



BEST PRACTICE

Mass Evacuation Reception Planning: Resource Management Issues after a Nuclear Incident

PURPOSE

This Best Practice provides planners with an overview of resource management issues that are likely to be encountered by jurisdictions adjacent to a nuclear incident in an urban area.

SUMMARY

A nuclear incident in an urban area would likely cause a spontaneous mass evacuation from the incident area and its surrounding areas. Jurisdictions adjacent to the nuclear incident would become critical evacuation routes or destinations for the urban area's residents. As a result, receiving jurisdictions could experience a significant population surge after a nuclear incident in an urban area. This surge could quickly deplete the critical assets and resources of the receiving jurisdictions and overwhelm local emergency personnel before significant Federal and State assistance could arrive.

About This Best Practice Document

This Best Practice document provides planners with an understanding of resource management issues that jurisdictions adjacent to a nuclear incident area would likely experience after such an event. This Best Practice consists of the following sections:

- About This Best Practice Document
- Local Resources and Expertise in a Nuclear Incident
- Depletion of Critical and Scarce Resources
- Pre-incident Planning Activities
- Medical Facilities Surge Capacity
- Emergency Personnel Surge Capacity

The White House's [The Federal Response to Hurricane Katrina - Lessons Learned](#) found that the disruption caused by Hurricane Katrina throughout the Gulf Coast region hindered the ability of jurisdictions to activate many mutual aid agreements. Federal and State agencies responded by deploying critical assets and resources after the hurricane.

This document is part of the Mass Evacuation Reception Planning Best Practice series.

Local Resources and Expertise in a Nuclear Incident

Emergency response organizations typically maintain sufficient assets and resources to manage local incidents effectively and efficiently. Resource planning usually focuses on managing the needs of local residents and a limited number of potential incoming evacuees.

Few jurisdictions have the resources and expertise needed to manage a catastrophic incident. The [National Response Framework](#) (NRF) Base Plan defines a catastrophic incident as "...any natural or manmade incident, including terrorism, that results in extraordinary levels of mass casualties, damage, or disruption severely affecting the population,

infrastructure, environment, economy, national morale, and/or government functions.” Such an incident will exceed the resources normally available to State, tribal, local, and private sector authorities, and will require the deployment of Federal assets. Nevertheless, experts anticipate that jurisdictions adjacent to a nuclear incident area will have to rely mainly on local resources and expertise after a nuclear incident, perhaps for days.

Specialized Resources in Rural and Frontier Communities

Several studies found that most rural and frontier communities lack assets and resources needed to manage a population surge after a catastrophic incident in an adjacent urban area, including:

- The U.S. Department of Health and Human Services (HHS), Health Resources and Services Administration, Office of Rural Health Policy’s [Rural Communities and Emergency Preparedness](#) states that many rural communities lack access to hazardous materials personnel and assets.
- The University of Chicago, National Opinion Research Center, Walsh Center for Rural Health Analysis’ [Urban-to-Rural Evacuation: Planning for Population Surge](#) concludes that many rural jurisdictions have not planned for population surge from neighboring urban areas. As a result, infrastructure and capacities in these rural jurisdictions may quickly become overwhelmed during a large-scale influx of evacuees.

Depletion of Critical and Scarce Resources

Jurisdictions adjacent to a nuclear incident area will likely experience the depletion of critical resources, personnel, and assets after a nuclear incident.

- **Critical resources:** Jurisdictions adjacent to an urban area should expect significant shortages of water, food, medical supplies, and other resources following a nuclear incident. The large number of evacuees entering these jurisdictions would likely deplete local supplies before Federal and/or state agencies could deploy additional resources and support assets.

Many retailers rely on daily deliveries of goods and materials; they are unlikely to have a large stock of critical supplies at the time of an event. The deployment of resources to jurisdictions adjacent to a nuclear incident area will likely be extremely challenging, if not impossible.

- **Personnel and assets:** Jurisdictions adjacent to an urban area would likely lack sufficient personnel to perform vital emergency response functions after a nuclear incident. This includes, among others, personnel with unique, specialized radiation knowledge and training, and assets. The Council of State and Territorial Epidemiologists’ [The Status of State-level Radiation Emergency Preparedness and Response Capabilities, 2010](#) survey report found that many states lack a sizable cadre of radiation emergency personnel and are poorly prepared to respond to a major radiation emergency. Further, 81 percent of the

The State of Missouri Emergency Management Agency’s [Missouri Hazard Analysis: Annex O. Attack \(Nuclear, Conventional, Chemical, and Biological\)](#) states that secondary effects of a nuclear, chemical, or biological attack would include lack of adequate shelter, food, water, health and medical facilities personnel, and mortuary services.

The [Public Health Preparedness for Chemical, Biological, Radiological, and Nuclear Weapons](#) report states that following Hurricane Katrina approximately 68,000 hurricane victims evacuated to Houston, Texas, in a short period of time. The high number of evacuees who arrived at the Houston’s Astrodome triage center overwhelmed triage personnel.

available personnel “are public health agency employees working in other areas who would be assigned or redirected to response activities.”

Pre-incident Planning Activities

Pre-incident planning is essential to help jurisdictions prepare for a nuclear incident in an adjacent urban area. The following assumptions can help prepare emergency management and response agencies to manage available resources after a nuclear incident.

- **Develop a regional resource management strategy:** A regional resource management strategy and a common operating framework are essential to help emergency managers and responders coordinate regional efforts following a nuclear incident. The U.S. Department of Transportation, Research and Innovative Technology Administration’s [Hazardous Materials Emergency Preparedness Grants Program: Assessment of the Alignment Between Local Activities and Program Goals](#) states: “Regional strategies can help communities exploit economies of scale by pooling their limited resources.”

The All Hazards Consortium’s [Mid-Atlantic Region Catastrophic-Event Preparedness Workshop Report](#) includes recommendations that can help emergency managers develop a regional resource management strategy, ensure a coordinated regional preparedness approach, and support regional resource savings. Specifically, planners in jurisdictions adjacent to an urban area should:

- Develop and share regionally interoperable logistics and distribution plans. This effort should include establishing regional transportation and distribution protocols for resources, commodities, and donations.
- Establish partnerships with regional and local private sector organizations to identify resources and personnel that may be available after a disaster. This effort should include identifying and collaborating with private sector partners with specific expertise in just-in-time distribution.
- Share and jointly evaluate essential information regarding locations of critical facilities such as medical care facilities and shelters.
- Share information on memoranda of understanding and availability of critical resources such as fuel supplies within the region.

The Metropolitan Washington Council of Governments’ (MWCOG) [Regional Emergency Coordination Plan for the Metropolitan Washington, D.C., Council of Governments](#) is designed to strengthen regional communication and coordination among jurisdictions in the National Capital Region. This plan addresses natural and human-induced hazards, including terrorism.

- **Expand resource inventories to incorporate event-specific resources:** Many jurisdictions routinely inventory resources that would be employed during incident response operations. However, these inventories might not include the critical resources needed to manage a significant population surge after a nuclear incident in an adjacent urban area. Planners should consider including resources that may be necessary to manage this scenario into all the appropriate existing inventories. These resources can include, among others, adequate radiation monitoring instruments and mass decontamination assets.

Many governmental, private sector, and non-profit organizations may possess critical equipment and employ personnel capable of operating them. Inventorying these assets and personnel prior to an event can help ensure that these assets are deployed rapidly and effectively.

- **Plan to rely on local resources:** Experts anticipate that Federal and State assistance will likely be largely directed towards the incident area immediately after a nuclear incident. As a result, jurisdictions adjacent to a nuclear incident area may receive very limited assistance for an extended period of time.

Resource prioritization will be critical after a nuclear incident in an adjacent jurisdiction. As a result, emergency management and response organizations must consider, as a priority, establishing resource management procedures tailored to this scenario. These specific guidelines are critical to help responders prioritize and employ local resources to maximize the number of lives saved after a nuclear incident in an adjacent urban area. Guidelines that can help planners prioritize critical scarce resource after a nuclear incident in an adjacent urban area include, but are not limited to:

- The HHS [Radiation Emergency Medical Management](#) website includes information and guidance on hospital procedures, surge capacity, preparation and plans, triage, and hospital incident command system.
- The International Association of Fire Chiefs' [Terrorism Response: A Checklist and Guide for Fire Chiefs and Community Preparedness Leaders](#) is designed to help fire chiefs and other community preparedness leaders assess local assets and resources. This document also describes how best to utilize these resources and how to fill identified gaps.
- The State of Alaska Department of Military and Veteran Affairs' [Alaska Emergency Response Guide for Small Communities](#) includes resource management guidelines that can help agencies plan for the first 72 hours following a nuclear incident in an adjacent jurisdiction.
- The University of Washington, Northwest Center for Public Health Practice's [Emergency Distribution of Pharmaceuticals](#) discusses the logistics of providing medications to a large population. This module can help public health workers, volunteer health care providers, and other personnel manage mass dispensing of pharmaceuticals after a nuclear incident in an adjacent urban area.

Following the March 11, 2011, Great East Japan Earthquake, the Ministry of Defense of Japan mobilized and deployed approximately 107,000 Self-Defense Forces personnel, 540 aircraft, and 60 ships. These personnel provided assets and capabilities that impacted localities lacked at the time of this event.

The Ventura County, CA, Department of Public Health's [Ventura County, California, Nuclear Explosion Response Plan Version 3.0](#) notes that the military will likely participate in response operations following a nuclear detonation by a terrorist organization. Military bases have extensive resources that "need to be catalogued, requested and utilized" after a nuclear incident.

Studies found that after Hurricane Katrina many receiving jurisdictions encountered difficulties managing the influx of evacuees. On August 31, 2005, Texas began accepting evacuees. On September 3, Texas state officials reported that 100,000 Louisiana residents were housed in hotels and motels, and 123,000 additional evacuees were in 97 shelters throughout the state. The large number of evacuees quickly depleted local resources.

- **Tailor existing standard operating procedures to the specific nuclear scenario:** Many of the procedures and practices that responders commonly employ during responses to large-scale incidents would likely be ineffective or unfeasible after a nuclear detonation. For example:

- Damage to the regional critical infrastructure systems could compromise communications and the delivery of essential services such as power.
- Emergency personnel could be unable to collect and share critical information immediately after a nuclear event.
- Emergency personnel in receiving jurisdictions could be confronted with mass confusion, anxiety, and panic among evacuees and residents.
- Many evacuees entering an adjacent jurisdiction could bypass field triage stations and/or treatment areas, whether they are contaminated or not.
- Some personnel may be reluctant or unwilling to perform essential tasks for fear of exposure and/or contamination.

For additional information on the unique issues and challenges that emergency responders will likely face after a nuclear incident in an adjacent urban area, please also refer to the *Lessons Learned Information Sharing Best Practice, [Mass Evacuation Reception Planning: Overview of Planning Issues after a Nuclear Incident](#)*.

Planners in jurisdictions adjacent to a nuclear incident area should consider tailoring existing standard operating procedures to a nuclear incident scenario. Developing specific personnel and resource allocation guidelines for a nuclear detonation in an urban area can help ensure that emergency response agencies in adjacent jurisdictions do not exhaust critical assets at the beginning of response operations.

Response Priorities for Adjacent Jurisdictions

The [Ventura County, California, Nuclear Explosion Response Plan Version 3.0](#) addresses immediate, time-sensitive emergency response priorities and responsibilities following a nuclear detonation in an adjacent urban area. This list includes immediate response priorities for the Unified Command, Operations Section, Planning and Intelligence Section, Logistics Section, and Finance and Administration Section. In addition, the plan lists immediate response priorities for the American Red Cross, fire department and HazMat units, gasoline stations, grocery store and chain managers, hospitals, medical examiner, the National Weather Service, pharmacies, police department, public health and emergency medical services, public information officer, state highway patrol, and water purveyors.

Medical Facilities Surge Capacity

Many hospitals and trauma centers in urban areas are located in the downtown areas, in close proximity to potential terrorist targets. The [Vulnerability of Populations and the Urban Health Care Systems to Nuclear Weapon Attack – Examples from Four American Cities](#) study found that the main healthcare facilities in New York, Chicago, Washington, D.C., and Atlanta “...are likely to be in the fatality plume, rendering them essentially inoperable in a crisis.” Emergency response and medical personnel will likely transport victims to hospitals located in jurisdictions adjacent to the nuclear incident area. However, most jurisdictions adjacent to urban areas lack sufficient resources such as burn beds and medical personnel with specialized radiation knowledge to effectively assist all the potential injured, exposed, and/or contaminated victims.

Medical and emergency response personnel in jurisdictions adjacent to a nuclear incident area will likely be unable to identify a sufficient number of hospital beds to assist all the victims after a nuclear incident. The National Academies of Science's [Assessing Medical Preparedness to Respond to a Terrorist Nuclear Event: Workshop Report](#) estimates the number of available hospital beds in and around several cities within 4, 24, and 48 hours of a nuclear incident. The report notes that medical personnel would have to empty half of the medical facilities located within a 300-mile radius of ground zero in less than 48 hours to secure sufficient beds to accommodate all the potential victims.

The HHS, AHRQ's [Hospital Surge Model](#) can help planners estimate the hospital resources needed to treat casualties resulting from a nuclear, biological, chemical, foodborne, radiological, or conventional attack. This web-based tool provides estimates of hospital personnel, equipment, and supplies required to treat casualties after any of these incidents. In addition, planners can use the [Mass Evacuation Transportation Model](#) to estimate evacuation and transportation time for patients and other populations.

Emergency Personnel Surge Capacity

Jurisdictions may not have sufficient personnel to manage the consequences of a nuclear incident in an adjacent urban area. Planners should be aware that emergency response personnel can be very quickly overwhelmed following an event of this magnitude.

Emergency management and response agencies should identify personnel that can help perform such critical activities as population monitoring, mass care and triage, and traffic and crowd control during response operations. These personnel should receive appropriate training prior to an event and/or just-in-time-training.

Medical Management Personnel and Activities

After a nuclear incident, the needs of tens of thousands of victims will likely overwhelm the resources of any region's healthcare system. HHS AHRQ's [Mass Medical Care with Scarce Resources: the Essentials](#) states that the arrival of additional Federal and State medical resources would likely be delayed or hindered after a nuclear event. As a result, emergency response and medical personnel may have to allocate "scarce resources in ways that are different from normal circumstances but are appropriate for the situation." The HHS AHRQ guide also provides jurisdictions with information on planning for scarce resource allocation after a mass casualty event, including a nuclear device explosion.

The [Prompt and Utter Destruction: The Nagasaki Disaster and The Initial Medical Relief](#) study found that the 1945 nuclear explosions in Hiroshima and Nagasaki instantaneously destroyed all the main medical facilities within the cities. Surviving doctors, and medical staff and students provided assistance to victims in the disaster areas. For example, Nagasaki Medical College students and medical staff assisted victims immediately after the detonation. The college was situated approximately half a mile from the blast site and had reported significant structural damage. Yet, victims continued to self-deploy at this center seeking medical assistance soon after the nuclear incident.

The HHS, Centers for Disease Control and Prevention, Radiation Studies Branch developed resources that emergency managers, medical personnel, responders, and receivers can employ after a nuclear incident in an adjacent urban area. These resources are available [here](#).

The National Academies of Science's [Assessing Medical Preparedness to Respond to a Terrorist Nuclear Event: Workshop Report](#) notes that after a nuclear event any regional pre-planned medical response would be unable to cope with medical needs. Spontaneous individual responses from local medically trained and untrained personnel would be likely. These personnel would augment the initial emergency medical response.

Planners should consider identifying healthcare professional groups that routinely do not perform emergency medicine, but could support primary healthcare providers after a nuclear incident in an adjacent jurisdiction. These groups should include personnel that would require limited healthcare training to perform specific emergency medical functions. The Director of the University of Georgia's Institute for Health Management and Mass Destruction Defense noted that these groups can include providers such as pharmacists, dentists, and veterinarians. These personnel could increase local healthcare capacity, especially mass casualty burn care, because they have taken many of the same medical courses as do physicians and nurses.

The [Radiation Injury Treatment Network \(RITN\)](#) includes 57 bone marrow transplant centers, donor management centers, and umbilical cord blood banks that jointly prepare for the response to a mass casualty marrow toxic incident, including the detonation of an improvised nuclear device. RITN can provide training for physicians and other health care workers, assistance during an emergency, coordination with U.S. medical facilities, and emergency communications support.

Law Enforcement Personnel and Activities

Many local law enforcement agencies may not have a sufficient number of law enforcement officers to perform all necessary traffic and/or crowd control activities after a nuclear event in an adjacent urban area. The All Hazards Consortium's [Mid-Atlantic Region Catastrophic-Event Preparedness Workshop Report](#) recommends that planners prioritize "personnel who will be essential to the dual, potentially conflicting responsibilities of protecting infrastructure and conducting an evacuation." The [Rural Preparedness Planning Guide: Planning for Population Surge Following Urban Disasters](#) also recommends that jurisdictions develop plans to increase law enforcement personnel to manage the consequences of a population surge into a jurisdiction. In particular, law enforcement planners might want to consider that:

- Banks, schools, and other venues have security personnel that could support specific law enforcement operations; and
- Some community emergency response team personnel could assist during traffic and/or crowd control operations.

Protecting grocery stores and other key supply centers from looting could become a priority following a nuclear incident in an adjacent urban area. Food and water suppliers may be unable to deliver these resources immediately after a nuclear event. As a result, planners should work with local law enforcement agencies and suppliers to develop disaster plans specific for this nuclear scenario. These plans should include procedures for securing and distributing supplies.

Readers can also refer to the *Lessons Learned Information Sharing* Learned [Emergency Operations Center Management: Assigning Logistics Section Staff Members to Maintain Situational Awareness of Resources](#) for additional information on identifying and assigning personnel to maintain situational awareness of potential shortages, looting, and hoarding during response to a nuclear incident in an adjacent jurisdiction.

Mental Health Personnel and Activities

The management of evacuees' psychological and behavioral response will be critical after a nuclear detonation in an adjacent urban area. A nuclear detonation will likely have a significant and widespread social, psychological, and behavioral impact. The Executive Office of the President, Office of Science and Technology Policy's [Planning Guidance for Response to a Nuclear Detonation](#) states that "among key issues are the mental health impacts on the

general public, potential effects on emergency responders and other caregivers, and broader impacts on communities and society.”

A large number of people could experience stress-related symptoms and exhibit behavioral responses disproportionate to radiation-induced health effects after a nuclear event. A 2011 survey of the Japanese Ministry of Health, Labor, and Welfare found that approximately 40 percent of the Ishinomaki city residents in the Miyagi Prefecture displayed sleep disorder symptoms following the March 11, 2011, earthquake, tsunami, and nuclear accident. Further, 7 percent of the responders experienced anxiety and depression, and 20 percent consumed more alcohol than before the disaster.

The *Lessons Learned Information Sharing* Lesson Learned [Radiological Incident Response: Post-Release Psychological Management](#) describes the 1987 Cesium-137 release that occurred in downtown Goiânia, Brazil. This release had an immediate and profound psychological impact on the population, the victims, and emergency response personnel.

Many evacuees may demand that responders conduct extensive, unnecessary monitoring and decontamination. The Columbia University Mailman School of Public Health’s [Regional Health and Public Health Preparedness for Nuclear Terrorism: Optimizing Survival in a Low Probability/High Consequence Disaster](#) and the Lawrence Livermore National Laboratory’s [Planning and Response to the Detonation of an Improvised Nuclear Device: Past, Present, and Future Research](#) observe that the public’s reaction to a nuclear detonation could be significantly different than expected. Many people could experience post-traumatic stress disorder, radiation stigma, Informed Radioactive Contamination Syndrome, or “radiation panic” following a nuclear detonation. Further, many people could request to be decontaminated and could exhibit symptoms mimicking radiation exposure.

Several resources can help jurisdictions adjacent to urban areas plan for the behavioral and psychological consequences of a nuclear event, including:

- The Tarrant County, Texas, Advanced Practice Center’s [PsychoSocial/Behavioral Response to Radiological and Nuclear Disasters](#) includes training resources that response personnel can use to identify and manage the psychosocial consequences of a nuclear disaster.
- The [Social, Psychological, and Behavioral Responses to a Nuclear Detonation in a U.S. City: Implications for Health Care Planning and Delivery](#) lists strategies for preventing, reducing, and addressing the negative social, psychological, and behavioral consequences of a nuclear incident.

Early psychological intervention could help manage the potential psychological effects of a nuclear detonation and facilitate emergency response activities. Planners should identify personnel that could provide psychological first aid at the onset of emergency response. Further, experts recommend that emergency management and response agencies educate responders, receivers, and other personnel on the potential psychological effects of a nuclear detonation.

Population Monitoring Activities and Personnel

Many evacuees could leave the nuclear incident area without undergoing screening or, if necessary, decontamination. Many victims also could by-pass reception and assessment centers located near the incident site in an effort to move away from the incident area. Evacuees could travel significant distances before reaching a reception center where they could be assessed and/or decontaminated.

Planners in jurisdictions adjacent to an urban area should consider developing mass decontamination guidelines or annexes tailored to this particular scenario. These guidelines should include procedures to ensure that reception, assessment, and decontamination personnel have sufficient radiation detection systems and training to screen incoming evacuees effectively and efficiently.

The Conference of Radiation Control Program Directors (CRCPD) recognizes attempting to screen all incoming evacuees could quickly deplete local resources. Jurisdictions will require locally trained and registered volunteer radiation professionals to assist with population monitoring activities after an event in an adjacent jurisdiction. These volunteers could include:

- Health physicists,
- Medical physicists,
- Nuclear medicine technologists,
- Radiation biologists,
- Radiation oncologists,
- Radiation protection technologists,
- Radiation safety officers,
- Radiologic technologists, and
- Radiologists.

The [Report on the National Association of County and City Health Officials/Centers for Disease Control and Prevention Workshop on Operating Public Shelters during a Radiation Emergency](#) lists functions specific to a radiation emergency that shelter personnel would need to perform following a radiological release event. The report also describes decontamination, monitoring, registration, and tracking procedures at and around shelters for victims, responders, receivers, pets, and service animals.

Volunteers could perform population monitoring at community reception centers, shelters, emergency operations centers, and hospitals. CRCPD's [A Plan for Incorporating Local Volunteer Radiation Professionals into Existing Health Volunteer Programs to Assist in Population Monitoring](#) describes and evaluates the Radiation Volunteer Development Program. The goals of this CRCPD program include developing a process for recruiting, managing and training volunteer radiation professionals; promoting a volunteer registry of radiation professionals within existing registries and/or programs; and developing a volunteer radiation professional deployment and utilization plan.

The CDC developed resources that can help emergency management and response agencies in receiving jurisdictions plan for population monitoring activities after a nuclear incident in an adjacent urban area. These resources include:

- [Screening People for External Contamination: How to Use Hand-held Radiation Survey Equipment](#). This video is designed for personnel assigned to conduct mass screening for radioactive material contamination following a large-scale incident. Trainers can use this video to provide pre-incident and/or just-in-time training.
- [Virtual Community Reception Center](#). This web-based training tool provides an overview of population monitoring processes conducted at community reception centers.

RESOURCES

Resources

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