



Threat and Hazard Identification and Risk Assessment Guide

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Table of Contents

Overview	1
Basic Elements of the THIRA Process	3
Step 1: Identify the Threats and Hazards of Concern	5
Step 2: Give the Threats and Hazards Context.....	7
Step 3: Examine the Core Capabilities Using the Threats and Hazards.....	9
Step 4: Set Capability Targets.....	13
Step 5: Apply the Results	15
Conclusion.....	17

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Overview

Every community has an obligation to understand the risks it faces. Knowledge of these risks allows a community to make informed decisions about how to manage risk and develop needed capabilities. Risk is commonly thought of as a product of a threat or hazard, the vulnerability of a community or facility to a threat or hazard, and the resulting consequences that may impact the community or facility. By considering changes to these elements, a jurisdiction can understand how to best manage risk exposure.

Many methodologies exist to understand, qualify, and quantify risk. These methodologies most often focus on a single threat or hazard type and a small area or fixed facility. However, there are additional challenges when applying an approach designed for a single threat or facility assessment to geographic areas as large as cities and states and the full spectrum of threats and hazards. The specificity gained by complex probabilistic modeling and analysis is lost when trying to apply the results across the complex landscape of prevention, protection, mitigation, response, and recovery.

This Threat and Hazard Identification and Risk Assessment (THIRA) guide provides a comprehensive approach for identifying and assessing risks and associated impacts. It expands on existing local, tribal, territorial, and state Hazard Identification and Risk Assessments (HIRAs) and other risk methodologies by broadening the factors considered in the process, incorporating the whole community throughout the entire process, and by accounting for important community-specific factors.

The THIRA guide describes a step-by-step process:

- Step One assesses the various threats and hazards facing a community of any size.
- Step Two assesses the vulnerability of the community to those hazards using varying time, season, location, and community factors.
- Steps Three and Four estimate the consequences of those threats and hazards impacting the community and, through the lens of core capabilities, establish capability targets.
- Step Five captures the results of the THIRA process to set an informed foundation for planning and preparedness activities across prevention, protection, mitigation, response, and recovery.

The process can be illustrated with an example: a jurisdiction identifies tornadoes as a hazard and assesses its vulnerabilities if a tornado strikes at different times, seasons, and locations. Using the core capabilities identified in the National Preparedness Goal (Goal), the jurisdiction assesses the impacts and identifies the highest potential capability target level for Fatality Management Services. Preparing for response, the jurisdiction develops typed resources using the National Incident Management System to accomplish the required Fatality Management Services target. These resources are either built or sustained through collaboration with non-traditional partners, mutual aid planning, or direct investment by the jurisdiction. The jurisdiction may also undertake mitigation planning and projects such as safe rooms and warning systems that have been proven to lessen fatalities. Taking these actions reduces vulnerability, lowering the Fatality Management Services capability target in future THIRAs.

Using the THIRA results, a jurisdiction can develop a strategy to allocate resources effectively to achieve capability targets and reduce risk. The strategy should consider finding, connecting to, and strengthening community resources by leveraging the expertise and capability of individuals, communities, the private and nonprofit sectors, faith-based organizations, and all levels of government. Ultimately, a jurisdiction may find that it must fill gaps in order to build and sustain capabilities. A jurisdiction can utilize resources such as bond initiatives and local and state appropriations as well as Federal grants, as appropriate, to support building and sustaining capabilities.

THIRA-informed planning is consistent with and expands on nationally accepted emergency management standards, which have long required using risk assessments, such as HIRAs, as the basis for planning across the mission areas. A continuous cycle of assessing capabilities, plans, and programs and incorporating the results into future THIRAs allows a jurisdiction to manage changes to its risk landscape. It also provides the means to educate and update individuals, families, businesses, organizations, community leaders, and senior officials on the risks facing a community. An informed public is the best advocate for building required capabilities and creating a secure and resilient community.

Basic Elements of the THIRA Process

The THIRA process consists of five basic steps:

1. **Identify the Threats and Hazards of Concern.** Based on past experience, forecasting, expert judgment, and available resources, identify a list of the threats and hazards of concern to the community.
2. **Give Threats and Hazards Context.** Using the list of threats and hazards, develop context that shows how those threats and hazards may affect the community.
3. **Examine the Core Capabilities Using the Threats and Hazards.** Using the threat and hazard context, identify impacts to the community through the lens of the core capabilities described in the Goal.
4. **Set Capability Targets.** Looking across the estimated impacts to the community, in the context of each core capability and coupled with a jurisdiction's desired outcomes, set capability targets.
5. **Apply the Results.** Plan for the ability to deliver the targeted level of capability with either community assets or through mutual aid, identify mitigation opportunities, and drive preparedness activities.

Step Two: Give Threats and Hazards Context

Inherent to this step is an understanding of the likelihood or probability of a threat or hazard affecting a community. This understanding of likelihood can be determined through a variety of means, including expert judgment or advanced statistical analysis.

These five steps (see Figure 1) are adaptable to the needs and resources of any jurisdiction. The THIRA process can be employed by a small, one-person department as well as a larger organization with greater needs and resources.



Figure 1: The Five-Step THIRA Process

The core capabilities identified in the Goal are used throughout the THIRA process (see Table 1). They provide a common language for preparedness across the whole community and stretch across the five integrated mission areas of Prevention, Protection, Mitigation, Response, and Recovery.

Table 1: Core Capabilities by Mission Area¹

Prevention	Protection	Mitigation	Response	Recovery
Planning				
Public Information and Warning				
Operational Coordination				
Forensics and Attribution Intelligence and Information Sharing Interdiction and Disruption Screening, Search, and Detection	Access Control and Identity Verification Cybersecurity Intelligence and Information Sharing Interdiction and Disruption Physical Protective Measures Risk Management for Protection Programs and Activities Screening, Search, and Detection Supply Chain Integrity and Security	Community Resilience Long-term Vulnerability Reduction Risk and Disaster Resilience Assessment Threats and Hazard Identification	Critical Transportation Environmental Response/ Health and Safety Fatality Management Services Infrastructure Systems Mass Care Services Mass Search and Rescue Operations On-scene Security and Protection Operational Communications Public and Private Services and Resources Public Health and Medical Services Situational Assessment	Economic Recovery Health and Social Services Housing Infrastructure Systems Natural and Cultural Resources

¹ Planning, Public Information and Warning, and Operational Coordination are core capabilities common to all mission areas.

Step 1: Identify the Threats and Hazards of Concern

Communities face a variety of threats and hazards that can be the result of natural, technological, or human-caused incidents. Table 2 provides examples of the types of threats and hazards.

- Natural hazards are those resulting from acts of nature, such as hurricanes, earthquakes, or tornadoes and disease outbreaks or epidemics.
- Technological hazards are those resulting from accidents or the failures of systems and structures, such as hazardous materials spills or dam failures.
- Threats or human-caused incidents are those resulting from the intentional actions of an adversary, such as a threatened or actual chemical or biological attack or cyber event.

The focus in this step is on deciding what should or should not be on the list. For example, a coastal jurisdiction in Oregon might include a tsunami while an inland jurisdiction that would not be directly impacted may not.

Table 2: Types of Threats/Hazards and Examples

Natural	Technological	Human-caused
Resulting from acts of nature	Involves accidents or the failures of systems and structures	Caused by the intentional actions of an adversary
<ul style="list-style-type: none"> ▪ Avalanche ▪ Disease outbreak ▪ Drought ▪ Earthquake ▪ Epidemic ▪ Flood ▪ Hurricane ▪ Landslide ▪ Tornado ▪ Tsunami ▪ Volcanic eruption ▪ Wildfire ▪ Winter storm 	<ul style="list-style-type: none"> ▪ Airplane crash ▪ Dam/levee failure ▪ Hazardous materials release ▪ Power failure ▪ Radiological release ▪ Train derailment ▪ Urban conflagration 	<ul style="list-style-type: none"> ▪ Civil disturbance ▪ Cyber incidents ▪ Sabotage ▪ School violence ▪ Terrorist acts

Jurisdictions should consider threats and hazards that occur in a neighboring community since they may have widespread impacts. For example, an industrial accident at a chemical plant in one community could impact communities downwind of where the accident occurred.

To begin, existing HIRAs, threat assessments, and homeland security strategies can be used to capture initial threats and hazards. Along with these resources, jurisdictions should use online data sources and local subject matter experts to understand potential threats and hazards. It is important to note that recent history or official records may not always be the best indicator of the presence or severity of a threat or hazard. Many severe natural hazards, such as damaging

earthquakes, occur with such low frequency that relying on records alone may give a false sense of security. Additionally, the potential severity of a frequently occurring hazard where expectations are based on annual averages, such as flooding, may also be misleading and should be carefully considered.

Online Data Resources

- U.S. Geological Survey (USGS)
- National Oceanic and Atmospheric Administration (NOAA)
- Census Bureau
- FEMA Disasters and Maps
- Full-Spectrum Risk Knowledgebase
- Lessons Learned Information System (LLIS)
- Nuclear Regulatory Commission (NRC)
- National Counterterrorism Center (NCTC)
- National Institutes of Standards and Technology (NIST)
- Environmental Protection Agency (EPA)

Other Sources of Data and Information

- Existing Risk Assessments
- Urban Areas Security Initiative Programs
- Emergency Management/Homeland Security Agencies
- Local and State Hazard Mitigation Offices
- Local National Weather Services
- Tribal Governments
- FEMA Regional Offices
- Local Fire, Police, and Health Departments
- Major Urban Area and State Fusion Centers
- Infrastructure Owners and Operators
- DHS Protective Security Advisors
- Colleges and Universities

Step 2: Give the Threats and Hazards Context

Once a list of threats and hazards is developed, it is important to put them in context for the community. For each threat and hazard on the list, explain briefly the different conditions under which a threat or hazard might occur that are of greatest concern to the jurisdiction. A jurisdiction can use its own expert judgment or advanced analysis of probability and statistics to inform the descriptions of the different threat and hazard conditions. This context will help identify capability targets later in the process. This step should consider the when and where for each threat or hazard:

- When might a threat or hazard occur? What time of day? What season?
- Where might the threat or hazard occur? Populated areas? Coastal zones? Industrial or residential areas?

As descriptions of the expected situation are developed, more than one may be needed if varying conditions such as time of day, season, or the impact area make a significant difference in how a threat or hazard affects the community. If a jurisdiction is hurricane prone, it will need multiple descriptions to reflect different conditions such as differing storm intensities, where it makes landfall, season, and time of landfall. Is it day or night? Does it make landfall during peak tourist season? In addition to time, location, and other community factors, the jurisdiction should recognize that past experience with threats and hazards may not be indicative of the future threat and hazard environment. Many other factors are subject to change including demographics, climate, and the built environment, and those changes should also be considered when developing the threat and hazard descriptions. The descriptions drive discussion or modeling that approximates impacts. Table 3 provides example descriptions.

Table 3: Example Descriptions

Threat/Hazard Group	Threat/Hazard Type
Natural	Tornado
Description 1: An F3 tornado strikes the business district on a Saturday afternoon in spring	
Natural	Hurricane
Description 1: A Category 3 hurricane makes landfall near a highly developed residential coastal area during the peak tourist season on an early September morning	
Technological	Dam Failure
Description 1: A major power-generating dam has a catastrophic failure resulting in the downstream flooding of three towns	
Description 2: A small earthen dam that retains a recreational lake that feeds a community's water supply fails, resulting in downstream flooding and a loss of potable water for an extended period	
Human-caused	Chemical Attack
Description 1: An unknown terrorist group delivers a chemical nerve agent attack at a large public gathering during the summer	

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Step 3: Examine the Core Capabilities Using the Threats and Hazards

Using the descriptions developed in Step 2, the jurisdiction will next need to assess how each threat and hazard may impact the community. The assessment of impacts is completed by using the core capabilities. The impacts are then paired with the jurisdiction's desired outcomes. The impacts, with core capabilities and desired outcomes, allow jurisdictions to gain an understanding of what is needed to manage risk.

Working with community leaders, the jurisdiction should establish desired outcomes. The desired outcomes should explain what the jurisdiction wants to achieve for each core capability. These outcomes should be informed by the Goal and should be developed with the whole community. In developing well-defined outcomes, it is important to consider timelines for achieving these desired outcomes. For example, in the Response and Recovery mission areas, desired outcomes for these core capabilities can be bounded by time (e.g., must be accomplished within 72 hours, 60 days, six months, one year). Desired outcomes for the Prevention, Protection, and Mitigation mission areas may be better presented in terms of percentages (e.g., 100%, 75%, or 50%). Examples of desired outcomes are shown in Table 4.

Table 4: Example Desired Outcomes

Core Capability	Desired Outcome
Screening, Search, and Detection	Screen 100% of targeted cargo, conveyances, mail, baggage, and people associated with an imminent terrorist threat or act using technical, non-technical, intrusive, or non-intrusive means
Access Control and Identity Verification	Ensure 100% verification of identity to authorize, grant, or deny physical and cyber access to specific locations, information, and networks
Long-term Vulnerability Reduction	Achieve a measurable decrease in the long-term vulnerability of critical infrastructure and systems
Fatality Management Services	During the first 72 hours of an incident, conduct operations to recover fatalities
Infrastructure Systems	Within 15 days of an incident, restore and sustain essential services (public and private) to maintain community functionality

Given the wide variety of threats and hazards that may affect a community, jurisdictions can leverage a range of skills to estimate the impacts of those threats and hazards. They can apply their own expert judgment supplemented by subject matter expertise as necessary or advanced modeling to estimate impacts in the context of each core capability. Those impacts should, at a minimum, span the core capabilities described in the Goal. Displaced households, fatalities, injuries/illnesses, direct economic impacts to the jurisdiction, indirect economic impacts from supply chain system disruption, and disruption to infrastructure are some, but not all, of the impacts that should be considered. As the impacts of a threat or hazard affect more than the public sector, the jurisdiction should work with their whole community partners, including the private and nonprofit sectors and faith-based organizations, to gain a full understanding of all of

the impacts to the community. A helpful way of displaying estimated impacts is through the use of a table as shown in Table 5. (This table is for illustration only and does not reflect all 31 core capabilities.)

Table 5: Example Estimated Impacts for Core Capabilities

	Prevention	Protection	Mitigation	Response		Recovery	
	Screening, Search, and Detection	Access Control and Identity Verification	Long-term Vulnerability Reduction	Fatality Management Services	Public Health and Medical Services	Infrastructure Systems	Economic Recovery
IED Attack: A lone actor deploys an improvised explosive device (IED) in an indoor concourse of a stadium during a sporting event	67,500 spectators 2,500 vendors and employees	2,500 vendors and employees	Reinforce 500 concrete support columns in stadium concourse	52 fatalities	350 casualties	N/A	\$14 million of direct economic loss (ticket sales, hotel stays, parking, food, and souvenirs)
Accidental Chemical Material Release: A nighttime accident in the rail yard results in the release of a toxic inhalation hazard (TIH) in a densely populated residential area	N/A	350 rail yard employees and first responders	Reroute 100% of rail carrying TIH around densely populated areas	4 fatalities	75 casualties	Damage and contamination to 3 lines at the rail yard	\$11 million of direct economic loss (loss of the chemical, physical damage to train, damage to rail yard)
Earthquake: A magnitude 7.2 earthquake centered near an urban area occurs during mid-afternoon in March	N/A	N/A	Undertake seismic retrofit measures at all public stadiums	375 fatalities	8,400 casualties	350,000 customers without power	\$8.4 billion of direct economic loss

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Step 4: Set Capability Targets

Once the desired outcomes have been defined and threat and hazard impacts estimated for each core capability, the next step is to set capability targets. The greatest impact, coupled with desired outcomes, sets the target for each capability. For example, if the highest impact is 375 fatalities and the jurisdiction's desired outcome for the Fatality Management Services core capability is to search for and recover all fatalities within 72 hours, the capability target becomes: *During the first 72 hours of an incident, conduct operations to search for and recover 375 fatalities.*

Using the impacts table from Step 3, combine the cells with the highest impact with desired outcomes to develop capability targets as illustrated in Table 6.

Table 6: Setting Capability Targets

Core Capability	Desired Outcome
Screening, Search, and Detection	Screen 100% of targeted cargo, conveyances, mail, baggage, and people associated with an imminent terrorist threat or act using technical, non-technical, intrusive, or non-intrusive means
Capability Target: <i>Screen 67,500 people</i> associated with an imminent terrorist threat or act using technical, non-technical, intrusive, or non-intrusive means	
Access Control and Identity Verification	Ensure 100% verification of identity to authorize, grant, or deny physical and cyber access to specific locations, information, and networks
Capability Target: <i>Verify 2,500 identities</i> to authorize, grant, or deny physical and cyber access	
Long-term Vulnerability Reduction	Achieve a measurable decrease in the long-term vulnerability of critical infrastructure and systems
Capability Target: Achieve a measurable decrease in the long-term vulnerability by <i>rerouting 100% of rail containing toxic inhalation chemicals around densely populated areas</i>	
Fatality Management Services	During the first 72 hours of an incident, conduct operations to recover fatalities
Capability Target: During the first 72 hours of an incident, conduct operations to <i>recover 375 fatalities</i>	
Infrastructure Systems	Within 15 days of an incident, restore and sustain essential services (public and private) to maintain community functionality
Capability Target: Within 15 days of an incident, <i>restore power to 350,000 customers</i>	

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Step 5: Apply the Results

The final step involves applying THIRA results to manage risk, including identification of mitigation opportunities and supporting preparedness activities. Using capability targets, a jurisdiction determines the required resources it needs to achieve its desired outcomes. A jurisdiction may find it simply needs to sustain existing capabilities, or it may identify a resource shortfall or capability gap. Several options may also be available to build capabilities or fill gaps, including working with non-traditional partners such as faith-based organizations, retail partners, and others.

If existing capabilities and capacities need to be supplemented to reach a capability target, jurisdictions can build capability or fill gaps by establishing mutual aid agreements with surrounding jurisdictions. It is possible that jurisdictions may require the resources of other levels of government to achieve a target and will need to collaborate closely with those external sources to secure the necessary resources. Cities, counties, states, and regions should work collaboratively to build, sustain, or deliver capabilities to the identified targets. For example, if states require national resources to reach a capability target, they should collaborate with Federal Emergency Management Agency (FEMA) Regional Offices and other Federal agencies. Finally, a jurisdiction may choose to build and sustain capabilities through the use of available grants or other funding and technical assistance. Regardless of how a jurisdiction chooses to address capabilities, the THIRA provides a framework to allow the jurisdiction to establish capability targets and monitor its progress towards building, sustaining, and delivering capabilities and managing the risks it faces.

A jurisdiction can use THIRA results to make informed decisions about how to allocate limited resources. A jurisdiction's capability targets, along with an understanding of the required resources to achieve them and the desired outcomes will allow a jurisdiction to determine how limited resources can best be invested to build and sustain capabilities. These results can also be used to brief community leaders, senior officials, and the public on resource requirements.

The THIRA results inform mitigation planning and projects and larger community planning efforts. It identifies areas where mitigation plans, projects, and insurance can be employed to reduce the loss of life and damage to property, which, if implemented, reduce the capability targets needed to achieve desired outcomes. For example, implementing seismic retrofit measures at electric utilities can help to ensure utility resiliency, which in turn ensures key emergency services such as hospitals remain available. Response capability targets can be reduced by promoting the development of safe rooms, which serve to improve the safety of individuals and the resilience of communities and lessen the need for response resources. Using THIRA results to inform mitigation planning and projects aligns with the traditional mitigation planning process of identifying hazards, assessing losses to the community, and setting mitigation priorities and goals for the community.

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Conclusion

Understanding the risks faced by communities and the Nation as a whole and how this information can be used to build and sustain preparedness is an essential component of the National Preparedness System. This THIRA guidance provides a common and consistent approach for identifying and assessing risks and their associated impacts. It expands on existing state, territorial, tribal, and local hazard identification and risk assessment processes. The THIRA is complemented by a Strategic National Risk Assessment (SNRA) that analyzes the greatest risks to the Nation, and contributes to a shared understanding of the full range of risks, including long-term trends that face our Nation. THIRAs and the SNRA, along with specialized risk assessments, provide an integrated national risk picture, which in turn helps to achieve the goal of “a secure and resilient Nation with the capabilities required across the whole community to prevent, protect against, mitigate, respond to, and recover from the threats and hazards that pose the greatest risk.”² Producing that integrated risk picture and achieving the Goal requires participation by the whole community. Consistent conduct and application of THIRAs provides an important tool for integrating whole community contributions toward achieving the Goal, and to educate individuals, families, businesses, organizations, community leaders, and senior officials on the risks they face and on their roles in and contributions to prevention, protection, mitigation, response, and recovery.

² National Preparedness Goal, Department of Homeland Security. September 2011.

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