Using Risk Modeling, Analysis, and Assessment to Inform Homeland Security Policy and Strategy

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Remarks

- Introduction to homeland security in the United States, the U.S. Department of Homeland Security (DHS), and the DHS Office of Strategy, Planning, Analysis, and Risk

- Strategic Planning, Risk Modeling, Analysis, and Assessment:
  1. Overview of the Strategic National Risk Assessment (SNRA)
  2. Overview of the Homeland Security National Risk Characterization (HSNRC)

- Discussion and Questions
Introduction to U.S. Homeland Security
Homeland Security in the U.S.

- **Vision:** A homeland that is safe, secure, and resilient where American interests, aspirations, and way of life can thrive

- The Homeland Security Missions:
  1. Preventing Terrorism and Enhancing Security
  2. Securing and Managing Our Borders
  3. Enforcing and Administering Our Immigration Laws
  4. Safeguarding and Securing Cyberspace
  5. Ensure Resilience to Disasters

“Ultimately, homeland security is about effectively managing risks to the Nation’s security.”

U.S. Department of Homeland Security

Secretary: Janet Napolitano
Appointed: 2009
Workforce: 210,000
Created: March 1, 2003
http://www.dhs.gov

Transportation Security Administration
U.S. Citizenship and Immigration Services
U.S. Customs and Border Protection
U.S. Immigration and Customs Enforcement
FEMA
Creation of SPAR

Office of Strategy, Planning, Analysis and Risk (SPAR) formed within DHS Office of Policy in March 2012 by merging strategic planning and risk analysis offices

“Designed to elevate the importance of a strong risk modeling, analysis, and strategic planning function within the Department.”¹

“Consistent with the Secretary’s vision and the Department’s approach to integrating risk-based decision-making across the Department.”²

¹ Joint Explanatory Statement accompanying FY 2012 DHS Appropriations Act (P.L. 112-74)
² Strategic Planning, Risk Modeling, and Analysis Plan, Fiscal Year 2012 Report to Congress, March 2012
Strategic Planning, Risk Modeling, Analysis, and Assessment
1 Strategic National Risk Assessment
Overview: Strategic National Risk Assessment (SNRA)

- Presidential Policy Directive 8 (PPD-8) ties national preparedness to “threats that pose the greatest risk to the security of the nation”
  - Includes acts of terrorism, pandemics, and catastrophic national disasters
- The PPD-8 Implementation Plan mandates that “[t]he Secretary of Homeland Security shall conduct a strategic, national-level risk assessment…”
- The SNRA was used to support development of the core capabilities and capability targets in the 2011 National Preparedness Goal

http://www.dhs.gov/presidential-policy-directive-8-national-preparedness
## Threats and Hazards Analyzed in the SNRA

<table>
<thead>
<tr>
<th>NATURAL HAZARDS</th>
<th>TECHNOLOGICAL HAZARDS</th>
<th>ADVERSARIAL / HUMAN-CAUSED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal Disease Outbreak</td>
<td>Biological Food Contamination</td>
<td>Aircraft as a Weapon</td>
</tr>
<tr>
<td>Earthquake</td>
<td>Chemical Substance Spill or Release</td>
<td>Armed Assault</td>
</tr>
<tr>
<td>Flood</td>
<td>Dam Failure</td>
<td>Biological Terrorism Attack (non-food)</td>
</tr>
<tr>
<td>Human Pandemic Outbreak</td>
<td>Radiological Substance Release</td>
<td>Chemical Terrorism Attack (non-food)</td>
</tr>
<tr>
<td>Hurricane</td>
<td></td>
<td>Chemical/Biological Food Contamination Terrorism Attack</td>
</tr>
<tr>
<td>Space Weather</td>
<td></td>
<td>Explosives Terrorism Attack</td>
</tr>
<tr>
<td>Tornado</td>
<td></td>
<td>Nuclear Terrorism Attack</td>
</tr>
<tr>
<td>Tsunami</td>
<td></td>
<td>Radiological Terrorism Attack</td>
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<tr>
<td>Volcano Eruption</td>
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<tr>
<td>Wildfire</td>
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</tbody>
</table>

Unclassified document with summary of results and definitions of events can be found at: [https://www.dhs.gov/strategic-national-risk-assessment-snra](https://www.dhs.gov/strategic-national-risk-assessment-snra)
SNRA Methodology Overview

Risk: The potential for an unwanted outcome resulting from an incident, event, or occurrence, as determined by its likelihood and the associated consequences.

— DHS Risk Lexicon, 2010

![Threat](image1)

![Vulnerability](image2)

![Consequence](image3)

Likelihood

The chance of something happening, typically measured or estimated in terms of frequency or probability

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Consequences

The effect of an incident, event, or occurrence, whether direct or indirect
SNRA Methodology Overview Continued

- Risk = \( f \) (Frequency, Consequences)
- Six consequence categories:
  - Fatalities
  - Injuries/Illnesses
  - Direct economic impacts ($ of loss)
  - Social impacts (displaced from home for at least two days)
  - Psychological impacts (distress)
  - Environmental impacts
- Order of magnitude precision
- Variety of data inputs and sources
- Time horizon: next 3-5 years
A wide range of threats and hazards pose a significant risk to the Nation, affirming the need for an all-hazards, capability-based approach to preparedness planning.

http://www.fema.gov/preparedness-1/learn-about-presidential-policy-directive-8
Homeland Security National Risk Characterization
Overview: Homeland Security National Risk Characterization (HSNRC)

- The Homeland Security Act requires DHS to conduct the **Quadrennial Homeland Security Review (QHSR)**, a “comprehensive examination of the homeland security strategy of the Nation”, including:
  - “recommendations regarding the **long-term strategy and priorities** of the Nation for homeland security”; and
  - “guidance on the **programs, assets, capabilities, budget, policies, and authorities** of [DHS].”

- QHSR requires a **characterization of homeland security risks** in order to set long-term strategy and priorities, and assess programs, assets, capabilities, budget, policies, and authorities.

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1 6 U.S.C. § 347
# Threats and Hazards Analyzed in the HSNRC

<table>
<thead>
<tr>
<th>Quantitative Plots of Frequencies and Consequences</th>
<th>Qualitative Narrative</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Accidental Biological Food Contamination</td>
<td>• Cyber Events that extract or alter information without system impacts</td>
</tr>
<tr>
<td>• Accidental Chemical Substance Spill or Release</td>
<td>• Cyber: crippling cascading attack on critical infrastructure</td>
</tr>
<tr>
<td>• Accidental Radiological Substance Release</td>
<td>• Cyber: Data destruction results in degraded commercial viability or Government Service</td>
</tr>
<tr>
<td>• Aircraft as a Weapon</td>
<td>• Cyber: Distributed Denial of Service (DDOS) attack causes erosion of consumer confidence and Economic loss</td>
</tr>
<tr>
<td>• Animal Disease Outbreak</td>
<td>• Space Weather</td>
</tr>
<tr>
<td>• Armed Assault</td>
<td>• Tsunami</td>
</tr>
<tr>
<td>• Biological Terrorism Attack, Non-food</td>
<td>• Volcano Eruption</td>
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</tbody>
</table>
Methodology Overview: A Continuum of Frequencies

- Recognizing that frequencies fall along a continuum obviates the need to distinguish between persistent and contingent threats and hazards

*Example threats/hazards and notional data:*

- Drug Smuggling
- Flood
- Hurricane
- Animal Disease
- Pandemic Influenza
- Accidental Radiological Substance Release
- Millennium
## Methodology Overview (continued): Consequence Categories

<table>
<thead>
<tr>
<th>Consequence Category</th>
<th>Elements</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Health and Safety</strong></td>
<td>▪ Deaths</td>
<td>▪ Illnesses</td>
</tr>
<tr>
<td></td>
<td>▪ Injuries</td>
<td>▪ Disabilities</td>
</tr>
<tr>
<td><strong>Economic Impacts: Direct</strong></td>
<td>▪ National economy</td>
<td>▪ Families and individuals: loss of income, insurance rates, retirement</td>
</tr>
<tr>
<td>and Indirect</td>
<td>▪ Businesses</td>
<td></td>
</tr>
<tr>
<td><strong>Socioeconomic Impacts</strong></td>
<td>▪ Displaced/Homeless</td>
<td>▪ Degradation of lifestyle</td>
</tr>
<tr>
<td></td>
<td>▪ Crime</td>
<td>▪ Degradation of families</td>
</tr>
<tr>
<td></td>
<td>▪ Drug addiction</td>
<td>▪ Jobs lost</td>
</tr>
<tr>
<td></td>
<td>▪ Degradation of social fabric</td>
<td></td>
</tr>
<tr>
<td><strong>Psychological Impacts</strong></td>
<td>▪ Distress (including PTSD, impaired functioning/quality of life)</td>
<td>▪ Loss of societal cohesion</td>
</tr>
<tr>
<td></td>
<td>▪ Fear (including anxiety, stress, worry)</td>
<td>▪ Loss of confidence in government</td>
</tr>
<tr>
<td><strong>Environmental Impacts</strong></td>
<td>▪ Flora</td>
<td>▪ Water</td>
</tr>
<tr>
<td></td>
<td>▪ Fauna</td>
<td></td>
</tr>
<tr>
<td><strong>Government Operations</strong></td>
<td>▪ Provision of essential government services</td>
<td>▪ Continuity of government operations</td>
</tr>
<tr>
<td></td>
<td>▪ Loss of public order</td>
<td></td>
</tr>
<tr>
<td><strong>Freedoms/Rights</strong></td>
<td>▪ For all Americans: search, privacy, movement</td>
<td>▪ For subsets of Americans: unequal treatment, stereotyping</td>
</tr>
<tr>
<td><strong>International Relations</strong></td>
<td>▪ Status of alliances</td>
<td>▪ Global leadership</td>
</tr>
<tr>
<td><strong>National Sovereignty</strong></td>
<td>▪ Encroachment on US territory/EEZ</td>
<td></td>
</tr>
</tbody>
</table>

**Best Practices for Measuring Consequences:**
- Quantitative estimates are preferable, when available; they have the most utility from a mathematical standpoint.
- If semi-quantitative scales are used, they should be defined in such a way such that they are *measureable* and based on *objective* criteria.
- The U.S. Coast Guard National Maritime Strategic Risk Assessment (USCG NMSRA), UK National Risk Register, and Netherlands National Risk Assessment create semi-quantitative scales for many of these categories using combinations of: *Time duration of impact, Geographic extent of impact, Severity of impact*
**Example: Fatality Risk Figure**

Events ranked from highest to lowest Fatality Risk (based on the best estimate):

- **Accidental/Human-Caused**
- **Adversarial**
- **Natural Hazard**

**NOTIONAL EXAMPLE**

- **Event A**
- **Event B**
- **Event C**
- **Event D**
- **Event E**

**Legend**

- **Best Estimate**
- **Accidental/Human-Caused**
- **Adversarial**
- **Natural Hazard**
HSNRC: From Analysis to Decisions

Understand continuum of risks in the current environment

Build off of existing risk assessments and models and develop a common approach to frequency/likelihood and consequence

Synthesize heterogeneous information, apply common repeatable framework, to drive to a master understanding of the most significant risks to the Nation

Informs strategic planning, drives future research, facilitates communication of risk to the public
HSNRC and the Homeland Security Strategic Environment

The HSNRC is a snapshot in time, but we must reflect changes in the future, such as trends. By including other analytic efforts, conclusions can:

- Clarify the risk picture and **avoid blind-spots** through qualitative systems analysis of risks
- Place recent **homeland security events in context**
- Describe **global dynamics and meta-trends** that are shaping our strategic environment
- Capture interdependencies and system relationships
- Identify **key challenges and opportunities**
Additional Lessons

- Socialization, peer review, and verification/validation of methodology and results
- Big data, no data, and restricted data
- Risk communication

*Ultimately, analysts must appropriately scope and conduct timely and relevant analysis to support real-time decision-making, using the best available data, models, and results*
Discussion and Questions