

Regional Risk Analysis: A Coordinated Effort

Elizabeth Jackson^A William L. McGill^B
Christopher Geldart^C

Risk assessments are being conducted more frequently as localities seek to enhance their preparedness and mitigate and manage risk with regard to all-hazard events. In the National Capital Region (NCR), a risk analysis was recently conducted that built on previous assessments and further contributes to a regional risk picture. This paper describes the development of the 2008 NCR Strategic Hazards Identification Evaluation for Leadership Decisions (NCR SHIELD) regional risk analysis, which includes both a risk assessment and strategic approach to risk management. It begins with a discussion of the difficulties that must be overcome to ensure executive decision makers align their thinking and pursue a common goal of assessing regional risk to inform their decision-making processes and, in turn, how they mitigate and manage risk at the strategic level. The paper concludes with information on the conduct of NCR SHIELD and outlines a stakeholder-engaged process for further developing a multi-jurisdictional approach to risk management.

Many jurisdictions throughout the Nation are analyzing risk in order to better inform decision making and better protect their infrastructures and way of life. Additionally, neighboring jurisdictions are partnering to develop a common picture of *regional* risk. Developing and conducting a regional risk assessment is more complex than most assessments due to varying jurisdictional interests and individual perspectives. Similarly, developing a strategic approach to risk management necessitates an understanding of the limitations of such an approach by regional leadership. A crucial aspect of developing a *regional risk analysis* is coordination—coordination of ideas, goals, and objectives among stakeholders. Often, the most difficult feat in a multi-jurisdictional risk effort is getting everyone together and having them agree on the necessary strategic focus of a regional risk analysis.

The purpose of this paper is not to provide the reader with a formula to quantitatively or qualitatively determine risk within a region of multiple jurisdictions, but rather a framework of how to coordinate a collective and collaborative regional risk analysis among different jurisdictions at the Federal, State, and local levels of government. The Office of National Capital Region Coordination (NCRC) within the Federal Emergency Management Agency recently coordinated a regional risk analysis, National Capital Region Strategic Hazards Identification Evaluation for Leadership Decisions (NCR SHIELD), in collaboration with the Office of Risk Management and Analysis (RMA) of the U.S. Department of Homeland Security's National Protection and Programs Directorate and with input from Federal, State, local, and private sector partners. NCRC's approach to coordinating this initiative is described below to lend greater

understanding to the planning and execution of a regional risk analysis, as well as enhanced understanding of *regional risk*. The described approach can also be modeled in regions throughout the country, serving to further enhance national risk efforts.

Overview of NCR SHIELD

NCR SHIELD is a regional risk analysis that, as conducted in 2008, consists of a risk assessment and strategic approach to risk management, in other words an initial look at potential investments to mitigate risk. Using a scenario-based risk assessment, NCR SHIELD prioritized risks of terrorism and natural hazards as they apply to assets in select critical infrastructure and key resource (CIKR) sectors within the National Capital Region (NCR). The 2008 NCR SHIELD initiative also produced broad, strategic-level risk management options in the form of investment themes and focus areas that could be applied across numerous sectors and subsectors to mitigate risk and enhance the security of the NCR.

NCR SHIELD:

- Answers questions on risk regarding all-hazards preparedness, prevention, protection, response, recovery, and mitigation to assist leadership within the NCR in its decision-making processes
- Aids decision makers in more efficiently evaluating risks across the NCR, as well as options to mitigate those risks and alternative strategies to manage risk
- Enables risk-informed decision making, allowing leadership to:
 - Better allocate resources and assets to mitigate risk and fill identified gaps between risks and response capabilities
 - Synchronize regional planning and response efforts in order to leverage the capabilities, assets, and resources of other jurisdictions
 - Craft well-informed grant submissions to achieve a greater return on investments

^A Program Analyst, Office of National Capital Region Coordination, Federal Emergency Management Agency, (202) 212-1513, liz.jackson@dhs.gov.

^B Assistant Professor, The Pennsylvania State University, 101P IST Building, University Park, PA 16802, (814) 867-0270, wmcgill@ist.psu.edu.

^C Vice President, Homeland Security and Emergency Management, URS Corporation, and Former Director, Office of National Capital Region Coordination, Federal Emergency Management Agency.

The 2008 NCR SHIELD initiative represents phase one of spiral program development for NCR SHIELD regional risk analyses in the NCR. While this recent analysis built on past NCR risk analyses, it was limited in the results it produced. Specifically, the analysis maintained a purely strategic focus and an initial approach to risk management was developed, rather than a full exploration of options to mitigate risk. Any future iterations of the NCR SHIELD regional risk analysis will continue to build on past efforts and facilitate the further enhancement of regional risk management.

Examples of risk assessments and associated analyses conducted in the NCR include, but are not limited to, the Washington, DC Risk Baseline, NCR Hazard Identification and Risk Assessment (HIRA), and Critical Infrastructure Protection in the National Capital Region – Risk-Based Foundations for Resilience and Sustainability (Strengths & Weaknesses Study).

Washington, DC Risk Baseline¹

A risk baseline was recently developed by Digital Sandbox, Inc.² that identified Washington, DC area risks, assessing threat, vulnerability, and consequence based on available data and models. The results of the baseline were consistent with those of NCR SHIELD. The agreement between these two analyses increased decision-maker confidence in their understanding of regional risk, thus providing a sturdier foundation to inform resource allocation decisions.

NCR Hazard Identification and Risk Assessment (HIRA)
Conducted by SRA International and the results of which were presented in early 2007, NCR HIRA analyzed risks to the NCR, particularly their impact on regional continuity.

Critical Infrastructure Protection in the National Capital Region – Risk-Based Foundations for Resilience and Sustainability

Also known as the Strengths & Weaknesses Study, this initiative led by the University Consortium for Infrastructure Protection³ assessed risk management

¹ This analysis was performed during the same general time frame as the conduct of NCR SHIELD. Despite this point, the two analyses were blind to each other, with neither influencing the results of the other.

² <http://www.dsbox.com/>.

³ The Consortium was managed by the Critical Infrastructure Protection Program, now Center for Infrastructure Protection, of George Mason University School of Law and included the Virginia Polytechnic Institute and State University, University of Maryland, University of Virginia, James Madison University, and Howard University. It also consulted with

The National Capital Region

The NCR was created pursuant to the National Capital Planning Act of 1952 (Title 40, U.S.C., Sec. 71). It is the 4th largest U.S. metropolitan area and encompasses:

- 12 local jurisdictions in Maryland and Virginia, and the District of Columbia
- All three branches of the Federal Government and 270 Federal agencies
- 5 million residents and more than 20 million tourists annually
- Estimated \$288B Gross Regional Product
- Headquarters of The World Bank, Organization of American States, and other international and national institutions
- Over 2,100 non-profit organizations
- More than 45 colleges and universities with over 130,000 students annually
- 2nd largest rail transit system and 5th largest bus network in the United States
- Two major airports

efforts in select CIKR sectors within the NCR to aid in the development of a strategic framework for critical infrastructure protection.

Value of a Regional Risk Analysis

While a risk analysis can be conducted within individual jurisdictions, regional risk assessments have added value to stakeholders and constitute greater input to the national risk profile. For example, a regional approach contributes to the sharing of best practices and lessons learned with respect to mitigation actions. The majority of the threats and hazards posed to a local jurisdiction will not stop at the jurisdictional boundary—they have a regional effect. For instance, much of urban infrastructure is multi-jurisdictional (e.g., transportation systems, drinking water and wastewater treatment systems, energy, etc.), thus understanding the risks of neighboring jurisdictions and a multi-jurisdictional approach to mitigating risk is necessary. Moreover, options to mitigate risk and alternative strategies to manage risk may be applied in numerous jurisdictions, taking into account that some strategies may be deemed more beneficial or more cost effective than others depending on the composition of a particular jurisdiction. The best way to prepare for all-hazard events is to collectively and collaboratively prioritize threats and, in turn, prioritize risks and associated strategies for risk management based on jurisdictional considerations, such as infrastructure architecture and availability of resources.

numerous independent advisors during the course of the Strengths & Weaknesses Study.

Regional risk analyses can address the cascading effects of an incident affecting multiple jurisdictions, as well as cross-utilization of resources. The results of such analyses help to identify gaps between risks and response capabilities; synchronize regional planning and response efforts in order to allow for the leveraging of each other's capabilities, assets, and resources; and also inform grant submissions. In addition to identifying gaps with respect to response capabilities, regional risk analyses also improve executive decision makers' understanding of how a region will respond to different events (i.e., reduce uncertainty). Further, performing such collaborative efforts encourages regional continuity and promotes strategic partnerships with respect to the mitigation and management of risk.

NCR SHIELD, a strategically-focused regional risk analysis,⁴ is intended to enable risk-informed decision making among senior, or executive, leadership and is aimed at enhancing the understanding of risk among decision makers of diverse backgrounds. In the NCR, regional leadership includes the Senior Policy Group (SPG), consisting of the Homeland Security Advisors (HSAs) and Chief Emergency Managers of the District of Columbia, Maryland, and Virginia and the Director of NCR, and the Chief Administrative Officers (CAOs); other regional organizations also exist and share membership with the aforementioned entities.⁵ In most cases, a state's HSA is the *chief risk officer* for homeland security and emergency management within that state. As such, he or she oversees the allocation of resources, including grant funding, to address risk. In order to most efficiently allocate resources and achieve a greater return on investment, an HSA must be educated on all-hazards risk and understand the differences between levels of risk analyses (i.e., strategic, operational, tactical, and programmatic).

In support of establishing a common understanding of risk, NCR SHIELD provides leadership with key information on factors and components of risk and the value of considering risk when making decisions, helping to frame discussions on better securing the Region. With the results of this regional risk analysis, leadership and relevant stakeholders can gain improved knowledge and enhanced awareness of the NCR's risks and capabilities to

⁴ An overall strategic focus is important in a multi-jurisdictional environment. However, options to mitigate risk at the operational and tactical levels will be addressed in future NCR SHIELD efforts to enable greater application both regionally and within individual jurisdictions.

⁵ For example, the NCR Emergency Preparedness Council (EPC) consists of elected officials, chairs of various Metropolitan Washington Council of Governments committees, and others involved in the Region's homeland security and emergency management activities.

mitigate and manage risk as well as to prepare for, respond to, and recover from all-hazard incidents.

Developing "Risk 101" and Managing Expectations

Based on interactions with regional stakeholders and garnering of information on past regional risk assessments and related efforts, NCR leadership and staff determined that a majority of stakeholders did not have a common understanding of risk and held different views of what a risk assessment is and what a risk assessment is to provide once conducted. It is for these reasons that risk education is vital to the overall risk analysis process and to effective decision making on the part of regional leadership.

Risk is assessed in terms of the logical interaction of factors that contribute to threat, vulnerability, and consequence for the purpose of rank ordering scenarios according to their potential for causing harm. Risk considers what can happen (threats and outcomes), the likelihood of it happening (the combined probability of threats and vulnerabilities), and the consequences if it does happen (severity of outcomes).⁶

Although previous regional risk assessments had been performed in the NCR, not all stakeholders, particularly executive decision makers, were fully satisfied with the results of the assessments based on their individual expectations. For instance, stakeholders may have expected more tangible information pertaining to a particular jurisdiction rather than an overall picture of regional risk. Additionally, they may have expected past efforts to produce specific information on *what can be done* to address risks (e.g., through risk management) rather than primarily information on *what their risks are* (e.g., through risk assessment).

NCR staff, chiefly the Associate Director for Risk Reduction, led efforts to develop "Risk 101" in order to establish a common understanding of the development, execution, and results of a regional risk analysis. Simply put, Risk 101 described risk in a nutshell and outlined the intended product of a regional risk analysis. The importance of mutual agreement on the expectations of a risk analysis cannot be stated enough; stakeholders must "be on same sheet of music" before moving forward with any analysis. The foundation of these expectations must also be based on a standardized view of *what is risk* among regional stakeholders. With streamlined thinking, stakeholders will more thoroughly understand the

⁶ Kaplan, S. and Garrick, B. J. (1981). "On the Quantitative Definition of Risk." *Risk Analysis*, Vol. 1, No. 1, pp. 11-27.

framework for regional risk analysis and are more likely to have their goals met once an assessment is conducted and options to mitigate and manage risk are presented.

The Risk 101 developed by NCR staff, in collaboration with researchers at The Pennsylvania State University and RMA, was based on lessons learned from past experiences, significantly leveraging previous regional risk assessments and analyses, and on stakeholder knowledge and expertise. Importantly, past risk initiatives often produce fruitful results that allow for the continued evolution of regional risk analyses. For example, NCR HIRA was successfully able to obtain stakeholder acceptance of the definition of “regional.” Definitions agreed upon through NCR HIRA were utilized in NCR SHIELD, along with other terminology developed through the vast knowledge and experience of those working in the homeland security risk community, to ensure synergistic efforts with regard to risk.

Risk Assessment Versus Risk Management

Risk 101 should not only define risk, but also distinguish between *risk assessment* and *risk management*. Understanding the differences between risk assessment and risk management is key to developing targeted stakeholder expectations for a regional risk analysis. In requirements outlined for past risk analyses, expectations of the stakeholders, the customers, were not clearly conveyed to those conducting the analysis due to the use of different lexicons. In the NCR, the diversity of the

stakeholders played a large role in the lack of commonly used terminology as stakeholders represented not only different jurisdictions but also different organizations (e.g., law enforcement, government official, infrastructure owner/operator). Miscommunication between parties, through no fault of either party, led to analysis results that fell below expectations.

In many cases, leadership (i.e., executive decision makers) may be provided with risk analysis information on threats posed to their jurisdictions that comes as no surprise to them. Threats are often surmised, but what leadership wants and frequently lacks is information that assists in *risk management*, that is, specific advice about what can be done in order to reduce risk in addition to a prioritization of risk scenarios that enables comparative analysis, also known as pre-mortem analysis. Essentially, leadership wants to know how to defend against the challenges it faces and mitigate overall risk. The best risk analysis report provides information on not only what may go wrong, but also on how to lessen the occurrence of negative impacts, such as through strategies for threat and vulnerability reduction. Such information proves vital to leadership decision making.

The product of a regional risk analysis is designed to support decision-making requirements for leadership. Risk analyses are typically used to characterize the uncertainties present in a decision maker’s understanding of the threats faced by a region and how that region would react in response to the occurrence of a threat. A risk

Risk 101: Differentiating *Risk Assessment* from *Risk Management*

Risk Assessment

A regional risk assessment identifies and measures the threats, vulnerabilities, and consequences facing a region of interest. In general, risk assessments seek answers to the following three questions:

- What can happen?
- How likely is it to happen?
- What are the consequences if it does happen?

The results of risk assessments, those statements concerning the nature and the magnitude of the assessed risks, are influenced by available knowledge and the inherent randomness of events. More knowledge permits more focused decisions, whereas less knowledge requires more robust strategies.

Risk Management

Risk management involves the consideration and implementation of measures to reduce the challenges identified in the risk assessment, and seeks to answer the following questions:

- What can be done?
- What are the trade-offs in terms of costs and benefits for each option?
- What impact will these options have on my future efforts to mitigate risk?

Attention may also be given to questions concerning the tolerance for certain risks (i.e., are the risks acceptable or, rather, should something be done?) and level of confidence in the analysis of data.

analysis is not a crystal ball or meant to replace the decision maker, but rather a means to assist leadership during the decision-making process. Resulting analytical reports do not offer step-by-step guidelines to mitigating all weaknesses; leadership needs to ensure that its questions on risk (chiefly those concerning areas of uncertainty) are identified and addressed to receive meaningful output. It is with a common, accepted lexicon, that common expectations can be developed and better results from a risk analysis may be produced for executive decision makers.

Risk assessments must produce *actionable* risk information, meaning that the results provide guidance on what can be done to mitigate risk. As such, the outputs of risk assessments provide the basis for recommendations regarding options to mitigate risk and alternative courses of action to manage risk and are required for informed decision making. Without information gleaned through risk assessments, risk management would be weakened significantly, in turn, affecting the protection of a region’s infrastructure, population, and economy. Risk assessments incorporate subject-matter expertise as well as a structured, comparative methodology to evaluate the threats, vulnerabilities, and consequences of an event or incident. They allow for expert opinion on the likelihood or probability of an incident’s occurrence and its expected impacts. Importantly, stakeholders, particularly executive decision makers, must be aware that the results of a risk assessment are analyst interpretations of the subject-matter experts’ belief of where values for threat, vulnerability, and consequence lie on a given spectrum. In other words, the risk assessment reflects information and insights gleaned from subject-matter experts on the factors and components of risk, of which uncertainty or a lack of knowledge and awareness may play a significant role.

Levels of Analyses

As noted in the textbox above, risk assessments address *what can happen, the likelihood of it happening, and the consequences if it does happen* and risk management addresses *what can be done, the costs and benefits for each option, and what impact options have on future decisions*. Although each of these areas can be addressed on different levels, it is important to understand the particular level within an organization that intends to use the information in decision-making processes.

To ensure the most utility in a multi-jurisdictional environment, risk analyses should be kept at the strategic level for regional leadership in order to

maintain the focus needed to best contribute to risk management. In the past, leadership has asked questions on risk at the strategic, operational, *and* tactical levels. Each of these levels should be addressed separately, starting with strategic then moving more in-depth as needed to augment information for local jurisdictions.

To ensure the regional risk analysis will meet the needs of stakeholders and assist them in the decision-making process, thus add value, the requirements of regional leadership must be identified. These requirements are conveyed in the form of questions to be answered through the analysis.

As decision makers consider the questions they need answered, they must acknowledge that there is no 100% solution to problems associated with risk—no guarantee for a 100% profile of risk within a region. Regional risk analyses are intended to help *build on* a more defined, clear risk picture in a particular region. Any results require continuous reassessment and realignment with leadership goals and objectives to ensure decision-making needs continue to be met. Each analysis should enhance or augment the previous one in an effort to work towards

Levels of Risk Analyses
<p>The development and organization of a specific methodology depends critically upon the level of analysis of the specific questions being posed.</p> <ul style="list-style-type: none"> • Strategic – Concerns the most significant questions of executive decision makers, e.g., <ul style="list-style-type: none"> - When considering regional threats to the NCR, what keeps you up at night? - What are costs and benefits you consider when weighing different courses of action to reduce risk? - <i>How much is enough and where?</i> • Operational – Concerns decisions faced by operational-level decision makers, e.g., <ul style="list-style-type: none"> - Security deployment of check points for screening versus high-profile patrols • Tactical – Concerns the likely risks of alternative tactical-level decisions, e.g., <ul style="list-style-type: none"> - Placements of vehicle barriers around a key facility • Programmatic* (<i>may apply at any of the above three levels</i>) <ul style="list-style-type: none"> - Compares the risk reduction benefits of one or more programs - Assesses the technological, cost, and/or schedule risks within a single program

more comprehensive picture of risk in that region—just as NCR SHIELD built on NCR HIRA and other past risk assessments or analyses conducted in the NCR.

A regional risk assessment must focus on *regional* risks and potential solutions at the strategic level to produce meaningful results for regional stakeholders.

Examples of questions that can help a region's decision makers better understand and manage regional risk include:

- What is the region's homeland security decision-making environment? Who are the decision makers and how do they interact?
- How much is known about the different challenges threatening a region? How much is known about how the region will respond to these challenges?
- What are the highest risk scenarios affecting the region (considering a scenario composed of a challenge and undesirable outcome)?
- What are the principal threats, vulnerabilities, and consequences?

Focusing on a regional, strategic approach to risk management, the following questions should be considered:

- What capabilities can be shared effectively among jurisdictions?
- Where are the largest gaps between the threats that we face and the capabilities that we possess?
- What are the likely returns on alternative strategies and/or investments to manage our risks?
- How should we prioritize our funds with respect to potential investments (e.g., should we apply funds to high-risk scenarios only)?

Developing the Regional Risk Approach

Following development of Risk 101, NCRC leadership and staff met with key regional stakeholders to determine the questions on risk to which NCR leadership sought answers. It was between the input of regional leadership and stakeholders, NCRC staff, and RMA leadership and staff that the processes utilized in NCR SHIELD were developed.

Outlining the Process for Conducting a Regional Risk Analysis

The coordination of regional risk analyses must begin with clearly defined questions that describe the scope of the

analysis and, thus, the risk assessment. Before an assessment is developed, the following questions should be addressed by those conducting the analysis in coordination with regional leadership:

- Who are the customers?
- What is the purpose of doing this analysis?
- What is the scope of the analysis in terms of the sources of risks, targets at risk, effects of concern, and mechanisms that cause harm?
- What is the appropriate, or necessary, level of detail required to support leadership decision making?
- What resources are available to undertake this analysis?

Information on a regional risk analysis process, which was considered in the development of NCR SHIELD, is offered below as an example of the process for conducting such an analysis, specifically one focusing on answering leadership questions on risk at the strategic level.

Risk Analysis Process

The purpose of a regional risk analysis is to provide executive decision makers with meaningful risk information that supports risk-mitigation investment decisions.

- The first phase of a regional risk analysis process is comprised of requirements generation and model development through the identification of specific strategic risk decisions and questions of leadership that will be supported through the risk assessment product and risk management outputs. As part of the requirements generation, risk analysts would meet with regional leadership to obtain consensus on the purpose, scope, and resources available to undertake the analysis. In addition, this step aims at gaining leadership buy-in to the assessment process.
- The second phase obtains a baseline assessment of the current regional risk posture from an all-hazards perspective. The goal of this phase is to communicate actionable risk information to decision makers.
- The third phase evaluates alternative risk mitigation strategies and investment options to determine whether they can be justified on the grounds of cost effectiveness, affordability, ability to meet risk reduction objectives, and overall acceptability.

In order for a regional risk analysis to be defensible in the face of public scrutiny, it must follow a defensible process

that is consistent with the standards of practice established by the risk community.

- The risk analysis process must be acceptable to relevant decision makers. Accordingly, the risk analysis process must be simple to understand, logically sound, and feasible to implement with available resources.
- The risk analysis process must be analytic in nature. That is, the process must break the problem down into its basic components in a logical manner and have sufficient resolution to accommodate variables that can be affected by the decision maker.
- All aspects of the risk analysis process must be transparent. That is, the sources of information must be clearly stated, the reasoning from information to judgments must be fully documented with all assumptions stated, and all uncertainties must be properly expressed.

The process detailed below provides a basis for a regional risk analysis that meets the above stated requirements.

- The Scenario Identification step attempts to imagine and describe a comprehensive set plausible challenges (e.g., hazards, threats) that could adversely impact a particular region and the types of impacts of concern to regional leadership. Such challenges include naturally-occurring events (e.g., storms, landslides), industrial accidents, and malicious attacks.⁷ Impacts of concern typically include loss of life, significant disruption of lifeline services, and property damage. For a specified analysis scope, this step produces a set of scenarios that includes all plausible and relevant combinations of challenges and impacts.
- The Consequence and Severity Assessment step assigns a value to each scenario considering both the type of impact and cause of impact. This value represents the overall undesirability for each scenario. The subsequent vulnerability and hazard/threat assessment phases discount this value according to the potential for its realization.
- The Vulnerability Assessment step assesses the probability of a particular undesirable impact becoming reality following the occurrence of a particular hazard or threat. In general, a vulnerability assessment examines the ability of a

⁷ The 2008 NCR SHIELD initiative addressed risks of terrorism and natural hazards. The risk assessment was not an all-hazards assessment; however, numerous potential investments produced as part of the strategic risk management approach are applicable across the threat spectrum.

region to withstand or resist the effects of a hazard or threat. For malicious attacks, a vulnerability assessment also considers weaknesses in a region's security posture that could contribute to attacker success.

- The Hazard/Threat Likelihood Assessment step assesses the potential for each hazard and threat to occur in a specified time frame. This step considers the historical record of previous events and expert judgments concerning the potential for future events, taking into account both internal and external factors.
- The Risk Assessment step synthesizes the consequence, vulnerability, and hazard/threat judgments to make statements of regional risk for each scenario. Complementing these statements is guidance on what can be done to reduce risk, to include both focused (targeting a specific scenario) and broad (targeting a wide range of scenarios) mitigation strategies. This step also reiterates the boundaries of the analysis and the degree of uncertainty present in the final estimates.

[Process Utilized for NCR SHIELD](#)

The actual risk analysis process used for NCR SHIELD varied to a degree from the above for numerous reasons. Among those reasons were the time frame allotted for the analysis and quality of subject-matter expert outreach with respect to the elicitation of risk-related information.

Risk Assessment

Risk assessments prioritize threats, identifying those scenarios that pose risks to a particular jurisdiction (or region), asset or group of assets, population, or mission execution. RMA, with contract support, developed the risk assessment methodology used in NCR SHIELD. The following textbox describes this risk assessment methodology.

SHIELD Risk Assessment Methodology
 by Katie Stout, Mary Walsh, and Geoffrey French, CENTRA Technology, Inc.

Strategic Hazard Identification and Evaluation for Leadership Decisions (SHIELD) includes a scenario-based regional risk assessment tool developed under RMA leadership to support and inform strategic risk management decision-making for the National Capital Region (NCR). The SHIELD process is designed to be a flexible and repeatable process to answer the following three questions:

1. What can happen?
2. How likely is it to happen?
3. What are the consequences if it does happen?

The SHIELD risk assessment framework addresses these questions by generating scenarios and assessing the threat, the vulnerability, and the consequence, as defined by the National Infrastructure Protection Plan (NIPP). To generate scenarios (i.e., the potential attacks by an adversary on a target) through a standardized and repeatable process, the SHIELD risk assessment adopts the structures currently used within the federal government, and developed within DHS, for categorizations of potential targets and potential events.

First, the SHIELD framework utilizes the NIPP as a guide to standardize definitions of the infrastructure that supports a region's economy, government, and society to ensure a comprehensive review of potential targets. Then, the SHIELD risk assessment focuses the scope of the analysis on standardized events with which a region cannot contend. To limit the terrorism scenarios but still provide a comprehensive review of possible attacks, SHIELD uses the U.S. Department of Homeland Security-Federal Bureau of Investigation publication "Potential Terrorist Attack Methods – Joint Special Assessment," which categorizes and assesses potential terrorist attack methods that could be used against critical infrastructure. For natural hazards scenario development, SHIELD utilizes the list of natural hazards types defined by the Federal Emergency Management Agency, historical information from the National Oceanic and Atmospheric Administration and the Centers for Disease Control and Prevention, and the findings from past assessments that considered representative hazard mitigation plan risk assessments.

For each possible pairing of attack method (or natural hazard) and target infrastructure, regional sector subject-matter experts (SMEs) considered the types of assets, systems, and facilities in the Region and selected one or a set that represents the worst reasonable combination of vulnerability and consequence. In the data collection process, SHIELD provided worksheets for infrastructure SMEs to evaluate and rank the consequence and vulnerabilities of the Region's scenarios, as well as separate worksheets for the Region's fusion centers to capture the terrorist threat levels. This data call required a range of individuals to provide input from local, state, and federal perspectives. The SHIELD ranking guidance provided to SMEs included definitions, parameters, considerations, and examples so that they could make consistent and comparable judgments on the components of risk that the SHIELD framework considers in the analysis of each scenario (see Figure 1).

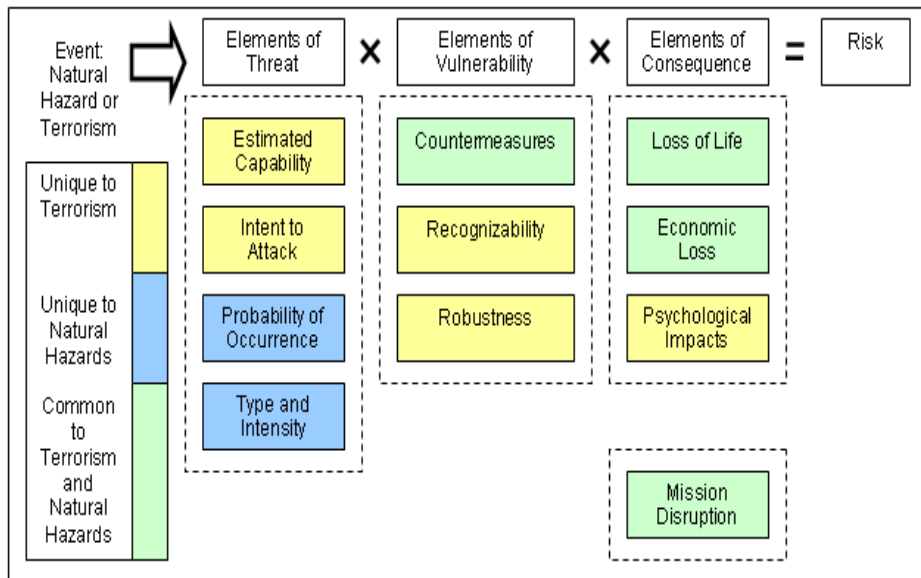


Figure 1. SHIELD Components by Risk Factor

Using the individual judgments of the SHIELD risk components provided by the SMEs based on the presented scenarios, the components were logically integrated to create clear levels of severity for the risk factors (threat, vulnerability, and consequence) and the final risk levels. These components were drawn from existing risk assessment frameworks within DHS, such as the Strategic Homeland Infrastructure Risk Assessment (SHIRA), and from the incorporation of factors deemed by leadership as the most important in strategic decision making. For threat, SHIELD adapted the top-down approach currently used by SHIRA and added an element for terrorist intent to attack the people, assets, or facilities in a specific region. SHIELD also adopted SHIRA's scenario-based approach to vulnerability (e.g., the vulnerability assessment of an asset, system, or facility considering a specific attack method).

Interviews with the decision makers in the Region led to the selection of the aspects of consequence measured in SHIELD. The primary consequences considered were expected fatalities, potential economic costs, and psychological impacts. NCR leadership, however, requested an additional assessment of the effect of a disaster on regional continuity or "common essential missions." Although this was a complex endeavor, the SHIELD model implemented an innovative approach that assessed the degree of disruption for those essential missions that crossed jurisdictions. The SHIELD team closely coordinated with infrastructure SMEs to describe the extent of disruption to mission areas over time and assess the impact of the outage on the Region. The analysis allowed NCR leadership to see the types of attacks that would affect essential services most severely across the Region.

Risk Management

Risk management is the process by which options and strategies to address risks are identified, evaluated, and considered by leadership and implemented by appropriate parties. It also involves the continued assessment of such options and strategies to ensure those measures taken to mitigate or manage risk remain effective. The 2008 NCR SHIELD initiative produced strategic investment themes and focus areas determined by an analysis of the risk assessment results, review of existing and desired capabilities,⁸ and limited input from regional stakeholders and subject-matter experts.

To enable the use of NCR SHIELD results in the Fiscal Year 2009 Urban Areas Security Initiative (UASI) grant process, the 2008 NCR SHIELD risk management approach was constrained and primarily depended upon internal analysis rather than a broader assessment of information from NCR stakeholders. Given the opportunity to perform a full analysis of information for the risk management component of NCR SHIELD, which will be conducted in future iterations of the initiative as funding allows, NCRC staff would have utilized Stakeholder-Engaged Risk and Vulnerability (SERV) Analysis.⁹ SERV Analysis is a five-step approach to regional all-hazards risk management developed by researchers at The Pennsylvania State University. This approach empowers regional stakeholders and employs extensive discussions with those organizations and individuals who have direct involvement in the mitigation

of homeland security risks, including Federal, State, and local government officials and CIKR owners and operators. The goal of SERV Analysis is to evaluate real regional risk mitigation options on the minds of regional decision makers, and in the process back-calculate each stakeholder's perception of regional risk to stimulate discussion, debate, and ultimately consensus. The five steps of SERV Analysis are described below.

1. IDENTIFY. This step seeks alternative points of view of what can or should be done to manage regional risk from the people responsible for its management. This elicitation of risk mitigation options engages those stakeholders intimately familiar with the needs, concerns, weaknesses, and strengths of a particular region's prevention, protection, response, and recovery capabilities. The end product of this step is a wide variety of investment options under consideration at the time for reducing all-hazards risk.
2. DISCUSS. As a group, this step asks how each option reduces risk by discussing the pros and cons of each in terms of their ability to reduce risk, the benefits and costs, affordability, and impact on future decisions. In particular, for each option:
 - a) Describe which scenarios will be impacted and explain how. For example, does the option address the risks attributed to just one type of attack method (e.g., explosives) or does it have an all-hazards focus?
 - b) Describe how regional capabilities will be improved and explain how. For example, does the option improve existing capabilities or does it add a new capability?

⁸ For reference, the *National Preparedness Guidelines* issued by DHS in September 2007 includes the Target Capabilities List (TCL), "which defines 37 specific capabilities that communities, the private sector, and all levels of government should collectively possess in order to respond effectively to disasters."

⁹ Portions of the approach were used in discussions with subject-matter experts following the release of the November 2008 NCR SHIELD report.

- c) How much better off would the region be with the option than it is now, all things considered? Explain why.
 - d) Consider the life-cycle costs of each option and any potential degradation over time. For example, does the option require continuous maintenance or does it present an improved form of defense that will erode over time?
 - e) On balance, do the benefits of the option meet or exceed the costs?
 - f) Will choosing this option limit our ability to do other things in the future?
 - g) Would the public find this option to be acceptable?
3. CROSS-CHECK. Compile a list of all threats and capabilities considered and cross-check each against the proposed options to identify collateral benefits or detriments. For example, if Option A addresses “explosive attacks” and Option B addresses “evacuation capabilities,” this step asks whether Option A does anything to improve regional evacuation capabilities and whether Option B does anything to reduce the threat of an explosive attack.
 4. EVALUATE. This step evaluates each investment proposal on the basis of three criteria and provides reasoned narratives explaining the findings:
 - a) Risk Reduction: Does the proposal buy down risk enough?
 - b) Benefit/Cost: Does the reduction in risk result in a favorable return on investment?
 - c) Affordability: Is the proposal affordable?
 5. MONITOR. This final step identifies diagnostic indications that will help determine whether a particular option is actually performing as intended in terms of benefits, risk reduction, and affordability.

Risk Analysis Outputs

The outputs of a risk analysis (both risk assessment and risk management) are primarily presented in the form of a written report. During the development process outlined above, a determination is made regarding how the resulting report(s) will be protected and where the report(s) will reside. In the case of the 2008 NCR SHIELD initiative, the core written report is unclassified, but marked For Official Use Only. NCR stakeholders can access the report through a password-protected website utilized in the Region. The report and supporting materials may also be requested through NCRC.

Coordinated Effort and Approach to Leadership

It is the approach taken with respect to leadership, the executive decision makers in a given region, that is critical to the success of a regional risk analysis. Methodologies used in risk analyses can be interchanged, but stakeholder engagement and ensuring a coordinated effort cannot be compromised. The purpose of conducting a regional risk analysis is to present leadership with information needed to make risk-informed decisions, decisions regarding appropriate measures to address regional risks. Without the acceptance of an analysis and its results, this purpose cannot be met and effective decision making may be hampered.

The Director of NCRC serves as a member of the Senior Policy Group, as noted earlier, and interacts regularly with regional leadership and diverse stakeholders in both the public and private sectors. NCRC staff also work closely with numerous entities in the Region to fulfill the Office’s broad Congressional mandate “to oversee and coordinate Federal programs for and relationships with State, local, and regional authorities in the National Capital Region. . . .”¹⁰ As homeland security officials are continually advocating a risk-informed approach to decision making, regional leadership and stakeholders frequently discuss the need for risk information to justify their decisions with respect to the allocation of resources. NCRC leadership and staff often take part in such discussions and work to support coordinated and collective efforts to better protect the Region from all hazards.

Although the analysis itself began in early 2008, planning efforts for NCR SHIELD were well underway in 2007. The initiative was discussed with key stakeholders in the risk community and broached to executive decision makers in the NCR. A proposed approach for NCR SHIELD development and initial execution was formulated, particularly with respect to collaboration among diverse regional entities. Following the delivery of Risk 101 to the Region’s leadership, a critical component of any regional risk analysis, the Director of NCRC and RMA contract support conducting the NCR SHIELD analysis met with NCR leadership to discuss the key questions that NCR SHIELD should address, focusing on areas of uncertainty and those questions of importance to decision makers. These meetings were held with members of the SPG and CAOs representing numerous cities and counties within the NCR to ensure that a multi-jurisdictional perspective informed the regional risk analysis. Importantly, throughout the process of conducting the analysis, NCRC

¹⁰ Homeland Security Act of 2002, P.L. 107-296, Sec. 882.

leadership and staff engaged with regional leadership and stakeholders to ensure the effort would produce meaningful results.

The Director of NCRC and NCRC staff regularly provided updates on NCR SHIELD to regional leadership and other stakeholders, to include the SPG staff and NCR Emergency Preparedness Council (EPC). Such updates were offered via formal briefings during meetings and conference calls, via email, and through more informal conversations. NCRC staff directly engaged with those supporting regional leadership to facilitate the clarification of expected outcomes and expound on the potential use of NCR SHIELD in leadership decision making, as well as provide Risk 101 information as needed. Through these various updates and accompanying discussions, the value of a regional risk analysis to the NCR's homeland security efforts was communicated.

Ultimately, the high-level findings of the risk assessment and the strategic investment themes and focus areas constituting NCR SHIELD's strategic approach to risk management were briefed by the Director of NCRC at a joint meeting of NCR leadership and stakeholders / subject-matter experts during which the Region's Fiscal Year 2009 grant applications were discussed at length. Follow-up discussions continue to be held with NCR stakeholders to aid in the utilization of NCR SHIELD in determining the best allocation of resources and assets to mitigate and manage risk.

Key Outputs

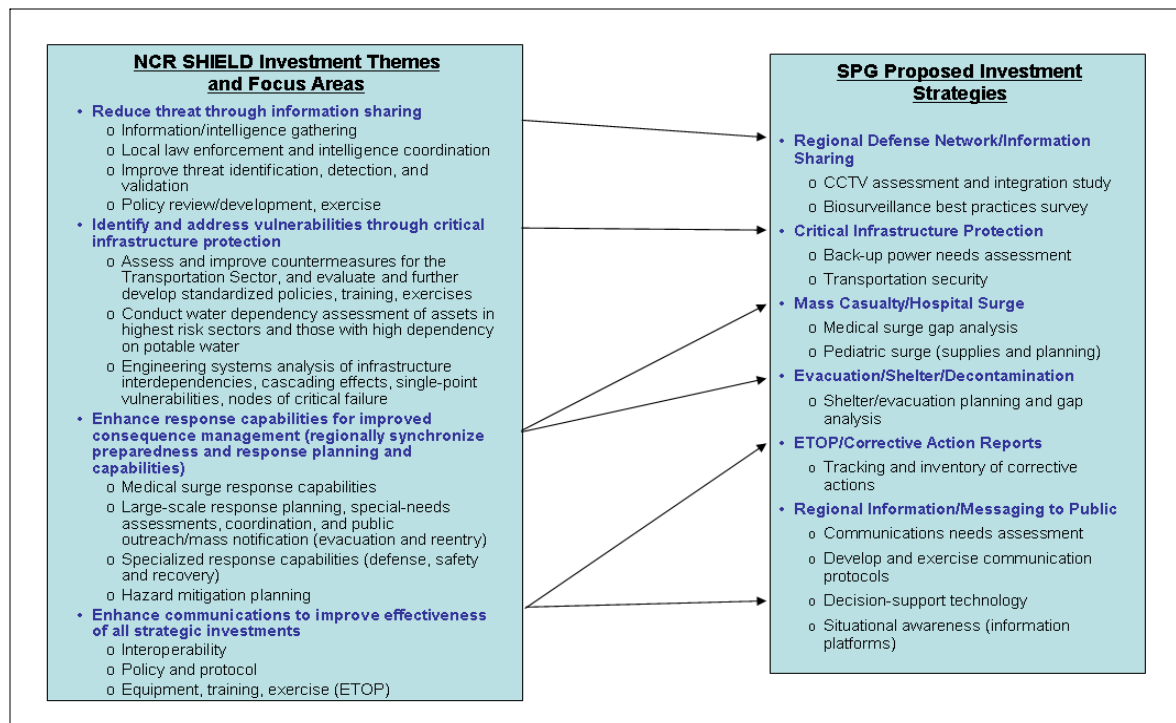
The 2008 NCR SHIELD initiative produced a prioritization of regional risks as they apply to select CIKR sectors and broad investment themes to support efforts to mitigate and manage risk, each with focus areas to aid NCR leadership in refining proposed investment themes and assist subject-matter experts in determining appropriate projects. This prioritization was based directly on

input from Federal, State, local, and private sector subject-matter experts in the Region and contributed to leadership's evaluation of overall regional risk. More specifically, it rank ordered scenarios involving terrorist events and natural hazards to aid decision makers in understanding the highest risks within the NCR, offering insight as to the highest threat scenarios, those CIKR that are most vulnerable to certain threats or hazards, and those threats or hazards that are the most consequential for CIKR. The strategic investment themes developed as part of the NCR SHIELD risk management approach addressed numerous scenarios, not only those deemed the highest risk scenarios. Often, mitigation options will impact a range of scenarios, whether by reducing threat, addressing vulnerabilities, or improving consequence management.

By maintaining a strategic focus, NCR SHIELD empowers regional stakeholders—providing leadership with information and guidance to make high-level decisions and allowing subject-matter experts to provide operational and tactical levels of clarity on the risks facing the Region and steps that can be taken to address such risks.

Support of Investment Strategies

Of particular importance to regional leadership, the results of the 2008 NCR SHIELD regional risk analysis supported potential investment strategies under consideration by executive decision makers. By keeping the analysis on the strategic level, NCR SHIELD outputs corroborated and helped refine leadership's proposed investments and



The views expressed herein are those of the individual authors and may not represent those of the institution.

associated grant guidance. The strategic focus also allowed subject-matter experts to develop appropriate projects within the investment themes and focus areas that meet their specific needs and objectives.

As discussed in the earlier section on Risk 101, the outputs of risk assessments provide the basis for recommendations regarding options to mitigate risk and alternative courses of action to manage risk. Referencing the assessment outputs and initial risk management options developed by RMA in the course of the analysis, NCRC staff formulated the investment themes and focus areas presented to NCR leadership and stakeholders. The above figure compares the risk management outputs of the 2008 NCR SHIELD initiative and the SPG's proposed investment strategies.¹¹

Supporting regional efforts to mitigate and manage risk, NCR SHIELD will be referenced in Fiscal Year 2009 UASI grant applications from NCR stakeholders. In future efforts, NCRC staff will continue to develop and improve upon a stakeholder-engaged risk analysis process to enhance decision making with respect to risk management.

Conclusion

In sum, the process utilized in the National Capital Region Strategic Hazards Identification Evaluation for Leadership Decisions (NCR SHIELD) initiative and added information in this paper offer readers insight as to the value and development of a regional risk analysis. The use of the approach outlined may also contribute to improved understanding of regional risk in itself. While only one example of a regional risk analysis, NCR SHIELD features a coordinated approach to leadership that can be applied to regions across the Nation. It represents a collective, collaborative effort of regional stakeholders aimed at addressing *strategic-level* decisions across the National Capital Region and supports executive decision makers in prioritizing and addressing risks, determining those actions that may mitigate risk on a multi-jurisdictional basis as well as in individual jurisdictions. The authors hope that the outlined approach to establish common understanding of what risk is and what a regional risk analysis can provide will be replicated for future initiatives. In any initiative of this kind, particularly a multi-jurisdictional effort, coordination is critical to success. Methodologies used to assess or analyze risks may change, but without coordination at the forefront of a

¹¹ Additional information on NCR leadership's thematic priorities/investment strategies can be found on the National Capital Region Homeland Security Program's website at <http://www.ncrhomelandsecurity.org/ncr/uasi2009.asp>.

regional risk analysis, along with risk education to ensure a common understanding of risk and frame related discussions, stakeholder expectations will not be met and risk-informed decision making will be hindered.

Acknowledgements

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Notably, the 2008 NCR SHIELD initiative was conducted in collaboration with the U.S. Department of Homeland Security's Office of Risk Management and Analysis (RMA). Under the strong and effective leadership of Tina Gabbrielli, RMA works to integrate the Department's risk-related activities and lead its efforts to establish a common framework to address the overall management and analysis of homeland security risk. NCR SHIELD would not have come to fruition in 2008 without her support and guidance. With respect to NCR SHIELD's risk assessment and associated methodology, the authors would like to acknowledge the valuable work of the following individuals: Robert McKendrick, Senior Program Manager (former), RMA; Dr. Kevin O'Prey, Consultant, RMA; and Geoffrey French, Tom Park, Mary Walsh, Heather Madruga, Katie Stout, and Suzan Edwards of CENTRA Technology, Inc.

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Without these stakeholders and risk professionals, the regional risk analysis discussed in this paper would not have been possible.