High Consequence, Low Probability Incident: A Framework for Integrated CBRNE Planning

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May 2026

Author Note

Artificial intelligence tools (ChatGPT and Microsoft Copilot) were used solely to assist with formatting, structural organization, and editorial refinement in accordance with APA guidelines. These tools were not used to generate original research content or substantive analysis.
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All information presented in this article is unclassified and intended for public release. For additional information, please contact Elaine Lammert, Program Director, Homeland Security Continuing Education Program, College of Professional Studies, George Washington University, at enlamm@gwu.edu.

Introduction - From "Failure of Imagination" to "Failure to Believe" to "Failure of Preparation"

Following the September 11, 2001 terrorist attacks, the concept of a "failure of imagination" described institutional inability to anticipate unconventional threats (Congress, 2004). In subsequent years, substantial intelligence, analysis, and scenario development highlighted emerging risks; however, political, cultural, and bureaucratic barriers frequently prevented full acceptance or operationalization—a condition that may be characterized as a "failure to believe" (Congress, 2004). In the contemporary security environment, the prevailing danger is therefore better described as a failure of preparation rather than imagination or awareness (FEMA, 2016).

The Fédération Internationale de Football Association (FIFA) World Cup represents one of the largest recurring mass-gathering security challenges in the modern era. Its geographic dispersion, predictable crowd surges, symbolic political value, and global media saturation make it uniquely attractive to a wide spectrum of threat actors (CISA, 2026) (Fédération Internationale de Football Association, 2025). Using the FIFA World Cup as a case study, this paper examines realistic CBRNE (Chemical, Biological, Radiological, Nuclear, and Explosive) Weapons of Mass Destruction (WMD) analysis and fusion center integration as standing capabilities (FEMA, 2016)

Post-9/11 homeland security strategy significantly expanded recognition of CBRNE threats (FEMA, 2025). Despite this, repeated after-action reports and Government Accountability Office reviews indicate persistent gaps between awareness, belief, and operational readiness While threats are increasingly well understood, institutional reluctance to fully accept their plausibility has often delayed meaningful investment in preparedness (CISA, 2026).

A persistent challenge in U.S. homeland security is the gap between how threats are framed at the national level and how they are perceived and acted upon at the state and municipal levels This gap is structural, rooted in different incentive systems, political pressures, and operational realities. At the federal level, threats are framed strategically: adversary capability development, transnational linkages, emerging attack modalities, and cascading national consequences. At the local level, threat perception is shaped by immediacy and accountability: response times, staffing, crime rates, and public trust. This divergence creates a perception gap reinforced by an incentive gap: agencies are rarely rewarded for preventing events that never occur (Duffy, 2026). As a result, intelligence-led policing has not been uniformly institutionalized. Threat analysis becomes episodic, fusion centers are underutilized, and preparedness is abstract rather than operational (Greene J. , 2023).

Closing this gap, as covered in the curriculum of the George Washington University (GWU) CBRNE Credential Program, requires aligning incentives with preparedness, institutionalizing

threat analysis, empowering fusion centers, and evolving performance metrics. This paper will examine how GWU's CBRNE micro-credentials seek to close this gap and foster imagination, enabling emergency managers and security experts to plan and prepare.

Background

Program Overview

The GWU CBRNE-WMD Credentials Program is a robust training program consisting of three specialized micro-credentials, each focusing on a different aspect of CBRNE-WMD defense. Each credential is delivered primarily in an asynchronous format over eight weeks, with approximately 40 hours of learning and engagement, including synchronous sessions with current experts in CBRNE-WMD and asymmetric threats. The program consists of three online courses: CBRNE Team Leadership and Management, Emerging Technologies in CBRNE Operations, and Medical Countermeasures in CBRNE Incidents, all of which culminate in an in-person Capstone experience. The inaugural cohort of this iteration was an integral part of the program and brought together sixteen participants from two countries to complete three eight-week micro-credentials.

The CBRNE-WMD Leadership and Policy Micro-Credential focused on leadership and management strategies concerning CBRNE incidents. The cohort learned from each other to navigate the legal, regulatory, and operational frameworks necessary to effectively respond to asymmetric threats while developing skills in strategic planning, interagency coordination, and crisis communication. Following this session, the cohort went straight to the CBRNE-WMD Emerging Threats and Technology Micro-Credential and explored the impacts of advanced and emerging technologies. They studied artificial intelligence (AI), nanotechnology, synthetic biology, and additive manufacturing. They then focused their research and discussions on integrating these technologies into CBRNE-WMD response strategies and gained a better understanding of their implications for future threats. The series concluded with the CBRNE-WMD Medical Management and Pre-Hospital Considerations Micro-Credential where the cohort delved into the medical aspects of CBRNE-WMD incidents. This module allowed the cohort to examine principles and methods of triage and patient management, integrating medical countermeasures and decontamination procedures. It additionally allowed for the evaluation of current and future management of mass casualty incidents and evaluate broader thinking in pre-hospital settings and first receiver considerations in managing complex CBRNE incidents.

All of this training allowed participants to expand upon their prior knowledge and learn how to apply it to real-world scenarios, as demonstrated at a capstone event conducted on November 6-7, 2025 While participants demonstrated strong prior knowledge and expertise in various aspects of these topics, all of the participants came away from each micro-credential with a newfound

depth and breadth of knowledge and appreciation for the complexities involved in these types of incidents.

Capstone

The inaugural capstone exercise, named Operation Red Card, conducted at GWU in Washington, D.C., served as a rigorous evaluation of student competencies in CBRNE scenarios, integrated broader strategic threat analysis, and derived operational and governance lessons applicable to any high-consequence, low-probability event.

The dominant risk is not lack of awareness but the gap between awareness and scalable, integrated preparation. Security success depends on preventing cascading failures, containing narrative weaponization, maintaining public trust, and preserving continuity across domains. Preparedness must evolve from compliance-based planning to resilience-based governance, embedding threat analysis and fusion center integration as standing capabilities.

This two-day competitive assessment involved Alpha and Bravo teams responding to simulated attacks on critical infrastructure during FIFA World Cup events. Participants demonstrated integration of leadership, emerging technologies, medical countermeasures, cyber-physical security, crisis communications, and intelligence fusion in their responses. Key findings highlighted the challenges of multi-vector threats, including cyber-physical interdependencies and novel delivery methods, underscoring the need for adaptive strategies in high-stakes international events. The exercise revealed strengths in team collaboration and innovation but also identified gaps in rapid inter-jurisdictional coordination and resource allocation under compromised conditions.

Summary of the Exercise Over the Two Days

The two-day exercise evaluated CBRNE response capabilities through simulated chemical, biological, and radiological incidents associated with FIFA World Cup venues. Scenarios included a chemical release on the Los Angeles Metro system compounded by cyber disruption of water infrastructure, a covert biological incident at the Kansas City International Airport resulting in delayed detection and requiring multi-national public health coordination, and a radiological dispersal event at the MetLife Stadium of East Rutherford, New Jersey, parking area following the World Cup final, emphasizing efficient but well-planned evacuation, contamination control, and long-term recovery.

Beyond technical response, the exercise examined leadership, coordination, and governance under conditions of uncertainty and cascading system failure. Teams were required to integrate public safety, public health, intelligence, cyber, and crisis communications functions while

adapting to incomplete and evolving information. A central analytical focus was the contrast between California's Home Rule Governance and New Jersey application of Dillon's Rule, which significantly shaped operational decision-making.

Under Home Rule, local authorities in the Los Angeles scenario exercised broad discretion to initiate proactive actions, mobilize resources, and coordinate responses without awaiting explicit state authorization, enabling a rapid operational tempo. In contrast, Dillon's Rule constrained local authority in the New Jersey scenario, requiring state-level approval for key response actions, particularly those involving radiological consequence management and interstate coordination. The exercise demonstrated that governance structures directly influence response agility and effectiveness during high-consequence incidents.

Exercising the Three Credentials of the Program Towards the FIFA World Cup

The exercise evaluated three core GWU CBRNE-WMD micro-credentials: CBRNE Team Leadership and Management, Emerging Technologies in CBRNE Operations, and Medical Countermeasures in CBRNE Incidents. These were integrated with crisis communications and intelligence.

Response Simulation Scenarios
Los Angeles

On the morning prior to the first match, an exercise simulated the issuance of a boil-water advisory in Los Angeles. Initially, groups were informed there was a problem with water pumps and filtration during the night. Shortly after 8 a.m., the participants were met with an explosion and a mass casualty incident on the Metro E Line at the Hawthorne/Lennox Station. Responders were immediately met with commuters complaining of eye irritation, tearing, coughing, difficulty breathing, pulmonary edema, nausea, vomiting, with a rapid onset of symptoms. HAZMAT teams quickly assessed the subway and found a harmful chemical had been released during the explosion. Unsure of the exact chemical type, participants assumed it was a toxic organic compound and quickly initiated triage and decontamination procedures. However, the loss of water pressure from the earlier incident presented challenges in traditional water-based decontamination procedures. Additionally, patients self-transported to nearby hospitals, overwhelming the local emergency healthcare system.

A concurrent Supervisory Control and Data Acquisition (SCADA) cyberattack reduced water pressure to 60% at decontamination sites, impeding wet decontamination efforts. Given the infrastructure degradation, teams adjusted their operational approach by emphasizing rapid

hazard characterization and dry chemical decontamination while prioritizing immediate life-safety actions (Eman Alshaikh, 2025).

Findings highlighted effective interagency coordination with the Los Angeles Joint Regional Intelligence Center (JRIC) but revealed vulnerabilities in decision frameworks when initial indicators mimicked industrial accidents. Completion objectives, including CBRNE response plans and crisis communications, were met through innovative adaptations, though California's governance autonomy enabled independent local decisions that occasionally delayed federal integration.

Kansas City

Over a period of 3-5 days, travelers who had passed through the Kansas City Airport experienced fevers, headaches, shortness of breath, nausea, vomiting, and flu-like symptoms. In response, authorities implemented enhanced epidemiological surveillance through the Missouri Information Analysis Center, in cooperation with the United States Department of State, to coordinate the deployment of mass prophylactic measures across both domestic and international channels to mitigate further impacts.

Key findings included the efficacy of global contact tracing and surveillance enhancements at transit hubs but logistical challenges in coordinating countermeasures for dispersed populations, often relying on self-reporting to identify candidates for post-exposure prophylaxis. Intelligence fusion linked biological data to terrorism indicators, yet diplomatic factors complicated rapid response. This scenario underscored the credential’s focus on medical countermeasures for low-infectious-dose pathogens with high environmental stability.

New Jersey

In the New Jersey scenario, an autonomous vehicle detonated within a secured area, raising concerns of a potential radiological dispersal incident. During the early phase, local and state authorities established initial control zones and implemented protective actions based on field readings and precautionary guidance. State radiation control programs provided immediate technical support while maintaining operational control. As the incident’s scope and interstate implications emerged, federal technical reach back was initiated. The Federal Radiological Monitoring and Assessment Center (FRMAC) was subsequently established, upon state request, to support sustained monitoring, assessment, and coordinated consequence management across the region (FEMA, 2023).

These findings highlighted the increased risk posed by autonomous vehicles and unmanned air vehicles as emerging attack vectors, underscoring the limitations of traditional security

perimeters. Mass evacuation planning incorporated the use of decorporation of radiological agents and biodosimetry; however, strict Dillon's Rule governance structures led to state-level authorization, which in turn caused operational delays. International protocols were effectively leveraged to manage exposures involving foreign nationals. Overall, this scenario emphasized the importance of long-term recovery planning and enhanced coordination across multiple states and the international community.

Lessons Learned

Overlooked CBRNE Planning

Preliminary inter-agency and intra-agency collaboration is critical for planning. This exercise highlighted the need for CBRNE stakeholders and experts to be at the planning table early and often. Their perspectives are critical and cross-cutting.

Planning Considerations for Peripheral Activities

Teams quickly realized that a capabilities-based planning approach was necessary for an integrated and effective response. Rather than scenario-based planning (i.e. a World Cup match), teams identified that the response capabilities should focus on preparation for the actual event and peripheral activities such as practices, watch parties, and crowded transportation hubs. Host nations and states/cities would do well to identify their risks and develop response plans that build broad-based capabilities to address them.

Cyber-physical Dependencies

A primary highlight was the cyber convergence in the Los Angeles scenario, where SCADA attacks on the water supply severely hampered decontamination efforts during the chemical attack on ancillary FIFA World Cup venues. This illustrated how cyber-physical interdependencies exacerbate CBRNE responses, necessitating integrated protocols to rapidly restore infrastructure.

A cyber intrusion that disables heating, ventilation, and air conditioning (HVAC), life-safety systems, or other critical infrastructure, combined with the dispersal of irritants or toxins, creates hybrid casualties and a fragmented response. The growing convergence of cyber and physical infrastructure risk complicates attribution, response, and public health coordination.

Autonomous Vehicles

In New Jersey, the use of autonomous vehicles as attack vectors underscores GWU CBRNE Micro-Credential Two's focus on emerging technologies, revealing the need for enhanced security protocols, such as credential verification and real-time monitoring, to counter security exploitation. The presence of autonomous vehicles can create challenges for first responders attempting to respond to an incident, necessitating planning not only for routine emergencies but also for potential security risks, thereby imposing additional resource demands.

A coordinated cyber intrusion targeting autonomous or semi-autonomous vehicles could deliberately disrupt traffic flow around event venues and regional corridors, impede first responder movement, delay medical evacuations, and generate panic (Boltachev, 2023). Compromised vehicles could also serve as covert delivery platforms for vehicle-borne improvised explosive devices or for the transport and release of biological or chemical agents, transforming transportation automation into a major threat.

California conducted a risk assessment and identified that a wildfire caused by a weaponized electric vehicle posed the highest risk. In that case, capabilities-based planning addressed California's water supply resources in the area, ensured lithium-ion extinguishing tools were readily available, and trained personnel in the latest techniques (Mishra, 2025).

Medical Countermeasures

Medical countermeasures were a consistent strength across scenarios: high-volume decontamination and respiratory support for chloropicrin in Los Angeles, mass prophylaxis and surveillance for tularemia in Kansas City, and decorporation agents with biodosimetry for radiological exposures in New Jersey. However, findings highlighted limitations in coordination and decision-making processes affecting resource allocation and prioritization under constrained conditions.

Fusion Centers and the Incident Command System

Participants identified interoperability, standardized procedures, and a shared operational language as critical requirements for effective multi-jurisdictional disaster response.

Less Commonly Identified Threats

Chemical Release in Transportation Nodes

A low-level release of a nerve agent or industrial toxic chemical in a regional transportation hub (rail hubs, intermodal centers) supporting stadium access exploits high throughput, jurisdictional complexity, and limited security integration. Even modest releases can overwhelm emergency medical services (EMS), paralyze regional mobility and logistics, and disrupt event access without requiring mass fatalities.

Biological Dissemination via Event Extras

Biological agents introduced at fan zones, watch parties, hospitality zones, hotels, team practices, or training facilities lead to delayed detection and dispersed outbreaks. This places significant strain on public health surveillance, epidemiological attribution, and interjurisdictional coordination.

Unmanned Aerial Vehicles (UAV/Drones)

Commercially available or modified drones enable surveillance of security layouts, dignitary tracking, perimeter vulnerability identification, or direct airborne dispersal of chemical, radiological powders, or biological agents. Even low-yield dispersal in densely populated areas (fan zones, open-air ceremonies, stadium ingress points) triggers panic, mass evacuations, and prolonged shutdowns. The psychological impact in a globally televised environment amplifies strategic consequences. Challenges include limited technology access, difficulties with real-time attribution, uneven counter-UAV capabilities, and blurred boundaries between benign and hostile activity in civilian airspace.

Capabilities-based Analysis of Different Localities
Los Angeles

Los Angeles possesses the infrastructure and institutional capacity to manage complex situations effectively. Its strong local autonomy allows for rapid initial decision-making by city and county leaders. This autonomy also allows it the ability to coordinate through established agreements with external agencies and resources across a range of incident types and severity levels, which plays a significant role in overall operations and incident response (FEMA, 2016).

Los Angeles can rapidly mobilize fire, law enforcement, EMS, public health, and transit authorities without significant disruption to the area's overall system (Office of Governor Gavin

Newsom, 2025). When incidents and potential incidents occur, effective intelligence sharing takes place within the region and with federal partners.

In the event of a potential CBRNE incident, the Los Angeles Fire Department's HAZMAT Task Force—classified as a Level One HAZMAT Team—brings a high level of expertise and operational capacity. This means they can respond to and initiate mitigation for CBRNE events.

Questions to be considered:

- If a cyberattack simultaneously disrupts water pressure and other critical infrastructure systems, what alternative decontamination methods are available to responders, and have personnel been trained to implement them?
- How will hospitals identify and manage contaminated patients who self-transport before formal notification from emergency responders?
- As transportation systems become disrupted, how will large numbers of residents, visitors, and spectators be moved away from affected areas while minimizing additional exposures?

As the incident evolves, planners must consider the impact of conflicting information and uncertainty.

- What processes are in place to determine whether the event is an industrial accident, a cyber-related infrastructure failure, or a deliberate chemical attack?
- How will intelligence, public health, and public safety partners share information and develop a common operating picture?
- What role will fusion centers play in identifying links between cyber indicators, infrastructure disruptions, and the chemical release?

Once the incident is stabilized, the next phase of planning will focus on restoring critical services and supporting affected populations.

- How will the loss or degradation of water, transportation, and other infrastructure systems strain local resources beyond the initial response?
- For those individuals exposed to the chemical agent and impacted by the disruption of essential services, what medical, behavioral health, and social support systems will be available, and can local, state, federal, and private-sector partners sustain these functions throughout recovery and restoration efforts?

Law enforcement in this area has several teams trained in CBRNE who work on planning and operations for prevention and detection during events of all sizes (City of Los Angeles, 2021).

Overall, Los Angeles demonstrated a locally driven, capability-rich response that excels in speed and flexibility but risks fragmentation without early federal synchronization, especially during cyber-enabled CBRNE incidents. Cyber-physical dependency water systems significantly

degraded operational effectiveness. The initial indicators, resembling an industrial accident, impeded threat recognition.

Kansas City International Airport

This incident unfolded as a slow-emergence biological event, requiring detection through epidemiological surveillance rather than through traditional emergency response triggers. Heavy reliance on public health intelligence, fusion center analysis, and international coordination was also a part of the overall operations. The affected population rapidly dispersed across jurisdictions and international borders.

In this incident, the ability to integrate medical countermeasures and contact tracing effectively is critical to initiating support for affected individuals and to the overall mitigation process. Recognizing aviation hubs as global amplification nodes for biological threats helps planners better prepare to track exposure, travel routes, and potential outcomes.

Given Kansas City's overall area, the limited local capacity to independently execute large-scale, multinational prophylaxis distribution means that a biological incident cannot be maintained at ground zero in Kansas City. The requirement to work with not only federal partners and agencies but also international groups will lead to delays and challenge traditional emergency management command structures.

Kansas City faces distinct limitations driven by its geographic position and relative scale when compared with larger metropolitan jurisdictions. While the region maintains robust capabilities for routine and regional incidents, a large-scale CBRNE incident, particularly a biological incident with dispersed and international impacts, would quickly exceed locally-sustainable capacity (Wiebe, 2025). Diplomatic and logistical dependencies can delay the deployment of medical countermeasures and the execution of comprehensive contact tracing necessary for effective bio-surveillance. Moreover, the delayed onset and non-specific presentation of symptoms inherent to biological incidents complicate early attribution, prolonging uncertainty as to whether the event reflects deliberate malicious activity or naturally-occurring exposure.

Questions to be considered:

- How long would it take local, state, and federal partners to recognize that isolated medical presentations represent a common biological exposure event?
- What mechanisms are in place to rapidly share epidemiological and traveler information across local, state, federal, and international partners while balancing privacy and public health requirements?
- If exposed individuals have already traveled internationally, who is responsible for coordinating notifications, follow-up actions, and ongoing monitoring?

- As potentially exposed populations disperse across multiple states and countries, how will medical countermeasures be distributed and administered in a timely manner?

As the incident evolves, planners must consider the challenges associated with attribution and public messaging.

- What capabilities exist to distinguish a deliberate biological attack from a naturally occurring outbreak during the early stages of an investigation?
- How will public health officials communicate new information and changes in recommendations while maintaining public trust and encouraging continued compliance with protective measures?
- How can healthcare systems prepare clinicians to recognize rare or high-consequence biological agents that may initially resemble common respiratory or influenza-like illnesses?
- What strategies will officials use to address misinformation, rumors, and social media narratives that may spread faster than the disease itself?

Once the biological agent is identified, the next phase of planning will focus on sustaining operations and supporting affected populations over an extended period.

- What surge capacity exists within hospitals, laboratories, public health agencies, and supporting partners to sustain operations for weeks or months?
- If the biological agent is not identified until after the tournament has begun, what criteria will decision-makers use to determine whether events should continue, be modified, or be canceled?
- For individuals who have been exposed or become ill, what medical, behavioral health, and social support systems will be available, and can local, state, federal, and international partners sustain these functions throughout a prolonged response and recovery effort?

Kansas City highlighted a public health-centric response model that depends heavily on state, federal, and international partners, illustrating how biological incidents overwhelm local capabilities despite strong planning. With high-profile locations used for the matches, resources may not be distributed as they should in order to support operations at all locations for pre- and post-screening for biological threats.

New Jersey

In this scenario, the cohort considered autonomous vehicles as targets that may be subjected to cyberattacks and/or used as delivery vehicles for threat dissemination. Another aspect of this event is that the FIFA World Cup Final is expected to attract a larger audience than prior events, including fans and dignitaries from around the world. This scenario tested a radiological attack towards the end of the Cup. This event affected transit infrastructure and impacted both guests and responders.

An event of this size, with such a large presence of dignitaries, requires multi-state and international coordination across New Jersey, New York, and federal agencies. This will also challenge authorities regarding how they can operate, and which resources can be deployed immediately. For example, New York-based resources cannot be deployed immediately unless mutual aid agreements and the scope of work have been determined in advance, to prevent deployment delays.

With a radiological device being delivered and deployed, federal resources should be integrated from the beginning of the response mission. Having predetermined, well-developed evacuation and long-term recovery plans in place is essential. When working with autonomous vehicles, planners need to have communication and plans in place to enable oversight during large-scale events (American Planning Association, n.d.).

Questions to be considered:

- Where are these vehicles deployed if they require recall?
- How can a large number of people who rely on this mode of transportation be moved out of the danger area and back home?

All of these are parts of the planning that should be undertaken (FEMA, 2024).

Once the incident is mitigated, the next phase of planning will be the long-term recovery of the site.

- How will that strain local resources beyond the initial response?
- For the victims who have been exposed to radiation and the event: What support is going to be in place for them, and can local medical and mental health from both New Jersey and New York, as well as the federal and international partners, support this function?

The New Jersey response illustrated a federally anchored, governance-constrained model, well-suited for technical consequence management but slower in early operational agility. Many local fire, law enforcement, EMS, emergency management, and government agencies will need to have seats at the table to better support an international event and be prepared for large- or small-scale CBRNE events.

Why the FIFA World Cup?

The FIFA World Cup 2026 represents the largest-ever edition of the global showpiece and will feature 104 games across 16 host cities in three countries: Canada, México, and the United States (FIFA, 2026). Matches are set to take place between June 11 and July 19, 2026, with preparations and planning well underway in each country and city. The relevance and timeliness

of the FIFA World Cup made it an apt backdrop for the inaugural capstone exercise, and the lessons learned over the two-day period are applicable to any large-scale event likely to draw a mass gathering. What makes the FIFA World Cup 2026 unique is that, rather than representing a single event or a potential target for bad actors, each individual match, watch party, and surrounding transportation node becomes its own soft target (or hard target, when taking into account surrounding airports).

Coordination with partners across multiple fronts will need to begin very early. This overall capstone exercise demonstrated that CBRNE response effectiveness is not solely a function of resources, but also of governance flexibility, integration of cyber and physical systems, anticipation of non-traditional threat vectors, and the ability to rapidly scale beyond local capabilities. FIFA World Cup events magnify these dynamics, making adaptive, multi-layered response frameworks essential across all jurisdictions, regardless of the size of the statutory authority.

Conclusion

High consequence, low probability CBRNE incidents, although infrequent, have significant potential impacts on the public and emergency responders. Effective planning cannot follow a one-size-fits-all approach; each location requires tailored plans and agreements based on its own needs, resources, and capabilities. This ensures response strategies are properly aligned with corresponding conditions.

The increasing use of unmanned aerial vehicles and autonomous vehicles in host cities for major events presents emerging challenges for emergency response. These systems can be easily exploited to deliver harmful materials or otherwise disrupt response operations, requiring planners to account for new and evolving threat pathways. Incorporating these risks into existing security and emergency frameworks is essential; however, doing so increases the overall complexity and resource demands on agencies responsible for safeguarding large-scale events.

Working with partners on many fronts will need to take place very early. The overall exercise demonstrated that CBRNE response effectiveness is not solely a function of resources, but also of governance flexibility, integration of cyber and physical systems, anticipation of non-traditional threat vectors, and the ability to rapidly scale beyond local capabilities. FIFA World Cup events magnify these dynamics, making adaptive, multi-layered response frameworks essential across all jurisdictions, regardless of the statutory authority’s size.

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