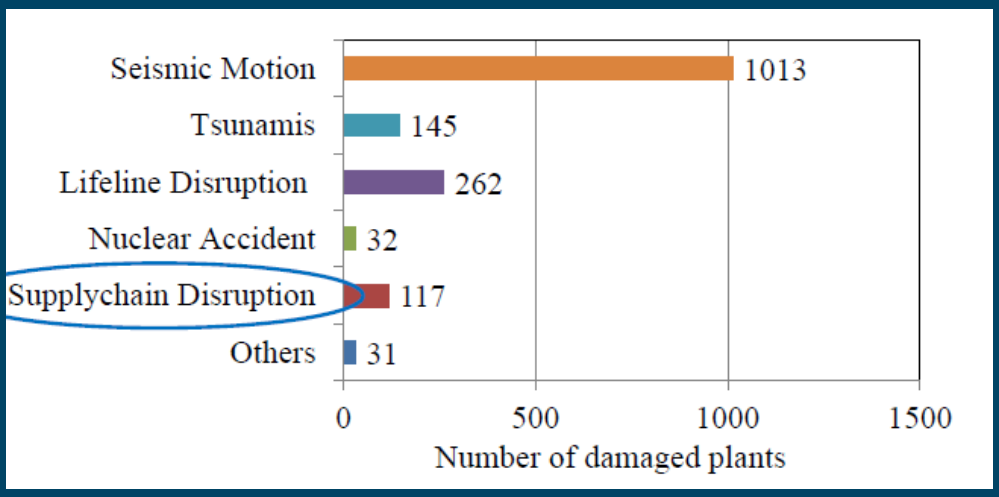
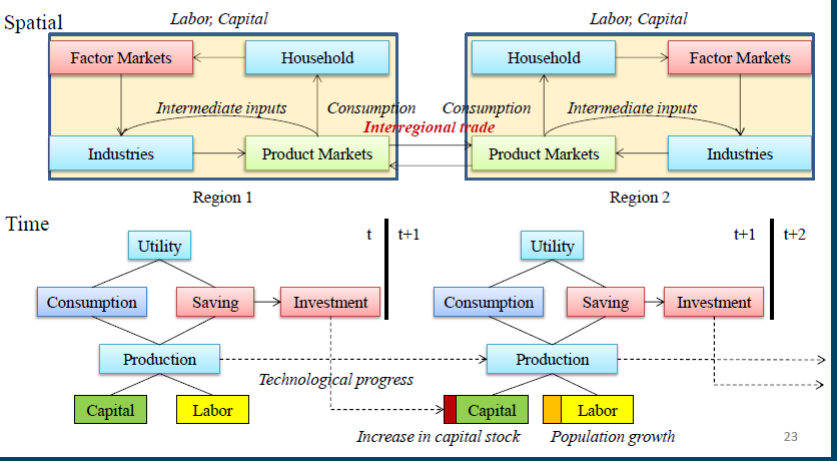


How can the indirect damage be evaluated?

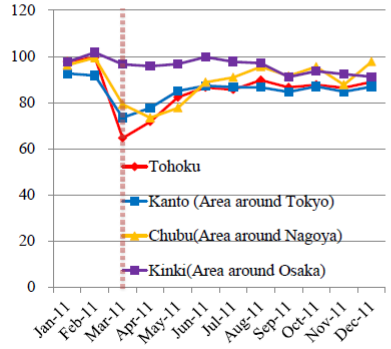
- A Computable General Equilibrium (CGE) model is a comprehensive economy-wide simulation model based on microeconomic theory and an existing input-output table.



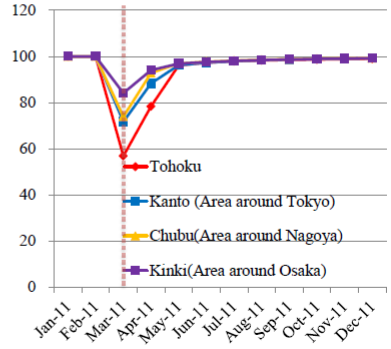
Comparison with Actual Data

- We compared the simulation results for industrial production with the actual data.
- The following results are still preliminary. We need to further research on the modeling.

Actual data: Index of Industrial Production



Model Simulation



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