

# Critical Infrastructure and Key Resources

Protection and Resilience

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June 23, 2010

# Why Protection and Resilience?

- Network-Centric Organizations/Interdependencies
  - Supply Networks: transportation, electrical power, oil and gas; water distribution networks; production flow supply chains; health care systems
  - Cyber Networks: tele-control and SCADA networks, banking and finance networks
  - Managerial/Organization networks where human resources supervise and/or utilize the services delivered by the above systems
  - Human Dimension: Community characteristics have significant effect on vulnerability and preparedness; average income, economic growth, level of awareness, and local politics

# Why Protection and Resilience?

- Urban Systems
  - By 2030 60% of the world's population will live in cities (United Nations)
  - Natural targets for deliberate violence
  - Global transportation networks and population density make them ideal for centers for disease
  - Concentration of economic assets and people make them highly susceptible to damage from national disasters

# Why Protection and Resilience?

- Ambiguity of defining risk and costs associated with investments in protection and resilience
  - Investments should seek to minimize risks across society as a whole versus individual events (all hazards?)
  - Investments that both enhance resilience against attack or disaster and provide economic, social or environmental benefits (Nashville, Arkansas, Minnesota, Gulf Coast)
  - Enhances long-term security because a secure society involves innovation in strong/resilient infrastructure and social systems as well as in counter terrorism techniques and technologies
  - Fragile communities are more likely to be susceptible to disaster or attack and to disruption and more likely to experience subsequent weakness and failure in the aftermath of an attack (Chile/Haiti)

# Defining Protection and Resilience

- Resilience:
  - The capability of a system to maintain its functions and structure in the face of internal and external change and to degrade gracefully when it must (Allenby and Fink)
  - Resilience for both physical and social systems can be conceptualized as having four infrastructural qualities:
    - Robustness: inherent strength or resistance in a system to withstand external demands without degradation or loss of functionality
    - Redundancy: system properties that allow for alternate options, choices, and substitutions under stress
    - Resourcefulness: the capacity to mobilize needed resources and services in emergencies
    - Rapidity: the speed with which disruption can be overcome and safety, services, and financial stability restored (Bruneau)

# Defining Protection and Resilience

- Protection
  - Actions to mitigate the overall risks to critical infrastructure and key resources assets, systems, networks, functions or their interconnecting links resulting from exposure, injury, destruction, incapacitation, or exploitation (NIPP)
    - In the context of the NIPP this includes actions to deter the threat, mitigate vulnerabilities, or minimize the consequences associated with a terrorist attack or other manmade or natural disaster. Protection can include a wide range of activities such as improving security protocols, hardening facilities, building resiliency and redundancy, incorporating hazard resistance into facility design...

# Implementing Protection and Resilience

- Awareness
  - Requires public concern about disasters and the operation of critical infrastructure; support for protection and resilience
  - Risk Communication
- Leadership
  - Possibly the most critical factor in promoting and implementing protection and resilience, and least predictable
  - Developing policies and tools that support and encourage protection and resilience
- Planning
  - Creating plans that reduce or mitigate threat; generating a warning time to implement or adjust plans and reduce potential costs; mitigating the event as it occurs; or planning short-term responses and recovery or longer term recovery capabilities
  - Drills and exercises to reveal weaknesses and lead to improvements in operations
  - Good planning allows operators to improvise, and skilled improvisation enables operators to adapt to field conditions
- Resource Allocation
  - Constructing and sustaining critical infrastructure requires adequate financial resources and long-term commitment

# References

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